Australia Pacific LNG Project

Volume 5: Attachments

Attachment 12: Visual Impact Assessment – Gas Fields and Pipeline

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Visual Impact Assessment

Final Report

Australia Pacific LNG Project

Gas Fields and Gas Pipeline Elements

January, 2010

A report prepared by

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GLOSSARY OF TERMS

Coal Seam Gas	A form of natural gas extracted from coal seams; primarily methane
Contrast	The degree to which a development component differs visually from its landscape setting
Integration	The degree to which a development component can be blended into the existing landscape without necessarily being screened from view
Landscape	Soft features of the urban, rural or natural environment, such as vegetation or green open space
Liquefied Natural Gas	Natural gas that has been converted to liquid form for ease of storage or transport. Liquefied natural gas takes up about 1/600th the volume of natural gas at a stove burner tip. It is odourless, colourless, non-corrosive, and non-toxic. When vaporized, it burns only in concentrations of 5 % to 15 % when mixed with air. The density of LNG is roughly 0.41 to 0.5 kg/L at -164 °C
Screen	The degree to which a development element is unseen due to intervening landscape elements such as topography or vegetation
Receptors	Sensitive component of the ecosystem that reacts to, or is influenced by environmental stressors
Remnant Vegetation	Vegetation which is mapped by the Queensland Department of Environment and Resource Management (DERM) as being within a remnant endangered regional ecosystem, a remnant of concern regional ecosystem, or a remnant not of concern regional ecosystem map. Vegetation remaining after an area has been cleared or modified
Topography	A description of the surface features of a place or region
Visual Sensitivity	The degree to which a change to the landscape will be perceived in an adverse way
Visual Effect	A measure of the visual interaction between a development and the landscape setting within which it is located
Visual Impact	A measure of a joint consideration of both visual sensitivity and visual effect that considered together determine the visual impact of a development
VCU	Visual Character Unit is a landscape area with similar visual characteristics
VCZ	The Visual Character Zones are broad tracts of landscape which have been determined by the gas field development areas. Each of the VCZs contains similar character in terms of topography, vegetation and land use
View	An area that can include land, water and or sky that is seen from a location and is the total area that is seen by the human eye at any one time
Primary View Zone	Is the most critical central part of a total view and is normally that part of the view enclosed by a cone created by angles of 30 degrees around the centre line of the view

EXECUTIVE SUMMARY

The visual assessment outlined in this report considers the visual impact of the Australia Pacific LNG Limited Project. The Project will utilise Australia Pacific LNG's substantial coal seam gas resources in the Bowen Basin, and the Surat Basin, including the Walloons Gas Fields, located between Chinchilla and Wallumbilla in the west to an area adjacent to Millmerran and Cecil Plains in the south west Queensland. The areas are within the Maranoa, Western Downs and Toowoomba Regional Councils, Queensland.

Specifically the study defined the visual effect and impacts of the gas field's elements of the Project on the landscape settings of the locality and the projection of this into the regional landscape. The development components include the establishment and operation of gas wells, gas and water gathering pipelines, gas processing plants and water treatment facilities. It also includes the gas transmission pipeline from the Walloon Gas Fields to Gladstone.

The visual assessment of the Project evaluated the condition of the existing landscape and the visual character of the proposed construction of the Project elements to determine visual impacts. The visual sensitivity of views on to the Project was considered in terms of general land use and distances of potential sensitive receptors to the project elements. A consideration of visual effect and sensitivity was the basis for determining predictive impact levels.

The CSG infrastructure will for the greater part be placed in existing modified rural landscapes. Although high visual effects may be created during the construction process of some project elements, this is limited in time, and views from sensitive receptors will generally experience little long-term significant effect or impact. The greatest visual effect may be created where there is a need to clear shrub and tree cover.

This is however dependant on sensitive siting of major infrastructure elements, such as a gas compressor station in relation to sensitive receptors such as residences, towns and highways. Further, it is dependent on appropriate and full implementation of proposed mitigation recommendations.

In addition and in a limited number of situations it may be necessary to carry out detail visual planning of some gas field areas. This would be in response to sensitive receptors such as a residence that may have extensive views over large areas of the gas fields and wells.

Visual and landscape proposed mitigation recommendations, developed for the Project, aim at reducing the potential visual impact both in the short and long term. Short term strategies should be carried out near to sensitive points of viewing and focus on achieving impact reduction while also achieving landscape improvements. Longer term strategies relate to landscape management of project component areas to restore and enhance visual amenity values close to pre-development conditions where possible.

From a visual amenity perspective the short and long term landscape management strategies will achieve acceptable levels of visual impact reduction, while creating enhanced landscapes in and around a number of sensitive landscape locations.

1.0 INTRODUCTION

1.1 General

WorsleyParsons have been commissioned to prepare an Environmental Impact Statement (EIS) for the Australia Pacific LNG Project to satisfy the requirements of Part 4 of the State Development and Public Works Organisation Act 1971. The Project as a whole consists of Coal Seam Gas (CSG) collection from wells constructed in the Walloons Gas Fields, in the vicinity of Miles and Chinchilla in central Queensland and piped some 450km to a Liquefied Gas Processing Plant on Curtis Island at Gladstone on the central coast of Queensland. The Project has been divided into three elements for planning and environmental assessment purposes. The two elements addressed by this report relate to the gas fields and gas transmission pipeline and include the collection and transportation of the gas from the fields to the LNG plant, with the LNG plant and associated facilities (e.g. loading jetty) referred to as the LNG facilities element of the Project.

This Visual Assessment Report is a component of the EIS and focuses on the 'upstream' activities associated with the Australia Pacific LNG Project. The objective of this report is to ensure that all visual impacts, direct and indirect, are fully examined and addressed.

This report has been prepared by Integral Landscape Architects and Visual Planning, for Worley Parsons Services Pty Ltd on behalf of Australia Pacific LNG Pty Limited. The practice specialises in landscape architecture and visual planning and has extensive experience in the visual assessment of pipelines and associated infrastructure.

The aims of this report are to:

- Describe the study area and its local context in respect of landscape character and visual elements;
- Examine the proposed development's potential impact on the landscape and visual amenity of the study area, its local area and receptors within it; and
- Recommend suggested mitigation measures to be considered to address potential adverse impacts.

A comprehensive field study was undertaken to assess existing activities in the Fairview and Spring Gully Gas Fields and the impact in which these activities have on the landscape. The assessment of the existing infrastructure provides a baseline to assess the potential impacts of future development within the Walloons Gas Field development areas. To determine the potential visual impacts of future development in the Walloons Gas Field development areas additional field studies were undertaken. The field assessment of existing landscape character in the development areas concentrated on views from public roads and other publicly accessible locations.

Evaluation of the visual implications of the proposed gas transmission pipeline was undertaken by means of a desktop study of mapped information, including topography, land use and landscape and settlement patterns. The review was then correlated with the field assessment data and photography.

1.2 Project background

The Australia Pacific LNG Project (the Project) is proposed by Australia Pacific LNG Pty Limited. Australia Pacific LNG is a coal seam gas (CSG) to liquefied natural gas (LNG) joint venture. The joint venture partners are Conoco Phillips Australia Pty Ltd and Origin Energy Limited, each with a 50% interest.

Australia Pacific LNG has petroleum interests in major producing CSG fields, including Spring Gully and Fairview in the Bowen Basin and Talinga in the Surat Basin. It also holds significant interests in less developed areas across the Walloons Fairway in the Surat Basin, which together with the Talinga CSG fields constitutes the Walloons Gas fields' development area.

Australia Pacific LNG is seeking to accelerate the development and production of its CSG reserves in Queensland through the development of a CSG to LNG project. The proposed project will encompass the further development of Australia Pacific LNG CSG fields in the Bowen Basin, and the Surat Basin, including the Walloons Gas Fields Development Area and the construction of a high pressure gas transmission pipeline to deliver the coal seam gas to the LNG plant located on Curtis Island, near Gladstone. Figure 1.1 illustrates the locality of the Project.

The gas fields element of the Project is centred on major producing CSG fields including Spring Gully and Fairview in the Bowen Basin and Talinga in the Surat Basin, as well as across the Walloons Fairway in the Surat Basin, which together with the Talinga CSG fields, constitutes the Walloons Gas fields development area (refer Figure 1.2). Staged development of the CSG fields is likely to commence with the Central Section, progressing west and northward to the Northern Section and then to the Eastern Section. Only the Walloons gas fields are being evaluated in this report. Other sources outside these fields may be sourced but have separate planning approval.

Gas from the CSG fields will be transported via an underground high pressure gas transmission pipeline. The gas transmission pipeline will be approximately 450km in length, running from the northern Walloons area and track north towards the proposed LNG plant to be located on Curtis Island. Figure 1.3 illustrates the preferred pipeline route.

The Project will also comprise the installation of other facilities to support field development. These facilities will include water treatment and gas processing facilities, access roads, pipe and equipment stores, stockpile areas, accommodation camps, and microwave towers.

1.3 The Walloons Gas Fields

1.3.1 Regional context

The Project is located in central Queensland, Australia. The CSG fields cover an area of approximately 572,000 hectares extending from Wallumbilla to Millmerran on the Darling Downs. The proposed LNG plant is located on Curtis Island, near Gladstone on the central Queensland coast, which will be connected to the CSG fields via an underground gas transmission pipelines (refer Figure 1.1).

The broader regional landscape is characterised by gently undulating rural lands broken by localised forest covered ranges and mountains providing visual variety. A combination of agricultural crops and grazing pastures are scattered throughout the region with an overlay of sealed and unsealed rural roads. Townships and rural settlements are dispersed throughout this non-urban landscape. Although the regional landscape is dominated by agricultural land use, the region is reasonably well vegetated with several State Forests and National Parks. Outside of the State Forests and National Parks, vegetation cover is predominantly remnant woodlands with frequent tree cover along road reserves.

1.3.2 Local context

The terrain throughout the Project area ranges from moderately flat terrain with broad based gently sloping hills with elevations of approximately 300m to forest covered mountain ranges. There is a high proportion of open exposed landscape with scattered pockets of remnant woodlands throughout the area. Tree cover is common along many road reserves throughout the gas fields.

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. Some rural residences within these agricultural lands will have views to the CSG fields and Project elements across cropping and grazing lands, as well as open grasslands.

There are areas of enclosed and semi enclosed forest throughout. The Gurulmundi State Forest is situated north of Miles and the southern portion of the Project area includes Kumbarilla and Boodandilla State Forests.

A network of existing major and minor public roads passes through the CSG fields, from which the upstream Project elements could be viewed. There are three major public roads dissecting the development area. These are the Warrego Highway, providing an east-west route from Brisbane to Charleville, passing through Wallumbilla, Miles and Chinchilla, the Leichhardt Highway, running north-south through central and southern Queensland, passing through Miles and the Kogan-Condamine Road, running east-west passing through the southern CSG fields from Kogan to Condamine. Several townships are situated along these major roads and are located inside the CSG field development areas.

1.4 Gas Transmission Pipeline

1.4.1 Regional context

The proposed high pressure gas transmission pipeline will traverse the landscape from the Walloons Gas Field development areas near Miles to the proposed LNG Plant located on Curtis Island, near Gladstone on the central Queensland coast (refer figure 1.1).

The broader regional landscape is characterised by rural hinterland, beaches, National Parks and State Forest. The gently undulating rural lands broken by localised forest covered mountain ranges and valleys provide visual variety. A combination of agricultural crops and grazing pastures are scattered throughout the region with an overlay of sealed and unsealed rural roads. Townships and rural settlements are dispersed throughout this non-urban landscape. Outside of the State Forests and National Parks, vegetation cover is predominantly remnant woodlands with frequent tree cover along drainage lines and road reserves.

Gladstone, a regional urban centre, is well known for its strong industrial base and is classified as a resource rich region. Sheltered by two large Islands, Curtis and Facing, the area offers calm waters and beaches. To the west of Gladstone is the hinterland of Banana Shire, scattered with eleven towns in the Callide and Dawson Valleys. The Shire is rich in minerals and consists of grazing and farming lands.

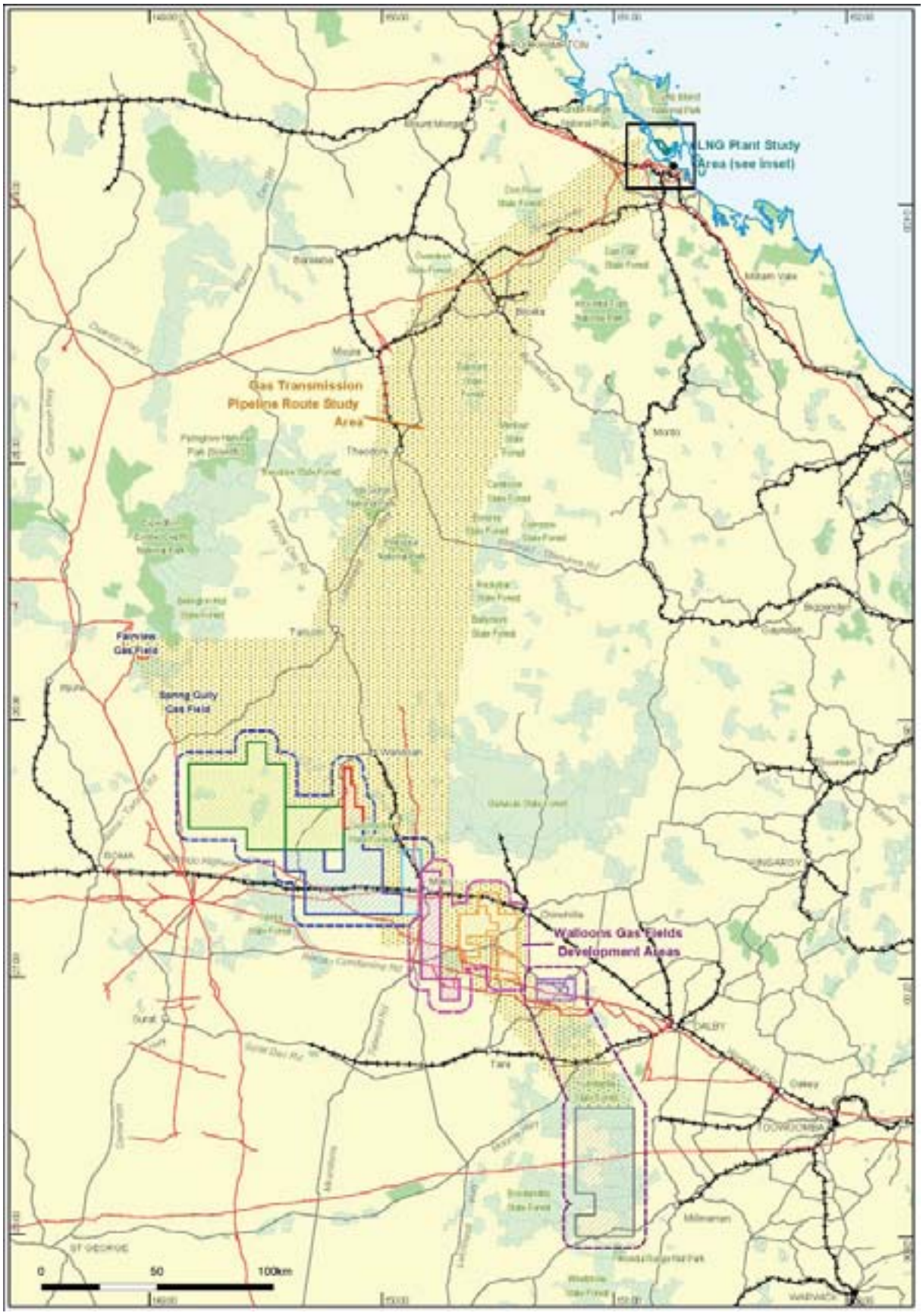


Figure 1.1 | *Project Locality Plan*

1.4.2 Local context

The terrain along the proposed pipeline corridor ranges from moderately flat terrain with broad based gently sloping hills to forest covered mountain ranges. There is a high proportion of open exposed landscape, as well as areas of enclosed and semi enclosed forest also occurring along the route.

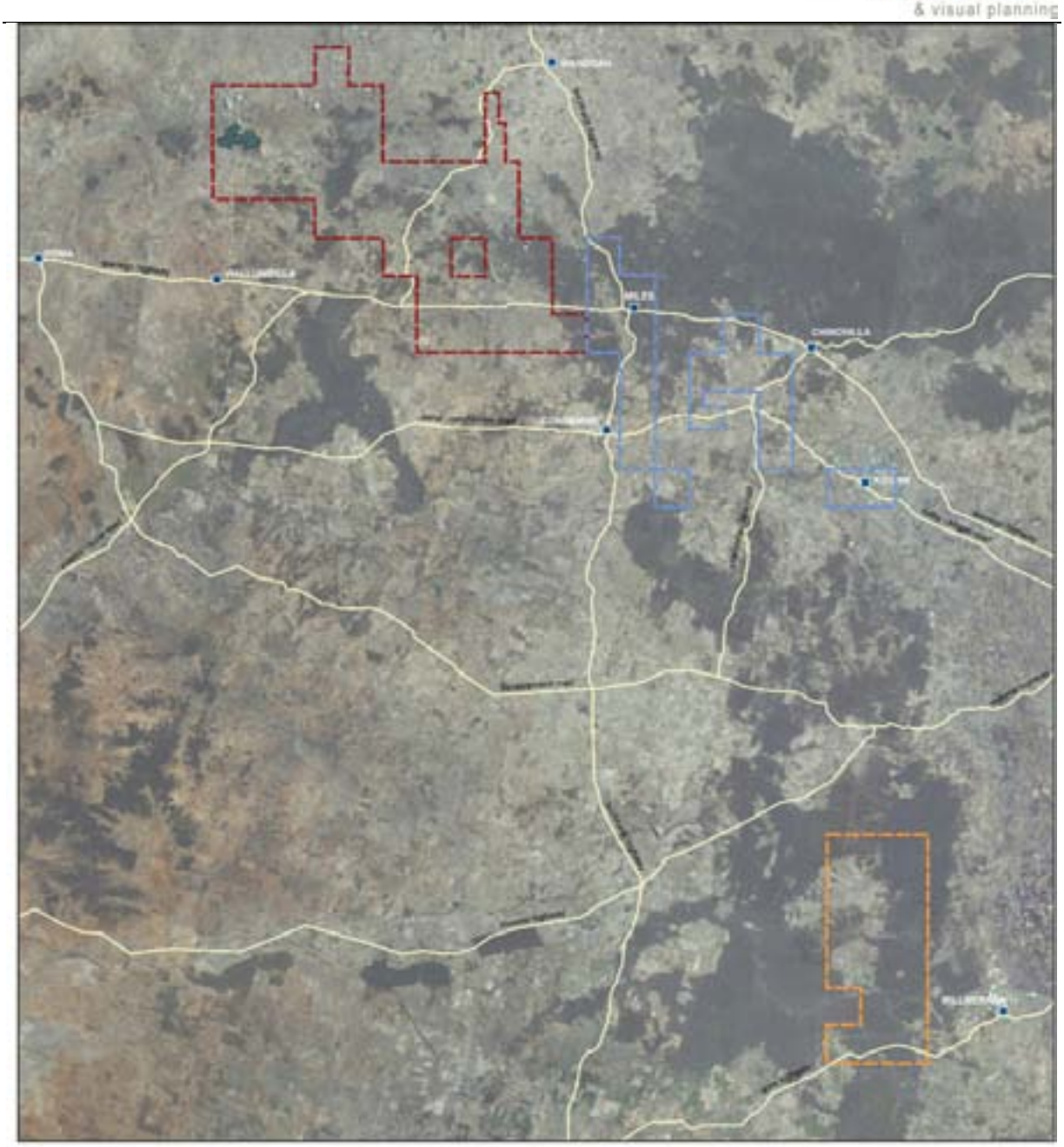
Agriculture is the predominant land use of the area with grazing being the dominant agricultural activity in the region. Historical land use patterns within the study area have resulted in significant clearance of vegetation. Some rural residences within these agricultural lands may have views to the pipeline corridor and Project elements across cropping and grazing lands, as well as open grasslands.

Networks of major and minor public roads pass through the pipeline corridor, from which some Project elements will be viewed. There are six major public roads which the pipeline corridor will cross.

These include the following:

- Warrego Highway, providing an east-west route from Brisbane to Charleville;
- Leichhardt Highway, running north-south through central and southern Queensland;
- Burnett Highway, generally running north-south from just south of Rockhampton to Nanango;
- the Dawson Highway, an east-west route commencing at Gladstone and runs to Springsure;
- Bruce Highway providing a north-south coastal highway from Brisbane to Cairns; plus
- Mount Larcom Gladstone Road, running east-west from South Gladstone to Mount Larcom.

The proposed route of the high pressure transmission gas pipeline does not cross any nationally designated areas of landscape importance such as World Heritage Areas or National Parks. Any landscape impacts would therefore most likely be only of local significance.



CSG Fields

FIGURE | 1.2

2.0 ASSESSMENT TECHNIQUES & METHODOLOGY

2.1 Relevant legislation and guidelines

The Australia Pacific LNG project was declared by the Queensland Coordinator General to be a significant project for which an Environmental Impact Statement (EIS) is required in accordance with Part 4 of the *State Development and Public Works Organisation Act 1971* (Queensland) on 10 April 2009.

This visual assessment, (see Figure 2.1 for methodology of assessment) is part of an overall environmental assessment to meet the requirements of the Coordinator-General's Terms of Reference under the SDPWO Act, IP Act, EPBC Act and EP Act. This was achieved by assessing the visual character of the receiving environments, the visual character of the development, and location of sensitive receptors to define visual impacts and as needed, develop suitable landscape mitigation strategies. The interaction of the visual character of the development components and the visual character of the receiving environment create the visual effect of the Project. The type of land use of the visual receptors and distances from visual receptors to the various components of the Project defines the visual sensitivity to the Project.

These impact levels can be reduced by altering either visual effect or visual sensitivity. In the case of the Project, the visual effect of some components is greatly reduced once the construction phase is completed. Visual sensitivity can be reduced as needed, and is further discussed as part of the suggested mitigation measures for the Project.

2.2 Stages of Visual Assessment Study

In order to review the visual significance and magnitude of the Project on the landscape, a baseline study was completed to record and analyse the existing character, quality and sensitivity of the landscape and any visual resources in the vicinity of the Project.

In general terms, there were four key stages to the landscape visual assessment study:

Stage 1: Desktop study

A desktop study of relevant background reports, other data and mapped information was undertaken to collect data on topography, land-use, and landscape and settlement pattern. This allowed the landscape to be divided into homogeneous zones that could be surveyed in the field.

Stage 2: Fieldwork

A comprehensive field study was undertaken and photographic records obtained. The field survey was carried out on the study area, by two visual impact assessment experts to gain a consensus of opinion.

Field work was completed to collect visual data relating to landform, land use, vegetation, boundaries and more perceptual aspects like scale, enclosure and visual unity. At the same time information was collected on the condition of landscape features and elements that contribute to the overall character of the area. Information relating to the visual character of existing CSG extraction, treatment and transmission was also obtained.

Stage 3: Classification

This stage refined and finalised the desktop study and field work output by classifying the landscape into Visual Character Zones (VCZ). The VCZs are broad tracts of landscape which have been determined by the

gas field development areas. Each of the VCZs (as explained in section 3.4.1) contains similar character in terms of topography, vegetation and land use.

Stage 4: Analysis and evaluation

The visual assessment of the upstream Project elements was completed in two steps. The first step determined the potential visual impact of both the construction and operation phases using an assessment method that measures both Visual Effect (refer Figure 2.2) and Visual Sensitivity (refer Figure 2.3) to determine the Visual Impact (refer Figure 2.4). The second step of the visual assessment developed strategies to mitigate those impacts.

2.3 Methodology for assessment of Visual Impacts

2.3.1 General method

The methodology to determine the level of visual impact of the CSG project involves, in the first instance, a consideration of the existing visual environment. This includes a consideration of existing landscape settings, and how they are seen from various viewing locations. In this way, the visual character of the landscape, as well as visual sensitivity of the various viewing locations, can be determined.

Secondly, the visual effect of the Project is determined by considering the visual characteristics of the Project in the context of the landscape within which it is seen.

A combined consideration of both visual sensitivity and visual effect determines impacts and gives some direction on Proposed Mitigation Recommendations. The overall method of visual assessment of the existing landscape and the project in the context of the landscape is outlined in Figure 2.1.

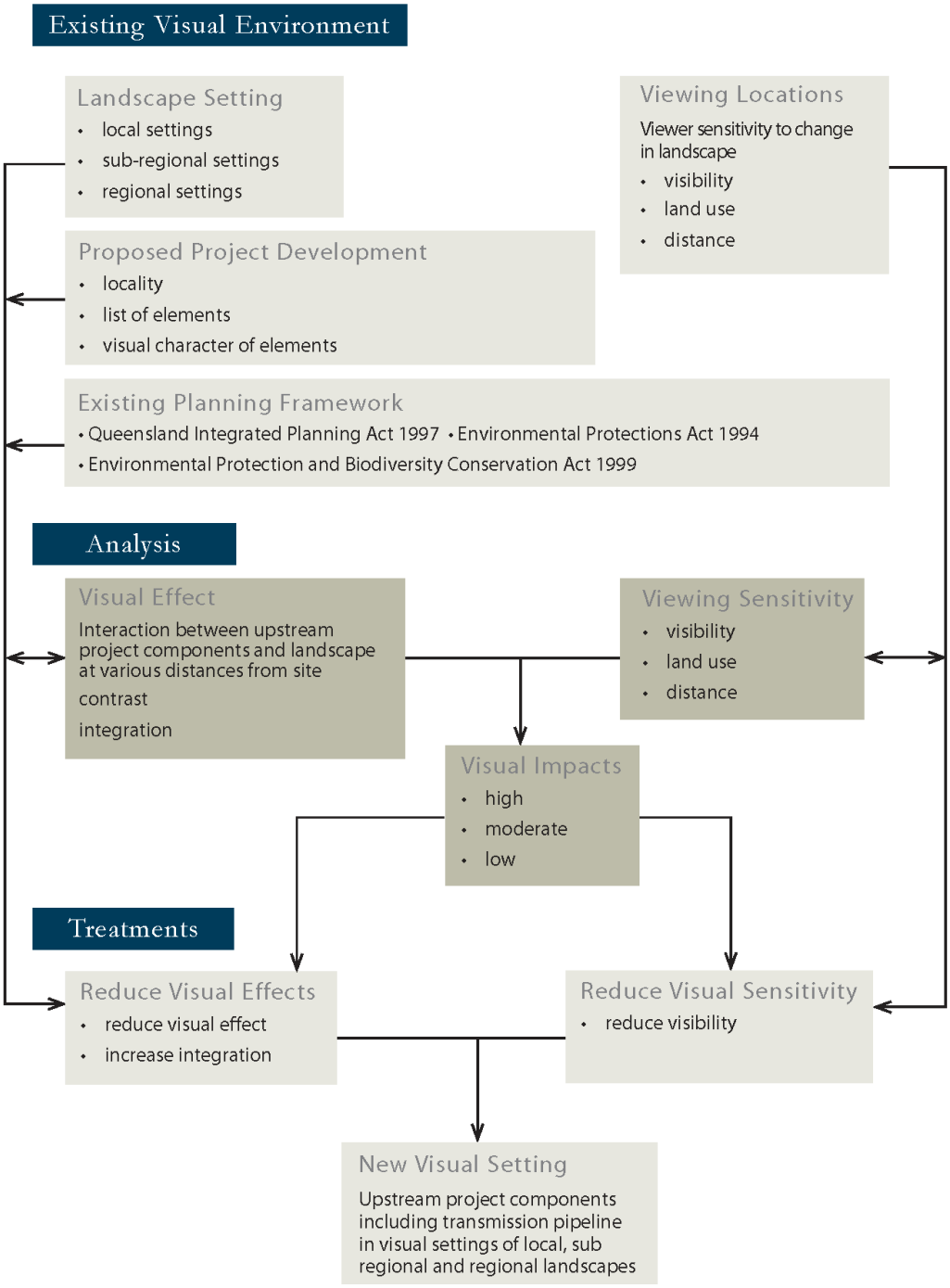


Figure 2.1 | *Visual Assessment Methodology*

2.3.2 Evaluation of the existing visual environment

The evaluation of the existing visual environment consists of the assessment of both the landscape and viewing locations within it. It also includes consideration of the statutory framework within which any development, such as the Project, must be considered.

Landscape setting

The landscape setting can be defined in terms of topography, vegetation, hydrology and land use features. These elements define the existing visual character of the landscape and the one with which Project elements interacts. There are within any landscape, areas of similar visual features that can be defined as a Visual Character Unit. Defining the landscape in terms of these units assists in understanding the visual character of the landscape as a whole.

Viewing locations

The viewing locations are those areas where people are likely to obtain a view of the CSG project elements. These viewing locations have different significance based on numerous factors, collectively evaluated through land use and distance.

Statutory Framework

In the case of the CSG fields and associated high pressure gas transmission pipelines the visual assessment is responsive to state and local regulations.

2.3.3 Evaluation of the development

The CSG Project is the development. This development will have certain visual characteristics associated with gas collection and transmission to a designated liquefied natural gas facility. These elements will express themselves in terms of form, shape, line and colour, and to a lesser extent texture. An understanding of this visual character will provide an appreciation of how various CSG project elements will be seen in the landscape.

2.3.4 Analysis

The analysis of the interaction between the existing visual environment and the proposed development provides the basis for determining impacts and Proposed Mitigation Recommendations. It is done by defining the visual effect of the development and visual sensitivity of viewing locations to determine impact.

2.3.5 Visual effect

Visual effect is a measure of the level of visual contrast and integration of a project with the existing landscape, refer Figure 2.2 Visual Effects

Visual Properties		Visual Effect Levels			
Contrast Levels with components in primary view zone	Visual Integration with components in primary view zone	High Visual Effect	Moderate Visual Effect	Low Visual Effect	Very Low Visual Effect
High Upstream project component does not borrow form, shape, line, colour or texture or scale from existing features of the visual setting and contrast levels are high with existing landscape	Low The project component lacks integration with visual setting because of scale totally dominating the ability of site or surrounding features, vegetation and or topographic features to integrate the development.	It occupies more than 0.25% of the primary view shed half cone area.	It occupies between 1 - 2.5% of the primary view shed half cone area.	It occupies less than 1% of the primary view shed half cone area.	It occupies less than 0.5% of the primary view shed half cone area.
Moderate Upstream project component borrow from some features of the visual setting in terms of form, shape, line pattern and or colour and scale, reducing visual contrast with existing setting	Moderate The project component has some degree of visual integration with setting from other features, vegetation and or topography achieve some level of integration.	It occupies more than 20% of the primary view shed half cone area, generally when in a foreground location.	It occupies between 20-10% of the primary view shed half cone area.	It occupies less than 10%.	It occupies less than 5%.
Low Upstream project component borrows extensively from features in visual setting in terms of form, shape, line, pattern colour and scale minimizing contrast with the existing setting	High Visual integration is high due to other features, vegetation and or topography achieving dominance and screening or filtering.	The project component occupies more than 40% of the primary view shed half cone area.	The project component occupies 40-30% of the primary view shed half cone area.	The project component occupies less than 30 - 20% of the primary view shed half cone area.	The project component occupies less than 20% of the primary view shed half cone area.

Note: The visual effect of the upstream project components change through time with the construction phase having high contrast and low visual integration creating high impacts at low levels of exposure.

Figure 2.2 | *Visual Effect*

An existing landscape has certain visual characteristics expressed through the visual elements of form, shape, line colour and texture. A development such as CSG extraction and pipeline delivery systems has different visual characteristics that will create contrast with the existing landscape. The degree to which the visual characteristics of the various components contrast with the existing landscape will determine the level of visual effect. A newly established element will have high contrast and a high visual effect. However, with rehabilitation and visual/landscape Proposed Mitigation Recommendations, this effect can be lowered significantly in a similar way, various elements are said to be integrated with the existing landscape based on issues of scale, position in the landscape and contrast. High visual integration is achieved if a development is dominated by the existing landscape, is of small scale and or of limited contrast.

The magnitude of the visual effect as outlined in Figure 2.2 is determined by a balanced consideration of the following:

Contrast and integration

The level of contrast and integration of the project elements with its surrounding landscape determine visual effect. Project elements, as expressed through the visual expression elements (i.e. form, shape, pattern, line and colour with minor consideration in relation to texture) contrast to varying degrees with the surrounding landscape and will also, to varying degrees, integrate with it.

The proportion of a view that includes project areas

For any given level of contrast and integration, the lower the proportion of the view that is occupied by the project elements, the lower will be the level of visual effect, which is determined by defining the proportion of the total field of view occupied by the project. This in turn is most appropriately determined by defining what percentage of the Primary View Zone it occupies, see Figure 2.3.

The area covered by a development element, such as a gas plant is determined by its projection into the view. That area is calculated by the width of the development that is at right angles to the direction of view and the elevation which is the dimension of the element parallel to the view line. This dimension is normally a combination of the elevation of the development components and some consideration of the footprint dimension, parallel to the view line.

The Primary View Zone is that area which is occupied by an arc, created by sight lines from the eye radiating out vertically and horizontally at angles of 30 degrees around a centre view line.

The Primary View Zone is the most critical central part of a view. It is not the total view, but the most important part.

Measuring the percentage of the primary view zone occupied by a CSG development element will provide a more critical measure than if it were measured as a percentage of a total view. A total view as defined in this methodology is a semi circle created by a diameter superintended by an arc of 1200, at the point of viewing. Instead the Primary View Zone of the total view has an arc of 600, see figure 2.3, creating a smaller area. It follows therefore that an element of a given size would occupy a greater percentage of that view, the Primary View Zone, than the total view.

Generally, a high visual effect will result if a visible area of the Project has a high visual contrast and low integration to the surrounding landscape.

A low or very low visual effect will occur if there is minimal perceivable contrast between the visible area of the Project and the existing landscape setting and / or the area occupied by the Project are only small parts of a total view.

Area of Primary View Zone at various distances from development

Distance from development	Area of Primary View Zone
200 m	20,782 m²
400 m	83,128 m²
500 m	129,888 m²
600 m	187,039 m²
800 m	332,514 m²
1000 m	519,553 m²
1200 m	748,157 m²
1400 m	1,018,325 m²
1600 m	1,330,057 m²
1800 m	1,683,353 m²
2000 m	2,078,214 m²

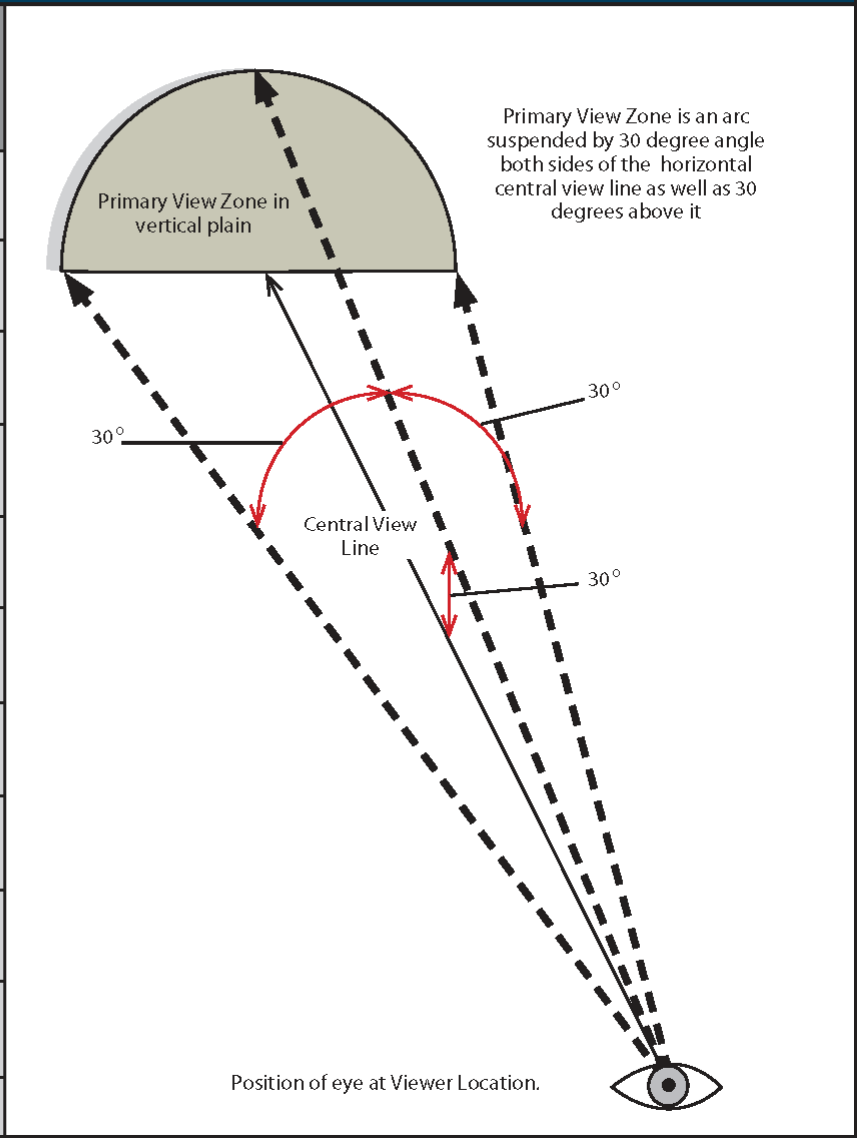


Figure 2.3 | *Area of Primary View zone at Various Distances from the development*

2.3.6 Visual sensitivity

Visual sensitivity is a measure of how critically a change to the existing landscape is viewed by people from different land use areas in the vicinity of a project.

In this regard, residential, tourist and / or recreation areas generally have a higher visual sensitivity than other land use areas including industrial, agricultural or transport corridors, because land uses, such as residential, use the scenic amenity values of the surrounding landscape and may also be used as part of a leisure experience and often over extended viewing periods. Figure 2.4 indicates the levels of visual sensitivity associated with the CSG Project.

However, the visual sensitivity of individual residences may range from high to low, depending on the following additional factors:

- Screening effects of any intervening topography, buildings or vegetation. Residences with well screened views of the project site will have a lower visual sensitivity than those with open views;
- Viewing distance from the residence to visible areas of the project. The longer the viewing distances, the lower the visual sensitivity; and
- General orientation of residences to landscape areas affected by the project. Residences with strong visual orientation towards the project site, i.e. those with areas such as living rooms and/or verandas orientated towards it, will have a higher visual sensitivity than those not orientated towards the Project, and which do not make use of the views toward the Project.

For any area to be given a sensitivity score, it must have visibility to a project element. The sensitivity ratings relate to the scale of the gas field elements as seen in the landscape, based on field assessment and general evaluation of maps and aerial photography.

Land Use	Visual Sensitivity Levels			
	Nearest visible upstream project component less than 2.5km away	Nearest visible upstream project component between 2.5 - 7.5 km away	Nearest visible upstream project component between 7.5 - 12.5km away	Nearest visible upstream project component more than 12.5km away
Town, village and rural houses	High Sensitivity	High/Moderate Sensitivity	Moderate Sensitivity	Low Sensitivity
Designated picnic areas, lookouts and walking trails in recreation reserves, national parks & state forests.	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Designated tourist roads & highways	High Sensitivity	Moderate Sensitivity	Low Sensitivity	Low Sensitivity
Less utilised public lands in national parks, state forests, etc.	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Other main roads	Moderate Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity
Minor local roads in rural zone	Moderate/Low Sensitivty	Low Sensitivity	Low Sensitivity	Low Sensitivity
Broad acre rural lands and forestry	Low Sensitivity	Low Sensitivity	Low Sensitivity	Low Sensitivity

Figure 2.4 | *Visual Sensitivity*

Visual Impact

The visual impact of the CSG project elements has been determined by considering both visual effect and visual sensitivity, which when considered together determine impact level. The way in which the visual parameters of visual sensitivity and visual effect are cross referenced and resultant impacts is illustrated in Figure 2.5.

Visual Effect	Visual Sensitivity		
	High	Moderate	Low
High	High Visual Impact	High/Moder-ate Visual Impact	Moderate/Low Visual Impact
Moderate	High /Mod-erate Visual Impact	Moderate Visual Impact	Moderate/Low Visual Impact
Low	Moderate/Low Visual Impact	Moderate/Low Visual Impact	Low Visual Impact

Figure 2.5 | *Visual Impact*

2.3.7 Mitigation

Visual impact Proposed Mitigation Recommendations are developed for both on-site and off-site situations to ensure that either visual effects and or visibility/visual sensitivity factors are decreased in appropriate time frames to achieve impact mitigation.

Reduce Visual Effects

Rehabilitation of disturbed areas within the Project boundaries will decrease the visual contrast created of CSG project elements to the existing landscape. The rehabilitation strategies that emulate patterns, shapes, line and colour of the existing landscape will reduce the contrast between the Project Elements and the existing landscape, reducing visual effect.

Reduce visual sensitivity

Reducing visual sensitivity is achieved by carrying out treatments to minimise visibility to the Project. Due to the scale of some elements, screening or integration treatments are best implemented at or close to the point of viewing.

New visual setting

On completion of Origin CSG Project and following rehabilitation, a new local landscape will be created. This new landscape will be one that has a range of project elements sited and treated with due consideration for visual appreciation of the landscape settings within which they were placed.

2.4 Limitations

The assessment of visibility of the gas field elements of the project was limited to general evaluation of topographic maps, aerial photography and a broad scale field survey of the CSG Gas Fields. Due to future planned selection of exact site location of the Project components it was not possible to accurately predict likely views or view-sheds from any given viewpoint. Similarly although a general appreciation of the spread of gas field elements based on functional needs was available, their siting within actual landscape settings has yet to be fixed making seen area analysis not feasible on this ground and on the grounds of numbers of elements and need. Where such analysis is needed it is a mitigation recommendation

3.0 EXISTING ENVIRONMENT

3.1 Introduction

This section of the visual assessment report evaluates the existing visual environment of the Walloons Gas Fields and the proposed high pressure gas transmission pipeline route between the Walloons fields and Gladstone. These landscapes have common properties that need to be evaluated.

Specifically, the visual character of the landscape is expressed through vegetation, land form and land use features. These values in turn influence the visual absorption capacity of the landscapes to development elements within the gas fields and the proposed high pressure gas transmission pipeline route.

3.2 Visual Character of the Landscape

Extensive open views across grassland or agricultural land, semi-open views of semi-enclosed forest and enclosed views of heavily forested areas dominate the visual character of the landscape.

Networks of tracks, from both sealed and gravel public roads, provide access to residences that are distributed throughout the area. Trees and shrubs, including native and exotic, are typically planted around residences. Other common structures in the landscape include water tanks, sheds, silos and stockyards.

The CSG fields and study area, of agricultural land and varying semi-enclosed and enclosed woodland, contribute to a unique rural and forested landscape character. These landscape patterns are a major influence on the visual quality of the landscape.

When travelling through the Project area along public roads a sequence of visual experiences is provided, alternating from open long distance views across open grassland or agricultural land, to visually enclosed views where the roads pass through State Forest or National Park. Also many road reserves throughout the area frequently include roadside vegetation often as remnant vegetation, which provides visual screening to distant landscapes.

The local and regional landscape is devoid of visual clutter, for example transmission lines and roadside signage, which creates a landscape with high visual integrity in most locations.

Key characteristics of the local and regional landscape character are:

- Landscape of contrast and variety;
- Open rolling landscape;
- Large scale open landscape with extensive vistas to level horizons and huge sky expanses;
- Semi-enclosed forest;
- Enclosed forest;
- High proportion of agricultural areas, with varied agricultural land-use including crop and livestock;
- Partial woodland cover along road reserves;
- Small clumps of trees are located in some grassland areas;
- Riparian areas; and
- Residential gardens.

3.3 Visual Absorption Capacity of Visual Character Units (VCU)

The Visual Absorption Capacity (VAC) of a Visual Character Unit is defined as the ability of that VCU to screen and or visually integrate the development components of the gas field and gas transmission pipeline project elements.

In this regard the two environmental parameters that have been used to define the VCUs, namely topography and vegetation will determine the VCU ability to absorb the various project elements such as gas wells.

Topography will determine the extent of cut and fill to create a pad and will influence the extent and scale of earthworks required to establish a pad. In terms of topography, the flatter country has a higher VAC than steep country because of better screening potential and also the minimisation of projection of gas well elements into a vertical view frame. Having said this, it is also true that if there is moderate topography it affords an ability to 'sink' Project Elements into the landscape via cut and fill, which enables elements to sit lower in the landscape

Vegetation influences the type of clearing that is required, i.e. whether it is grass, crop, scattered trees, woodland or forest. While the greatest visual effect would occur within forest, it also has the greatest visual absorption capacity (VAC). Trees around a Project Element would screen the area from external views. Woodland would also have a good VAC breaking up the line of Project Elements. Obviously grass and croplands would have the lowest VAC as they have no screening capacity. However, even in grassland, the dominant colour of the grassland provides a basis for achieving better VAC outcomes by painting gas well elements for better integration.

Croplands are generally flat more fertile soil areas generally along the flood plains of creeks. These areas are vast and open. While they require little environmental modification in terms of vegetation clearing and pad establishment, they have low VAC and project elements may be highly visible, given the extensive views that are available over croplands.

Open Grasslands areas generally occur on gentle to moderate slopes and often have cleared grass areas, with open woodland as a background, or there are clumps of retained trees and scrub scattered throughout. The vertical elements of vegetation and small rises in topography can provide screening or background to project elements (integration effect). This creates a receiving environment with a low to moderate VAC due to the influence of topography and vegetation on the visibility of a field of project elements.

Woodlands provide an ideal mix of VAC and limited environmental modification at well sites. Open woodland would require less clearing of tree cover than forest, while retained woodland around a project element would create moderate to high VAC.

Enclosed Forest areas provide strong screening despite the fact that there is a large visual effect in clearing forest areas to accept project elements.

3.4 The Walloons Gas Fields

The CSG fields are located on the Darling Downs extending from Wallumbilla to Millmerran (refer Figure 1.1). There are variances across the study area due to the difference in the land use, topography and vegetation cover. The functional character of the area and its context is largely agricultural with paddocks featuring both cropping and grazing. The clearing of original forested areas for agricultural land use has opened up views to mid and long distance.

The CSG fields and study area is a typical rural landscape of the region. It includes open grassland with scattered trees, woodland pockets often along creek and drainage lines, State Forest and National Parks,

managed farmland, an array of meandering creeks, large residences and townships, all of which come together to contribute positively to the setting of the area.

There are several State Forests within the CSG fields and study area. Gurulmundi State Forest is situated to the north between Miles and Wandoan, Yuleba State Forest borders the west portion along the Warrego Highway and both Kumbarilla and Boodandilla State Forests are located in the most southern CSG fields. The southern CSG field also borders the Wondul Range National Park, south-west of Millmerran.

Topographically the CSG fields and study area lies between approximately 300m elevation and 430m elevation and intersects the Great Dividing Range west of Miles. The topography and vegetation, coupled with the cultural land use of the area create a range of unique visual settings that are experienced in this locality. Topography and vegetation will be the major determinants of visibility to the project elements. They are also the major 'natural' features of the landscape in this location.

3.4.1 Landscape Character Zones (CSG Fields)

For visual assessment purposes the Walloons Development Area has been divided up into CSG fields. The CSG fields have been identified in the following sections however they do not have any visual implications on the overall visual analysis of the Project.

To assess the landscape character of the CSG fields, the development area has been divided into three Landscape Character Zones (LCZ), on the basis of geographic location and CSG field boundaries. There are overlapping similarities between the landscape character zones, as well as some unique variations between the zones. Dividing the landscape into distinct zones provides a valuable tool for visual character assessment of large areas (refer Figure 1.2). Views across the development area from public places and roads were analysed within the three landscape zones.

The Landscape Character Zones include:

- Roma LCZ
- Chinchilla LCZ
- Dalby LCZ

Within the landscape character zones, four distinctive and recognisable patterns of elements have been identified in the landscape. For the purpose of this assessment these elements have been labelled as Visual Character Units (VCU)

These Visual Character Units have been determined primarily by land cover and land use pattern. There are differences however in the Visual Character Units throughout each of the LCZs, due to topographic and vegetative changes. Landscape character types and patterns combined with varying topographic features create eight Visual Character Units, refer figure 3.1.

land cover & pattern	topographic features		
	flat (1)	undulating (2)	hilly/steep (3)
agricultural land (A)	▲		
open grassland (B)	▲	▲	
woodland (C)	▲	▲	
enclosed forest (D)	▲	▲	▲

Figure 3.1 | *Visual Character Unit Matrix. Land cover and pattern combined with varying topographic features create eight landscape character units*

3.4.2 Landscape Character Zone 1 – Roma LCZ

The Roma LCZ includes the Combabula/Ramyard, Woleebee and Carinya fields which are located predominantly north of the Warrego Highway between Wallumbilla and Miles, extending north near Wandoan. The topography to the north and south portions of this LCZ are predominantly flat to undulating. The terrain however in the central portion, becomes undulating to hilly through the Great Dividing Range.

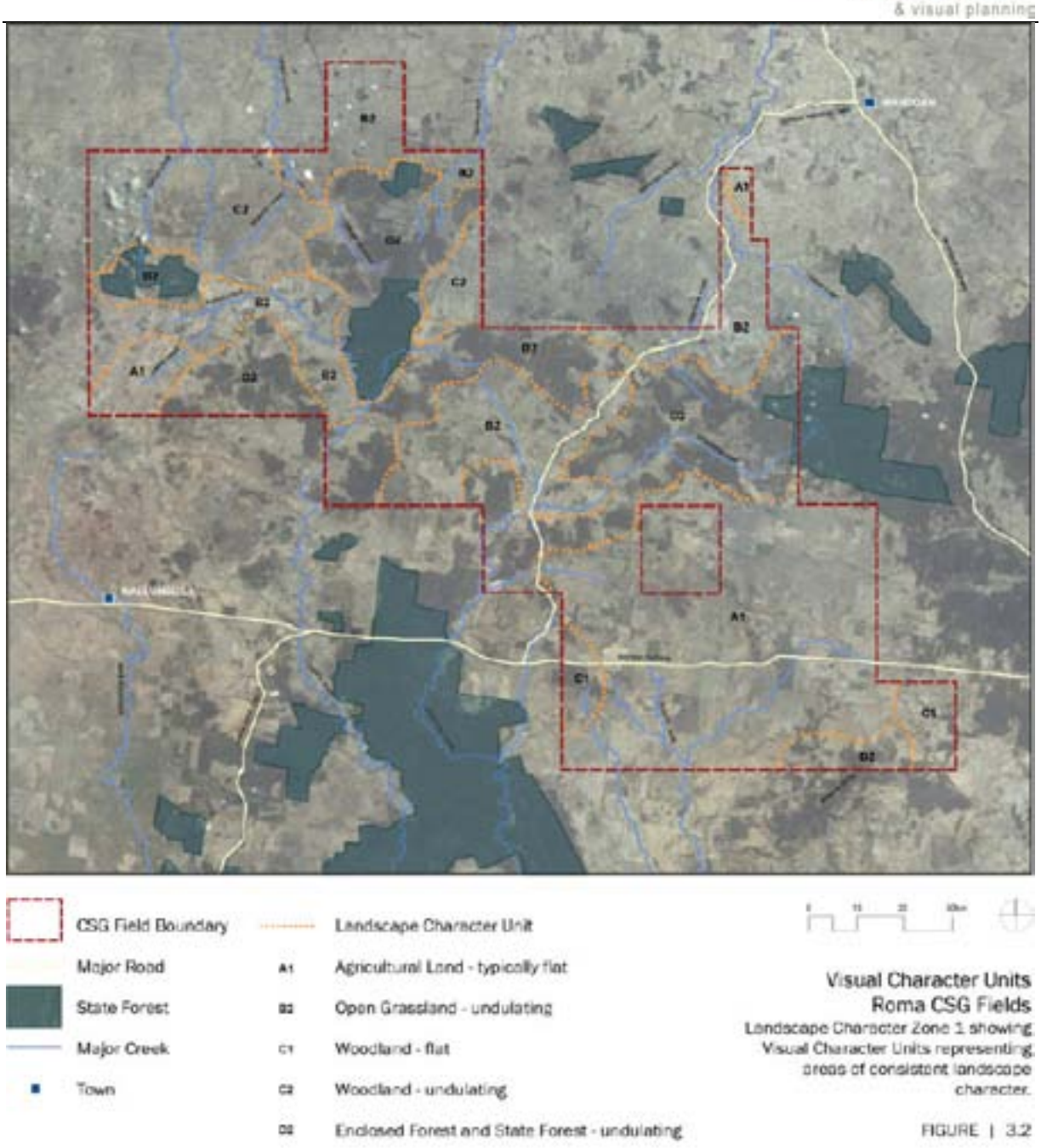
The landscape character throughout the Roma CSG Fields may be characterised as a cultural landscape reflecting the long term agricultural land use. This LCZ is predominantly agricultural land and open grassland, with vegetation patterns reflecting the geomorphology and land use. The landscape has been largely cleared of vegetation, consisting of unimproved natural pastures and improved pastures. Vegetation remains in steeper areas of woodland and forest, along creek lines and some road reserves. Roadside vegetation includes sections of remnant vegetation as well as planted trees. The land holdings are generally large, resulting in rural residences being wide spread throughout the LCZ.

Extensive open views are available across open grassland and agricultural land for a large portion of the Roma CSG fields. Views are screened however through woodland and forested areas. Roadside vegetation also assists with screening views.

Elevations range from approximately 300m at Barton Creek in the north-west to 450m at the highest elevation on Mt Combabula in the western portion of the Roma VCZ.

Combabula State Forest, Dinquin State Forest and Wooduck State Forest are located entirely within the Roma VCZ, while the Gurulmundi State Forest has a small portion located within the VCZ.

Five distinct Visual Character Units (VCU) have been identified within the Roma LCZ as shown on Figure 3.2.



3.4.3 Landscape Character Zone 2 – Chinchilla LCZ

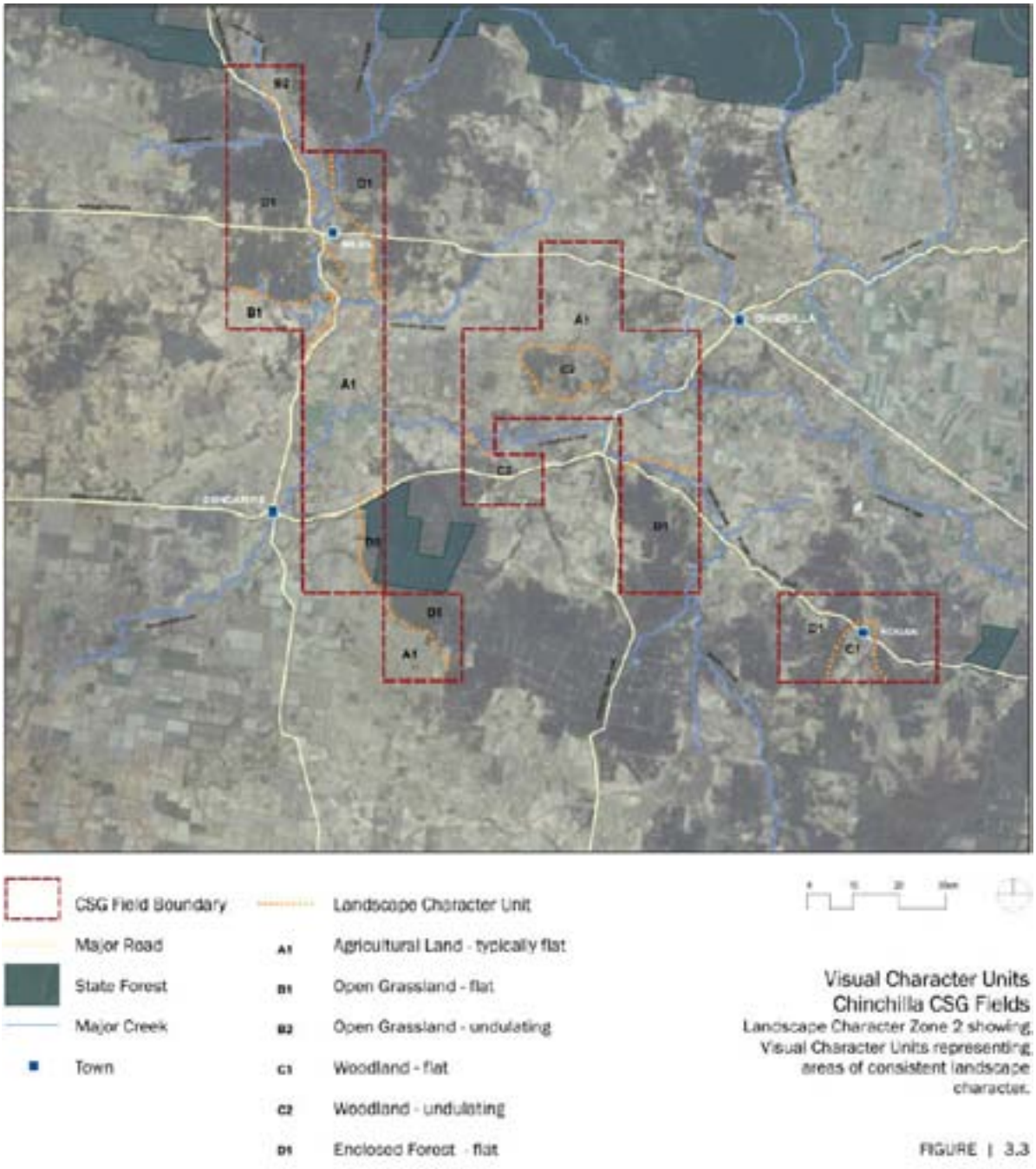
The Chinchilla LCZ includes Condabri, Talinga/Orana, Dalwogan and Kainama fields which are located from Miles to Chinchilla, predominantly south of the Warrego Highway. Similar to the Roma CSG Fields this zone consist of large areas of agricultural land use.

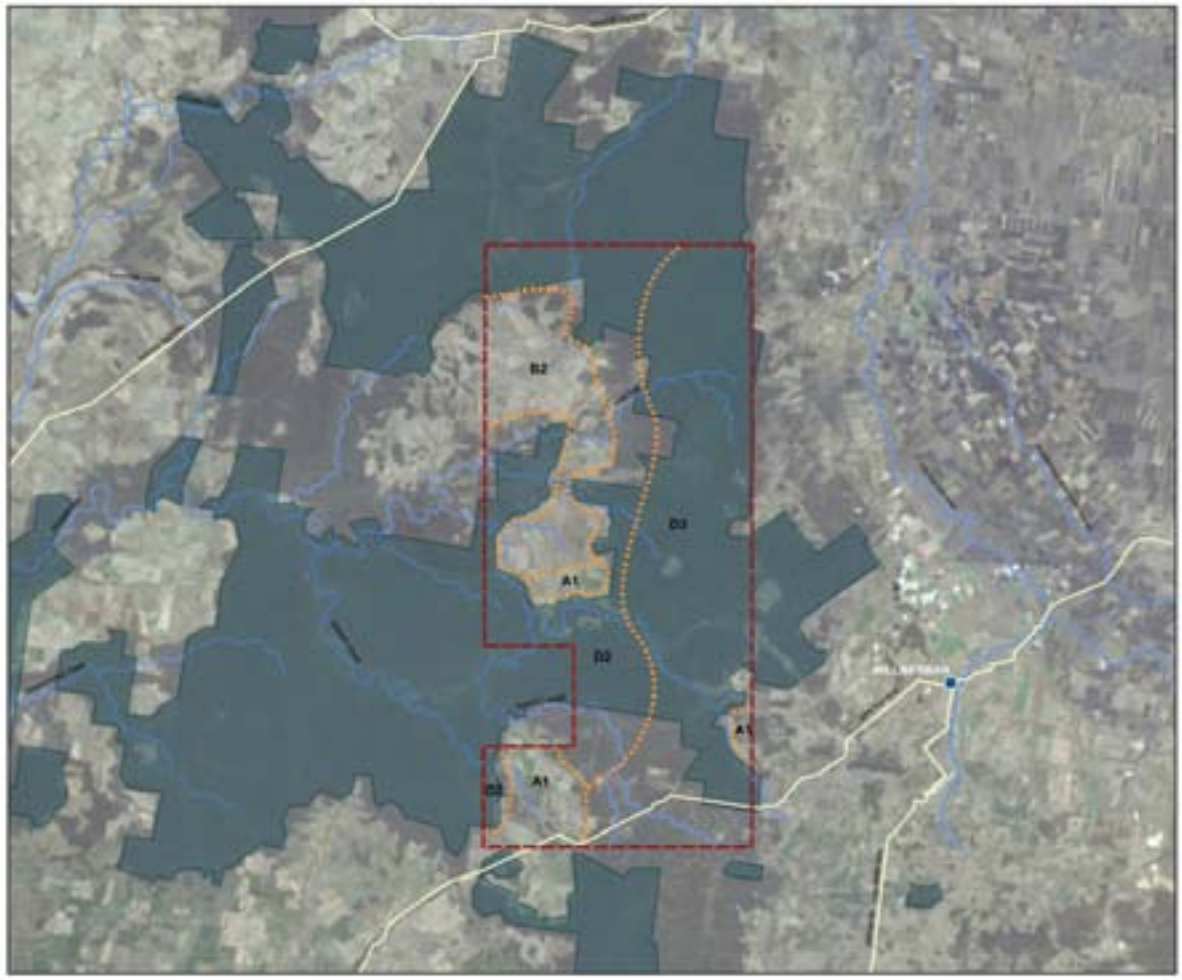
The Condamine River runs east-west through the central portion of the CSG fields with a wide belt north and south, of cleared agricultural plantings, creating a distinctive patchwork pattern. Containing few trees this landscape creates a broad open aspect. Settlement is scattered throughout the agricultural LCZ in the form of isolated residences, again reflecting the large scale land holdings.

The western portion of this VCZ has some areas of open grassland with scattered remnant trees, combined with the agricultural land; this zone has extensive open views much the same as the Roma VCZ.

Elevations range from approximately 290m at Miles to approximately 392m at Kogan in the south eastern portion of the VCZ. There is a small portion of the Condamine State Forest in the western CSG field.

Six distinct Visual Character Units (VCU) have been identified within the Chinchilla LCZ as shown on figure 3.3.





CSG Field Boundary
Major Road
State Forest
Major Creek
Town

A1 Agricultural Land - typically flat
B2 Open Grassland - undulating
D2 Enclosed Forest and State Forest - undulating
D3 Enclosed Forest and State Forest - hilly/steep

Landscape Character Unit

Visual Character Units
Dalby CSG Fields
Landscape Character Zone 3 showing Visual Character Units representing areas of consistent landscape character.

FIGURE | 3.4

3.4.4 Landscape Character Zone 3 – Dalby CSG LCZ

The Dalby coal seam gas–fields comprise of Gilbert Gully field which is generally located between the Moonie Highway and the Gore Highway west of Millmerran. Unlike the Roma coal seam gas fields and the Chinchilla coal seam gas fields, this Landscape Character Zone consists of approximately 60% State Forest. The Forest is more complex than other Landscapes described, with dense tree cover providing a degree of enclosure and containment of views.

This LCZ supports the least number of residences due to the presence of state forest. Apart from this large land holdings still create a wide spread of residences in the landscape and forest cover in the LCZ reduces visibility to and from residences.

Long distance views are available in the north-west portion, the south-west corner and a small area on the eastern boundary of this LCZ, where landform is generally flat to undulating due to agricultural land uses and open grassland.

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.

This LCZ consists of many tributaries primarily flowing into the Weir River which generally flows east to south-west.

Four distinct Visual Character Units, (VCU) have been identified within the Dalby LCZ as shown on figure 3.4.

3.4.5 Summary of Landscape Character Zones 3

The Landscape Character Units are geographically based but are also responsive to the locality of the various coal seam gas fields that make up the Walloons Gas Fields. An overall analysis of them provides the basis for understanding the characteristics that will form the basis for more detailed visual analysis and definition of the visual character units within them.

The LCUs have very similar characteristics in terms of topography, vegetation and land use pattern with local variation, e.g. the extensive crop lands along the Condamine River. Perhaps the greatest difference lies in the Dalby LCZ in that it supports so much forest in both state forest and on private land.

3.4.6 Visual Character Units

The Visual Character Units (VCU) represents areas that contain consistent landscape character in terms of topography, vegetation and land use. Each VCU contains elements or a combination of elements, which create a particular visual character. They have been described by spatial enclosure and pattern, which is determined by landform and land cover. No one VCU is identified as better, as or worse than another.

It is important to note that VCUs are defined at a broad scale. Some VCUs can change in character quite distinctly whilst in others the difference is more subtle. Boundaries have been determined between the VCUs as a single line. However, in reality the change between one VCU and another is not as clear-cut. Often the transition between units is difficult to define as a line, however the VCU descriptions identify the essence of those differences and the boundaries are seen as the changeover point where the characteristics of one unit outweigh those of another unit.

In-field investigation, photographs and aerial photography were analysed to identify the different landscape characteristics of each LCZ within the Project area. The primary characteristics of the four Visual Character Units are summarised below with typical photographs shown.

Local Visual Character Units include:

- Agricultural Land;
- Open Grassland;
- Woodland, and
- Enclosed Forest.

Agricultural Land

The *Agricultural Land* Visual Character Unit (refer figures 3.5 - 3.6) is a dominant landscape type found throughout each of the Landscape Character Zones.

This VCU has been heavily modified through agricultural practices. It has an exposed, open rural character with farmland, scattered trees and some remnant tree clumps.

In most cases, field sizes are quite large, creating large-scale mixed crop and grazing. Some remnant patches of vegetation still exist, particularly in road reserves and along drainage lines. As these areas contain few trees or woodland it creates a more expansive, open uniform and at times denuded character.

Land use in this VCU is largely private use amenity, with crop and cattle grazing. There are some residences within the VCU that will have visual contact with Project elements. This VCU is largely visible from highways and other local roads when travelling through the landscape.

Visual Significance

Generally this VCU will have strong visual links to the Project elements from several viewing locations. Due to its historical land use of cropping and grazing practices, flatness and limited vegetation cover, long distance open views are available from several road locations running through the unit, except where roadside vegetation blocks views.

This VCU has the lowest visual absorption capacity.

Figure 3.5 | *Agricultural Land. This VCU is typically flat with scattered trees and remnant vegetation patches generally along road reserves and drainage lines.*

Figure 3.6 | *Typical view across agricultural land from Cattle Creek Road.*

Figure 3.7 | *Open Grassland. This VCU is flat to undulating with a sparse landscape pattern.*

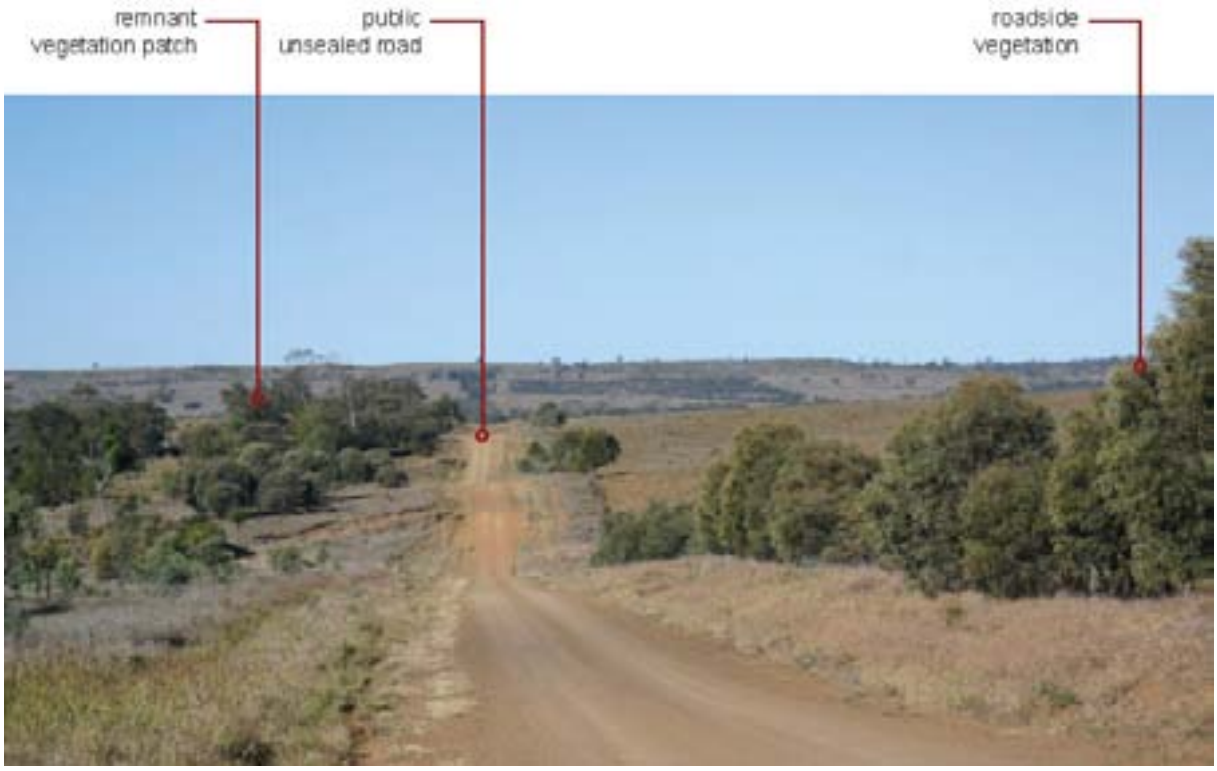


Figure 3.8 | *Typical view across undulating open grassland from Myalls Downs Road.*

Open Grassland

The *Open Grassland* Visual Character Unit (refer figures 3.7 - 3.8) is found scattered throughout each of the Landscape Character Zones.

Open Grassland consist of typically flat to gently undulating landforms. These naturally vegetated grasslands accommodating limited human activity form broad patches across the CSG fields. This VCU pattern is sparse and there are few landscape features to interrupt the open, gently sloping landscape. Vegetation is predominantly long grasses with some scattered remnant trees found within this unit.

Long views predominate, due to its openness, in this landscape unit with skyline features taking on particular importance. Long distance open views are available across grassland areas from many locations in the development area.

The lack of topographic features and tall vegetation contribute to its openness. The landscape has a smooth appearance that offers extensive and panoramic views. There are some rural residences situated within this VCU, which contribute to the character of the unit. Residential buildings, including residences and agricultural sheds are a feature which contrasts with the smooth and natural landscape. These residences are scattered throughout this landscape and increase in frequency around townships.

Visual Significance

This VCU will have strong visual links to Project elements from several viewing locations. Foreground landscapes within the unit itself will be a significant part of the view that will include components of the Project.

This Unit generally has low VAC however; this can be moderate due to the undulating topography, scattered trees and scrub that occur in much of the Unit.

Woodland

The *Woodland* Visual Character Unit (refer figure 3.9 - 3.10) is less dominant, found only in the Roma CSG Fields and the Chinchilla CSG Fields.

This VCU is more complex than Open Grassland and Agricultural Land VCUs described above, with tree cover more frequent, providing a degree of enclosure and containment of views. This unit is best described as semi-enclosed forest with a subtle mosaic of grassland and scrub. Some areas of this VCU have been cleared for grazing purposes creating pockets of open grassland.

The topography is gently sloping and level land. These gentle slopes of semi-enclosed forest with a subtle mix of grassland and grazing land create a typical landscape of the region.

The Woodland is a highly patterned landscape. Diverse vegetation patterns from scattered tree cover to dense pockets of forest, combined with varying flat to undulating land forms contribute to this highly patterned VCU.

In addition this VCU supports intermittent residences which also contribute to the landscape pattern through built form and planted vegetation. These residences create focal points in the landscape providing visual variety.

Visual Significance

Although the Woodland unit is limited in extent, it is significant in its visual screening effects in certain situations. The various levels of tree cover within this VCU have the potential to provide screening of Project elements where generally open landscapes will not. Most significant are forested areas along major

highways and roads. Tree cover within road reserves will act as a visual barrier, screening Project elements, from travellers moving through the region.

This VCU has moderate to high VAC. It may not require as much clearing as forest and can provide good screening when distances are greater than 500m between a project element and a sensitive receptor.

Enclosed Forest

The Enclosed Forest unit (refer figure 3.11 - 3.13) occurs within each Landscape Character Zone however predominantly within the Dalby CSG Fields zone.

This VCU is dominated by mixed species enclosed forest with grass and scrubby understorey. Occurring primarily in State Forest and National Park this VCU is heavily forested. These include Woodduck State Forest, Combabula State Forest, Gurulmundi State Forest, Condamine State Forest, Kumbarilla State Forest, Dunmore State Forest, Boodandilla State Forest and Western Creek State Forest.

The landscape within this VCU is generally flat to moderately hilly with elevations ranging up to 450m. The highest elevation point of 450m is located in the Roma CSG Fields.

Small areas of grassland with scattered tree cover and grazing occur in intermittent patches. Occasional rural residences are scattered throughout, however, generally this VCU does not support any sensitive land uses.

This tree-dominated unit creates strong visual enclosure, screening out land areas beyond immediate foreground views. Sealed and unsealed roads are frequent throughout this VCU with firebreaks and trails also contributing to visual difference in this highly enclosed landscape.

Figure 3.9 | *Woodland. This VCU provides enclosure and containment of views when topography is predominantly flat.*

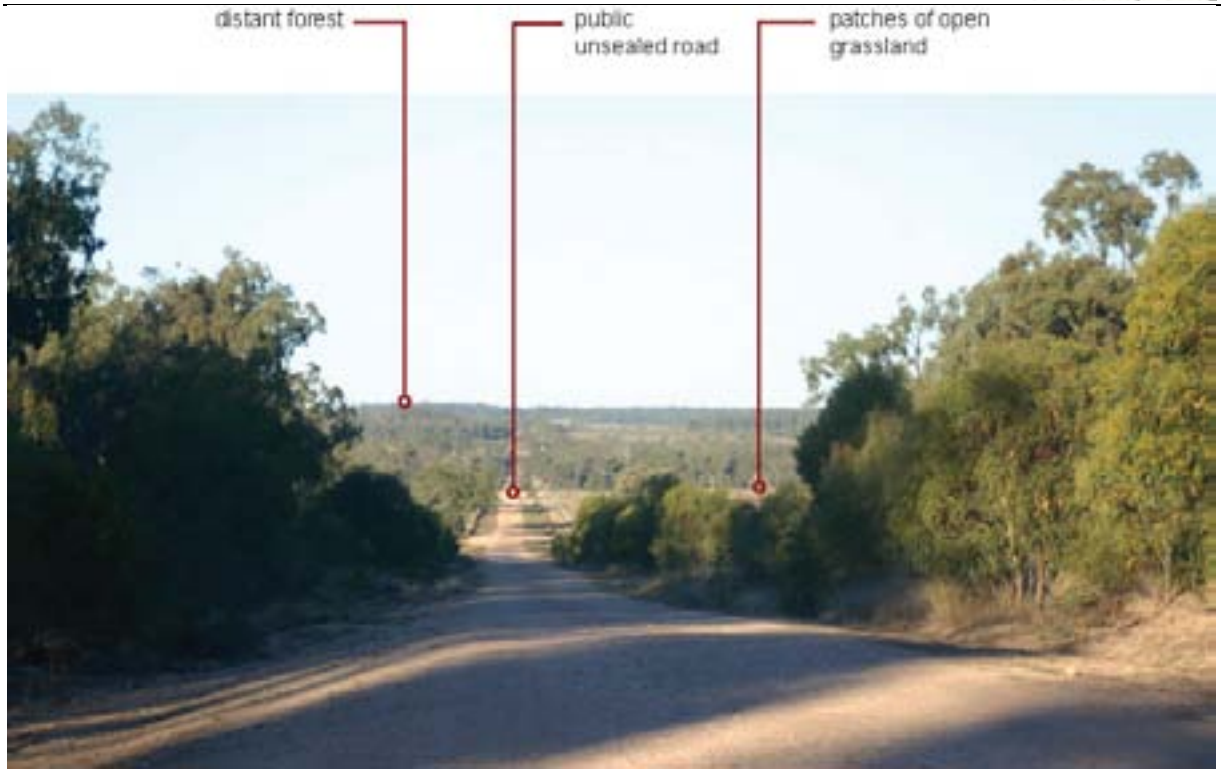


Figure 3.10 | *Typical view across undulating woodland from Crossroads Road. Distant views are available when topography is undulating however views are still contained to a degree*

Visual significance

Enclosed Forest generally does not support sensitive land uses and acts as a visual barrier to inward views from roads. If the Project is adequately set back from road reserves, tree cover in this VCU would preclude views to Project elements. The most important visual significance of this VCU is its visual screening potential.

This VCU has high visual absorption capacity, as retained forest around development element will, with the exception of microwave towers, generally be able to screen all other project elements from external view

3.4.7 Summary of Landscape Units of the CSG Fields

The existing landscape of the CSG fields is typically flat to moderately undulating with scattered vegetation to large patches of woodland. The Condamine River and Moonie Rivers are regional rivers which meander through the Project area.

The existing landscape character is the result of the historical evolution and change in the region. Land use is typical of western Queensland, comprising cultivated land including grazing and crop land with limited housing and transport infrastructure. Areas of flat terrain have low visual absorption capacity however remnant vegetation provides some limited screening.

Figure 3.11 | *Enclosed Forest. Typical view of enclosed forest along Kogan-Condamine Road, where topography is generally flat.*

Figure 3.12 | *This VCU is heavily forested creating strong visual enclosure.*

Figure 3.13 | *Enclosed Forest. Typical view of enclosed forest along Greenswamp Road. Although topography is undulating visual screening is still achieved.*

3.5 Landscape Character Zones (High Pressure Transmission Gas Pipeline)

To assess the landscape character the study area has been divided into 14 Landscape Character Zones (LCZ), which have been determined primarily by land cover and land use pattern. The LCZ's contain consistent landscape character in terms of topography, vegetation and land use. Each LCZ contains elements or a combination of elements, which create a particular visual character. The basis for the determination of the zones is to enable a localised consideration of landscape interactions both in terms of visual effects and visual sensitivity.

It is important to note that the LCZ's have been defined at a broad scale. Some can change in character quite distinctly, whilst in others the difference is more subtle. Boundaries have been determined between the zones as a single line. However, in reality the change between one LCZ and another is not as clear-cut. Often the transition between zones is difficult to define as a line, however the LCZ descriptions identify the essence of those differences and the boundaries are seen as the changeover point, where the characteristics of one zone outweigh those of another.

Topographic maps and aerial photographs were analysed and enabled appropriate identification of the different landscape characteristics of each zone within the Project area and not field survey given the distances, lack of public access and no access to private lands. The Visual Character Zones are illustrated in figures 3.14 and 3.15, and primary characteristics are summarised below.

3.5.1 Landscape Character Zone 1 – Condabri CSG Field to Pipeline Intersection

The pipeline route alignment starts within the Condabri CSG Field approximately 0.5km south of the Warrego Highway. The pipeline generally traverses in a north-west direction for approximately 43kms to intersect with the Woleebee branch.

LCZ1 is moderately undulating, with elevation ranges from 250m in the southern portion of the zone to 340m where the pipeline branches intersection. This zone is dominated by enclosed forest with two small portions of open grassland and scattered trees. These grassland areas are located immediately north of the Warrego Highway, as well as in the vicinity of the intersection of the two branches.

Immediately north of the Condabri CSG Field boundary the pipeline route crosses Dogwood Creek. The Great Dividing Range runs to the east and west of the pipeline corridor.

3.5.2 Landscape Character Zone 2 - Woleebee CSG Field to High Pressure Transmission Gas Pipeline Intersection

This branch of the pipeline commences in the Woleebee CSG Field, near the base of Mount Horrible and traverses in an easterly direction for approximately 37kms. Gurulmundi State Forest in within close proximity to the route alignment however the route runs to the north of the state forest.

This LCZ is moderately undulating with elevations ranging from 300m in the west to 374m in the eastern portion of the zone. Along the pipeline alignment the landscape character is generally open grassland with scattered trees, with some grazing. The pipeline traverses a small patch of enclosed forest for approximately 4kms near the eastern boundary line of the Woloobee CSG Field.

Juandah Creek flowing north runs parallel to the pipeline route for approximately 12kms. The pipeline route crosses the Leichhardt Highway just south of Juandah Creek. The Great Dividing Range runs to the south of the pipeline corridor.

3.5.3 Landscape Character Zone 3 - High Pressure Transmission Gas Pipeline Intersection to Old Chinchilla Road

From the intersection of the Condabri and Woloobee branches the proposed high pressure transmission gas pipeline routes progresses in a northern direction. LCZ3 is a relatively small zone of approximately 10km along the route alignment. The landscape character is predominantly enclosed forest with a small portion of agricultural land with scattered trees generally along drainage lines. Topography is moderately undulating with elevations ranging from 330 to 400m. The Great Dividing Range runs to the east of the proposed high pressure transmission gas pipeline corridor.

3.5.4 Landscape Character Zone 4 - Old Chinchilla Road to Glendoan Road

From Old Chinchilla Road the pipeline route travels in a northerly direction. This LCZ consists of open grassland grazing with some cultivated areas and scattered trees predominantly along drainage lines and road reserves. There are few remnant patches of enclosed vegetation.

Topography is predominantly flat with elevations ranging from 298m to 324m. Several residences are within viewing distance of the pipeline route throughout this zone.

The proposed high pressure transmission gas pipeline route crosses Roche Creek.

3.5.5 Landscape Character Zone 5 - Glendoan Road to Big Valley Road

The proposed high pressure transmission gas pipeline route, progresses in a north direction traversing a mix of semi-enclosed forest and enclosed forest through LCZ 5. This LCZ is typically flat to undulating with elevations ranging from 290m to 332m. A network of tracks, which could include property boundaries and fire trails, organised in a geometric form are a dominate feature of this landscape pattern.

The pipeline route crosses Bungaban creek and a series of tributaries which drain into Bungaban Creek.

3.5.6 Landscape Character Zone 6 - Big Valley Road to Deearne Road

This LCZ runs parallel to the Auburn Range. The route continues to traverse north through open grassland with scattered trees and remnant patches of vegetation along drainage lines and road reserves.

The route crosses Cockatoo Creek and a series of other small creeks which drain into Cockatoo Creek, such as Nine Mile Creek, Kennedy Creek and Rocky Creek. The route also crosses Pine Creek and runs parallel to the creek for approximately 6kms.

The proposed high pressure transmission gas pipeline runs adjacent to Ponty Pool Road for 2kms. Topography is flat with elevations showing a slight variance from 370m to 390m.

3.5.7 Landscape Character Zone 7 – Deearne Road to JP Gully

Within this zone, the pipeline traversing in a north-westerly direction has a distinct change in landscape character from LCZ 6. To the west of the pipeline corridor are valleys and mountain ranges, while the east is dominated by state forest. The corridor travels just west of several State Forest borders, including Camboon State Forest.

The pipeline crosses several gullies including Silverleaf Gully, Quinns Gully, Big Gully and Braser Gully; and including Ross Creek.

Vegetation cover in the valleys and mountains consists of remnant forest on slopes and along drainage lines. The eastern side of the corridor is dominated by enclosed forest with few patches of open grassland.

Elevations are much higher through this zone ranging from 300m to 480m.

The pipeline route crosses the Eidsvold Theodore Road. This road is the main road which travels to Cracow approximately 10kms from the pipeline corridor.

3.5.8 Landscape Character Zone 8 – JP Gully to Oxtrack Creek

Continuing to progress in a north westerly direction the pipeline crosses through a more open landscape. For a small area of approximately 2kms from JP Gully to Cracow Creek the landscape character is semi-enclosed forest. From Cracow Creek the landscape changes to open grassland and grazing land with scattered trees and few remnant vegetation patches predominantly on slopes and along drainage lines.

Several creeks are crossed including Delusion Creek, Horse Creek and Oxtrack Creek.

Topography is gently undulating with elevations ranging from 370m to 410m.

3.5.9 Landscape Character Zone 9 – Oxtrack Creek to Keen Creek

The proposed main transmission pipeline route continues in a north westerly direction through enclosed forest with patches of semi-enclosed woodland, crossing several unsealed tracks. Topography is moderately undulating with elevation ranging from 400m to 470m.

The proposed main transmission pipeline route crosses South Creek and Keen Creek.

3.5.10 Landscape Character Zone 10 – Keen Creek to Dawson Highway (south)

Landscape Character Zone 10 is predominantly open grassland and scattered trees with some patches of remnant semi-enclosed woodland.

The Banana Ranges run parallel to the pipeline west of the route. Elevations range from 350m in the southern portion of the zone gently decreasing to 250m from Dry Creek. Topography remains consistently flat from Dry Creek to the Dawson Highway.

The pipeline route crosses several creeks throughout this zone, which include Pump Creek, Twenty Mile Creek, Twelve Mile Creek, Dry Creek, Prairie Creek, Tiamby Creek and Quartpot Creek. The majority of these creeks run from the Banana Ranges.

3.5.11 Landscape Character Zone 11 – Dawson Highway (south) to Dawson Highway (north)

Within this zone the proposed main transmission pipeline route crosses the Dawson Highway and the Burnett Highway. From the Dawson Highway the route travels in a northerly direction for approximately 10kms at which point the route changes bearing and heads in a north easterly direction.

This LCZ is predominantly agricultural land with few patches of remnant vegetation along creek lines and road reserves. Topography is generally flat throughout this zone with a consistent elevation of approximately 250m.

Much the same as other LCZ's along the route, the pipeline crosses several creeks. LCZ11 crosses Back Creek, Kroombit Creek, Kroombit Creek (west channel), Callide Creek and Callide Creek (old channel).

3.5.12 Landscape Character Zone 12 – Dawson Highway (north) to Coal Road

LCZ12 traverse through the Callide Ranges which consists of enclosed forest covered ranges and valleys. The proposed main transmission pipeline route generally follows adjacent the Dawson Highway in a north easterly direction.

The proposed main transmission pipeline route crosses Collards Creek in several locations throughout this LCZ. Topography is moderately undulating through this section of the route with elevations ranging from 350m to 400m.

3.5.13 Landscape Character Zone 13 – Coal Road to Sneaker Gully

The landscape character changes through LCZ 13 to undulating grassland with scattered trees and patches of remnant vegetation. The proposed main transmission pipeline generally runs adjacent to the Dawson Highway for approximately 40kms, crossing the highway near The Mole Hill. The route changes bearing at Sandy Creek and continues in a north westerly direction for approximately 16kms. The route changes bearing again at Larcom Creek heading in a more westerly direction for approximately 8kms to Mount Larcom Gladstone Road. The pipeline route crosses Mount Larcom Gladstone Road and changes to a north easterly direction. The pipeline route also crosses the Bruce Highway east of Larcom Creek.

3.5.14 Landscape Character Zone 14 – Sneaker Gully to Curtis Island

This LCZ traverses in an easterly direction through the Mount Larcom Ranges. The pipeline route runs between Scrubby Mountain and Mount Larcom. This LCZ has forest covered slopes and ridgelines with

grassland and scattered woodland through the valley floor. Crop land also forms part of the valley floor. West of Kangaroo Island the pipeline traverses a patch of remnant forest for approximately 2kms.

The pipeline continues to traverse Kangaroo Island which consists of low swampy coastal plains and mangrove flats, across The Narrows Passage to Curtis Island. The route enters the island south of Graham Creek and terminates at the Curtis Island LNG Plant.

Along the proposed main transmission pipeline route on Curtis Island the landscape character is undulating forested hills and valleys.

The pipeline route crosses Sneaker Gully. The valley floor between Scrubby Mountain and Mount Larcom has a consistent elevation of approximately 100m. While elevations reach to approximately 173m on Curtis Island.

3.6 Summary of Landscapes along Pipeline Route

The existing landscape of the project area is typically flat to moderately undulating with scattered vegetation to large patches of woodland. The Condamine River and Moonie Rivers are regional rivers which meander through the study area. Several State Forests are located in the CSG field development area, the largest being the Western Creek and Kumbarilla State Forests, which are located within the southern area of the gas fields.

The pipeline study area traverses the Gilbert, Lynd and Murphy Ranges located north of Taroom, comprising strongly undulating lands increasing to mountainous regions and ridges. Continuing north along the study area towards Gladstone, gentle rolling terrain is encountered with isolated areas of steep hilly to mountainous country.

The existing landscape character within the Project area and the transmission pipeline study area is the result of the historical evolution of the region. Land use is typical of western Queensland, comprising cultivated land including grazing and crop land with limited housing and transport infrastructure. Areas of flat terrain have low visual absorption capacity however remnant vegetation provides some limited screening.

Landscape Character Zones
Gas Transmission Pipeline
(southern section)

FIGURE | 3.14

Landscape Character Zones
Gas Transmission Pipeline
(northern section)

FIGURE | 3.15

4.0 THE PROPOSED DEVELOPMENT AND VISUAL EFFECTS

4.1 Introduction

The proposed coal seam gas fields are centred on the Walloons Gas Fields development area approximately 572,000 hectares, located between Wallumbilla and Millmerran on the Darling Downs. The proposed gas transmission pipeline route runs approximately 450 km from the Walloons Gas Fields to the coastal town of Gladstone.

The pipeline will be constructed of steel and operated at high pressure. The preferred route (refer figure 1.1) commences in two locations, one location being the Condabri CSG Field the other being the Woloobee CSG Field. These two branches meet approximately 40kms north of Miles and progress in a northerly direction to the proposed LNG Plant facilities on Curtis Island.

During the initial stages of the project's drilling and completion activities could typically target up to 600 wells per year. It is estimated that the Walloons gas fields will be developed progressively with up to 5000 wells by 2021.

The proposed spacing of wells will be based on a 750 metre grid subject to the gas production profile and drilling techniques, however test drilling to date indicates that this distance could be substantially increased. Most CSG wells will produce both methane gas and associated water as a two phase mixture that will be separated at the well site via a local separator/metering facility. An underground network of low pressure gathering lines will link individual wells to respective gas and water processing plants. High pressure gas from the main gas treatment plants will be transferred to a take-off point for the main gas transmission pipeline through a network of high pressure gas pipelines across the development.

The associated water produced from the CSG wells will be treated using reverse osmosis plants to remove impurities prior to reuse of the water for commercial and beneficial use. Management of this associated water will also include the development of transfer ponds and pipelines, as well as other infrastructure such as reinjection wells, depending on the end uses of the associated water.

Currently appropriate communication infrastructure only exists at the Talinga Gas Production Facility. The Project will include the development of a microwave backbone to help facilitate both voice and data communications. This system will be replaced in the medium term by fibre optic cable that will be collocated with gas and water pipelines.

The project comprises the following elements.

- Installation, development, collection, processing and gas transportation built elements in the CSG Fields
- Gas transmission pipeline transporting gas from CSG fields to the LNG Production Plant and ship loading facilities on Curtis Island.

The visual character and effects of gas collection and transportation in the gas fields will be considered in this section of the report. Also discussed will be Proposed Mitigation Recommendations to reduce the visual effects of the various elements.

The visual character, effects and Proposed Mitigation Recommendations of the gas transmission pipeline between the Walloons Gas Fields and Curtis Island at Gladstone will be considered in Section 5 of this report.

4.2 CSG Fields

The visual character of the Project is created by the various Project elements. From a visual perspective, the Project has a number of major and minor visual elements.

The visually prominent elements of the Project include the construction, operation and decommissioning of:

- CSG and water production wells;
- Gas Processing Facilities;
- Water Treatment Facilities;
- Accommodation Camps, temporary and permanent;
- Microwave Towers;
- Walloons to Curtis Island Pipeline

In addition, the installation of other minor visually prominent elements will be required to support field development; these will include:

- CSG and water gathering pipelines, including valves
- Water Transfer Stations
- Access roads
- Storage and lay down areas (temporary)

Both the major and minor elements will cause varying levels of visual effect as seen from different viewing locations throughout different stages of construction and operation.

4.3 CSG and water production wells

4.3.1 General

The gas wells and their associated elements of access tracks and water/gas pipelines are the most visually significant feature of the gas collection and transportation process. Although the individual elements of a gas well are not major, if a number of wells are seen collectively from a vantage point on a hill or across open fields, they have the potential to create a significant visual effect.

Gas Well Pad Establishment

The first field operation, following the well surveying process, would be pad establishment for drilling rig work and well establishment which will utilise existing tracks or a new access route to establish the pad. This would normally involve removal of vegetation and topsoil, Figure 4.1 & 4.2

On areas with even moderate slope cut and fill batters would be required to create a level pad for the production wells on sites with significant side slope. The degree of cut and fill would increase on steeper slopes.

Figure 4.1 | *Gas and water production well site on flat land prior to installation. Areas stripped of vegetation contrast with the surrounding landscape.*

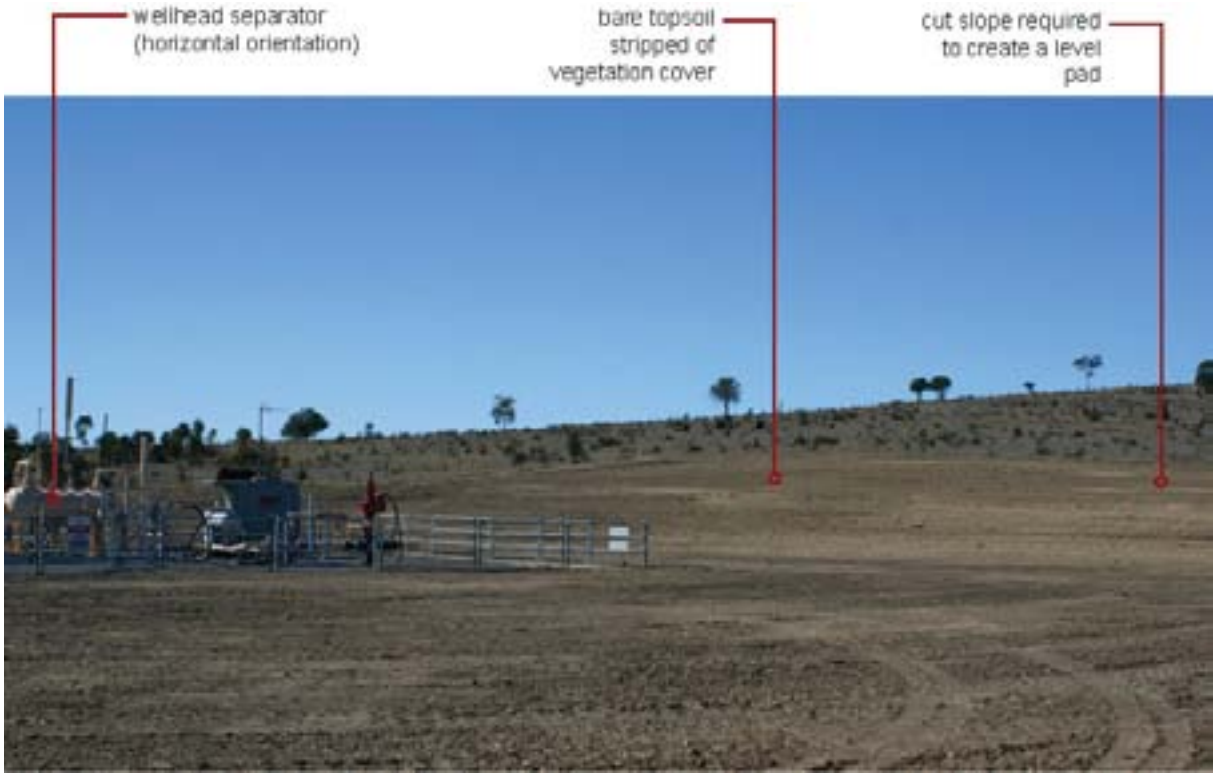


Figure 4.2 | *Gas and water production well on undulating land showing extent of cut and fill prior to revegetation. Bare topsoil areas are visually prominent from a distance. Elements contrast with form, shape, line and colours of the receiving landscape.*

Establishing the gas wells

The gas wells are established by gas well drilling rigs that normally operate 24hrs a day and taking a number of days to establish each well. Up to 9 rigs will work in various fields establishing the gas fields. Each gas well establishment unit has up to 20 elements of equipment including the drilling rig, see Figure 4.3. The continuous operation of the drill rig and associated components may include other earth moving, trenching, supply and transportation vehicles. The drill rig and work area will be illuminated at night to ensure a safe work place.

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. A consideration of night lighting associated with vehicles is discussed below is section 4.3.2.

Gas well operation and components

In most cases, CSG wells will produce both methane gas and associated water as a two phase mixture that will be separated at the well site via a small vessel called a wellhead separator. The two separated streams of gas and water are injected into a low pressure gas and water gathering network. The underground network of lines will link individual wells to respective gas and water processing plants.

The typical surface facilities associated with a well are shown in Figures 4.4 - 4.5, and consist of:

- The well head which is the termination of the well, and from which the water and gas is produced to the surface
- The motor to drive the sub-surface pump, located and attached to the wellhead
- The wellhead separator, with associated control devices, is the largest element in a well and stands approximately 3m high and is 2.3m in diameter.
- The power supply to drive the pump. This may either be a hydraulic pump driven by a small gas engine or a gas fuelled generator know as a Micro-turbine
- Solar panels and well monitoring devices
- Fencing around the whole well site

Up to approximately 600 well per year will be constructed with 5,000 in operation by 2021. These elements will create a large informal grid over the landscape with some wells removed on completion of the gas reserve in that location.

Figure 4.3a | *Aerial view of a gas well construction rig.*

Figure 4.3b | *The typical lighting requirements for a gas well construction rig during the drilling and completion phase.*

Figure 4.3c | *Night view of the Spring Gully Gas Plant*

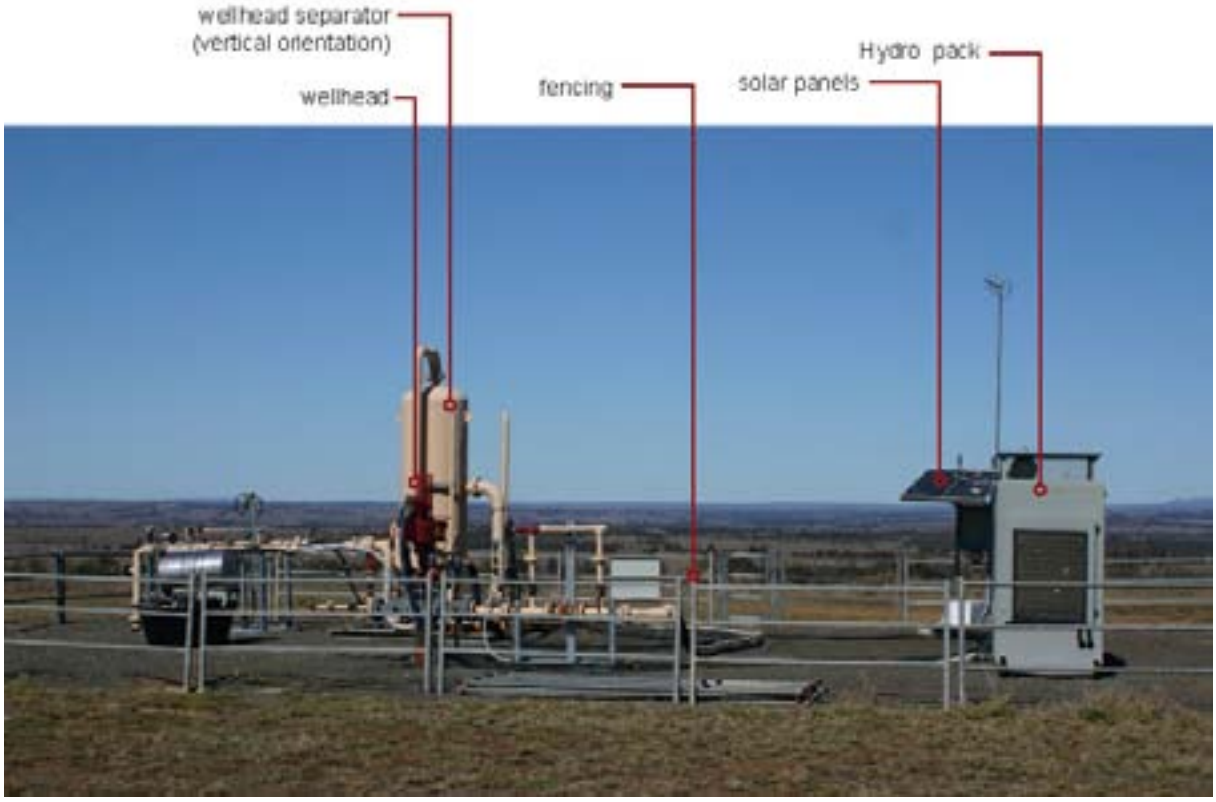


Figure 4.4 | *Gas and water production well. Elements are industrial in character are angular, linear or rounded, however are generally small scale.*

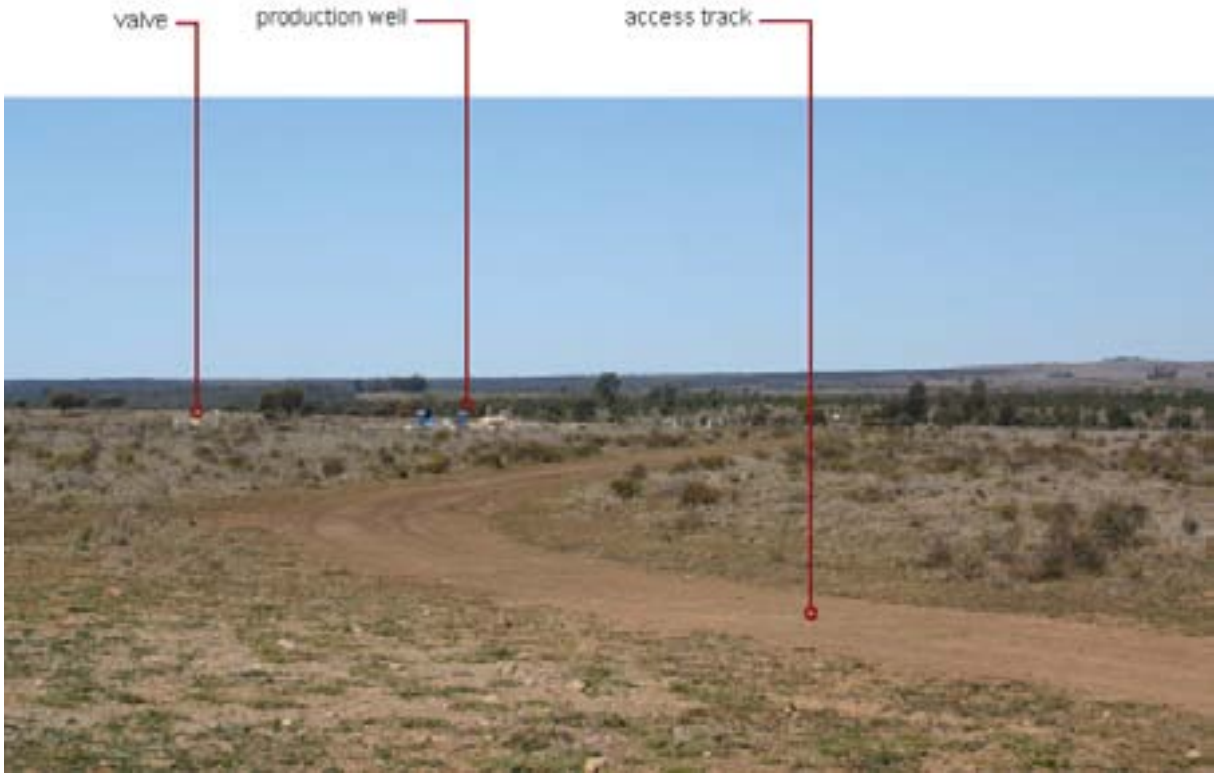


Figure 4.5 | *Access track to gas and water production well. The access track creates colour contrast withthe receiving landscape however borrows line from existing vegetation and topographic line in the visual setting.*

4.3.2 Visual Analysis

Gas Well Pad Establishment

The first operation in establishing the gas well is the planning of the location of the gas wells. This operation can have critical visual impact implications if it is placed close to a sensitive receptor. Therefore site selection in response to visual considerations and consistent with operational needs should select sites that are appropriately separated from sensitive receptors, especially residences.

The first field operation, following surveying, would be pad establishment for drilling rig work and well establishment. This would involve removal of vegetation and topsoil and would create a colour contrast with the adjoining undisturbed landscape.

On areas with even moderate slope cut and fill batters would be required to create a level pad for the production wells on sites with significant side slope. The degree of cut and fill would increase on steeper slopes.

The resultant cut and fill batters would contrast with the existing landscape during the construction phase. However this impact will lessen when rehabilitation occurs on the batters.

Gas Well Establishment

Following on from the creation of the well pad, construction activities would establish the gas well. During the construction process, in addition to the drilling rig being in place over the well head, there will be a collection of other support vehicles and other equipment in place. This equipment as well as construction activities that along with night lighting and day/night movement will create strong contrast in the landscape.

Gas Well Operation

Once the well is established and during the operation phase, the contrasting visual expression factors values (form, shape line and colour) of the wellhead components will be markedly different to those values in the surrounding landscape. Further there will be a large number of gas wells in place for long periods of time, potentially affecting significant portions of local landscape settings. This view of larger numbers of gas wells could be greater on view points in elevated locations where the captured view takes in more than one well.

The overall plan dimensions of a typical well site fenced area are approximately 15metres by 15 metres. However in sloped terrain the cut and fill pad needed to establish the well head, would be much larger and could be up to 100metres by 100metres. The height of the wellhead separator varies, dependant on vertical or horizontal orientation. Vertical orientation of the wellhead separator is approximately three metres, whereas horizontal orientation is approximately one and a half metres.

End of Economic Well Life

At the end of a well's economic life the surface infrastructure is removed from the well pad. The well pad may be enlarged to accommodate a drilling rig which is used during the well abandonment process. The surface site is then remediated and where required revegetated to match surrounding surface conditions.

Numerous gas wells in a view

What also has to be considered is the visual effect of a number of gas well seen in a view and their potential visual effect on a particular location such as a residence. In this situation numerous wells could create a visual effect on a particular view point.

Gas Wells in different Visual Character Units

A final consideration is how wells would be seen in the different Visual Character Units (VCU) as defined in Section 3 of this report. The VCUs are defined in terms of vegetation cover and topography.

The relevance of these environmental elements to visual outcomes relates to the different effects they have on the degree of environmental modification created by the wells and the visibility or screening of gas field elements placed in them. The ability of a receiving environment to screen a development such as CSG collection, transportation elements is defined as Visual Absorption Capacity (VAC)

Croplands are generally flat more fertile soil areas generally along the flood plains of creeks. These areas are vast and open. While they require little environmental modification in terms of vegetation clearing and pad establishment, they have low VAC and wells are highly visible, giving extensive views over many gas wells.

Open Grasslands generally occur on gentle to moderate slopes and often appear as cleared grass areas, with open woodland as a background, or there are clumps of retained trees and scrub scattered throughout. The vertical elements of vegetation and small rises in topography can provide screening or backgrounding to well elements (integration effect). This creates a receiving environment with a low to moderate VAC due to the influence of topography and vegetation on the visibility of a field of gas wells.

Woodland areas provide an ideal mix of VAC and limited environmental modification of well sites. Open woodland would require less clearing of tree cover, while retained woodland around a well would create moderate to high VAC, especially for wells beyond the first visible well and the field of gas wells as a whole.

Enclosed Forest areas provide strong screening of pad and gas well areas and have a high VAC.

Night Effects

Night lighting effects are limited to the gas well construction phase, Figure 4.3b. During construction, a phase that can last 2-4 days, night lighting of construction areas is bright and intense to allow for safe night working condition. 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.

There will be no night flaring of gas wells so there will be no night light effects during the operational phase of a gas well.

4.3.3 Visual Effect

General

The visual effect of the gas wells includes a consideration of the establishment of the well pad, well establishment by the rig and the operational phase of the well itself.

The establishment and operation of the gas wells would create visual contrast to the rural settings within which they are placed. The visual character of the wells is of a 'micro industrial' element that has shape, form, line and colour contrast with the surrounding natural landscape. This variation would be frequently repeated in an informal grid across the landscape potentially creating repeated nodes of strong contrast and visual effect.

Well Pad

The initial visual effect of well pad is created by the earth works that create the colour contrast of exposed soil in a grassed, wooded or forested landscape. This initial visual effect is quickly reduced as the new earthworks are rehabilitated.

Well Establishment

The next visual effect would be equally temporary and is created by the well establishment operation. This operation will create strong contrast and will additionally have movement and night lighting as elements that would increase visual effects. The visual effect of movement and night lighting could create high visual effects up to 1km.

Well Operation

The visual effect of the gas well elements is a more permanent contrast. The visual effect of the gas well would be greatly influenced by the colour of the gas well elements. This is especially true of the well head separator, but also relates to the minor elements as well as the fencing around the well itself.

Generally production wells are well sited within the landscape and are integrated with it by virtue of position and scale. They are generally not located on ridges avoiding skylines. In this context it is considered that it still is a Level I contrast and integration element in the landscape as outlined in Figure 2.3 in section 2 of this report.

Visual Effect of a Gas Well Pad

The gas well is the flat pad area and associated batters will create high visual contrast with the surrounding landscape. The pad and associated earth batters have varied visual presentation area to any field of view. Although the final operational area of the gas well is only 15m by 15m, the initial earth works can cover a much larger area. A visual presentation area of 75m by 50m has been used to define the percentage (%) of the primary view zone that is occupied by the well pad in a view.

Distance from Viewer	Area of Primary View Zone	Area of one gas well pad as it would present to Primary View Zone	Percentage of primary view zone occupied by gas well	Visual Effect Level
100m	5,195sq.m	Allow for 75m by 50m 3750sq.m	72%	high
200m	20,782sqm		18%	high
500m	129,888sq.m.		2.8%	high
850m	375,377sq.m.		1.1%	moderate
1000m	519,553sq.m.		0.9%	low
1200m	748,157sq.m.		0.5%	Low/very low
1500m	1,168,995sq.m.		0.3%	Very Low

Based on the visual effect levels outlined in Figure 2.3, the visual effect would be high to a distance of up to approximately 500m. Beyond this distance a well pad of this dimension would occupy less than 2.5% of the primary view zone and have a moderate visual effect. This visual effect level will decrease to low at approximately 850m when the gas well would be less than 1% of the primary view zone.

However when the visual contrast is removed by rehabilitation of the gas well site this will have a low visual effect at distances of 100-200m. This stage should be achieved within one year of earthworks commencing, depending on the receiving visual setting.

Visual Effect of a Gas Well

The visual footprint of a gas well is substantially less than that of the gas well site. The gas well measures some 22.5m by 17.5m with only one element being 3-4m high. Using a relatively conservative and large visual presentation area of 400sq.m to represent the view area of a well, as part of the primary view zone, it is possible to estimate the effect such an area of high contrast would have on a view.

Distance from Viewer	Area of Primary View Zone	Visual Presentation of gas well	Percentage of primary view zone occupied by gas well	Visual Effect Level
100m	5,195sq.m.	1 well is 400sq.m.	7.6%	high
200m	20,782sq.m.		1.9%	moderate
300m	46,759sq.m		0.8%	low
400m	83,128sq.m.		0.4%	very low
500m	129,888sq.m.		0.3%	very low

It can be seen from the above table that visual effect of one gas well quickly reduces to moderate, representing less than 2.5% of a primary view zone, figure 4.5, and then to low, this is especially true when seen on its own and with the gas well pad fully rehabilitated. If this is not the case then the longer distances associated with gas well pads could apply.

Visual Effect of a number of Gas Wells

It is possible that from an elevated location, or in an open field, to see a number of gas wells. Figure 4.6 illustrates this effect in a hypothetical scenario. In this scenario, a gas well has been placed in the middle of a primary view, 100m from a sensitive receptor, e.g. a residence.

In this hypothetical scenario, the next gas well would be at 850m away from the viewer. An additional two gas wells would be just outside the primary cone of vision. To be conservative, these wells were added into the PVZ, creating a view arc of 80 degrees in place of the normal PVZ of 60 degrees that would only have 2 wells within the primary view zone. This places four wells in the critical view zone. However, collectively these wells would only less than 0.25% of the primary view zone occupied by gas wells.

Distance from Viewer	Area of Primary View Zone	Area of gas wells as it would present to Primary View Zone	Percentage of primary view zone occupied by gas well	Visual Effect Level
100m	11,088sq.m.	1/ 400sq.m.	3.6%	high
850m	801,108sq.m.	4/1600sq.m	0.2%	very low
1600m	2,838,528sq.m	9/3600sq.m.	0.1%	very low

It can be seen from the table above that the large distances between gas wells mitigate against their visual effect, even the collective effect of numerous gas wells in an expanded primary view zone only result in very low visual effects.

The above is intended to illustrate the cumulative effect of seeing many gas wells. However it should be remembered that the applied impact level should be the highest recorded. In the hypothetical case

illustrated in Figure 4.6 and the table above the highest impact is for the well that is closest at 100m away from the viewing point as it has a visual effect level higher than the gas field measured as a whole.

Only the mitigation of that visual effect and potential impact of the closest gas well would bring the consideration of the lower visual effects of the more distant gas wells into consideration.

Post Operational Phase

The visual effect of the post operation phase, once gas wells have been removed and land pads revegetated, will be very low. Where there has been extensive land form modification this may require reforming prior to final rehabilitation to achieve a very low visual effect level that will be visually unperceivable.

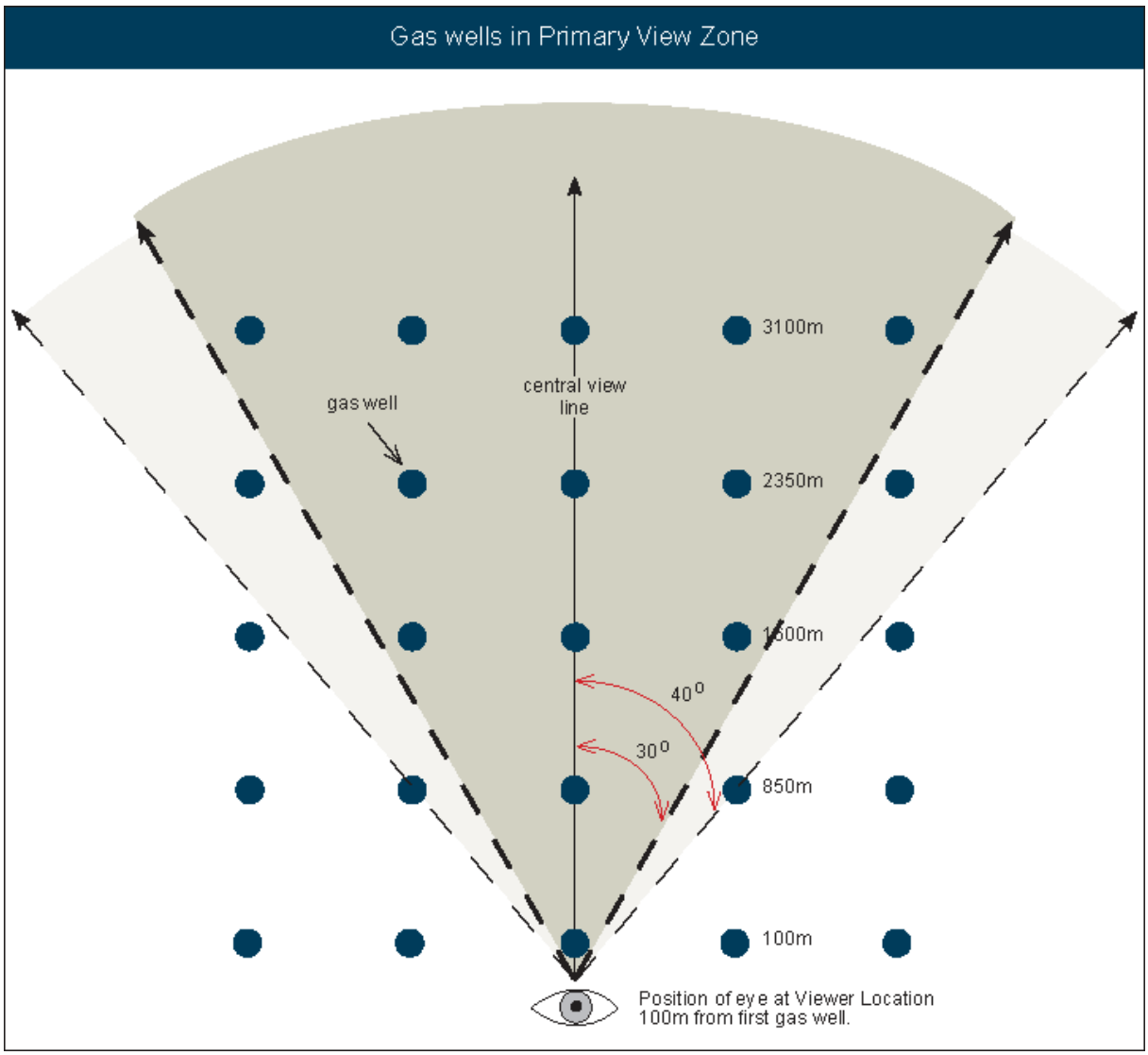


Figure 4.5a | *Gas wells in Primary View Zone.*

Figure 4.5b | *This view looking South-South-East from a hill top looking towards Taloona Gas Processing Plant, illustrates the theory outlined in figure 4.6. In this view, being part of the Spring Gully gas fields, there are approximately 15 gas wells. However, only one well is clearly visible at a distance of approximately 800-900m.*

4.3.4 Summary of Visual Effects of Gas Wells

The greatest visual effect created by the gas wells by virtue of the disturbed area it creates is the gas well pad and associated batters. These must be rehabilitated and or screened to reduce the visual effect of this gas well element.

The gas well itself is much smaller than the pad and earth works it is sited on. This element is industrial in character and totally contrasts with the rural settings within which it is placed. However it is small in scale and quickly becomes a very small portion of the primary view zone and an even smaller part of the total view, quickly achieving a low visual effect status

The evaluation of a gas field as part of the view zone as has been done in Section 4.3.3 above 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.

While the above provide an analysis of visual effects of the wells on all views, the final placement of the gas wells will require consideration of applicable mitigation and ongoing management measures to reduce the potential for long-term visual impacts.

4.3.5 Proposed Mitigation Recommendations

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 well gas fields as illustrated in Figure 4.5.

Such measures already implemented by Origin include:

- Creating gentle slope batters to better fit in with surrounding landforms, Fig 4.5a;
- Having the option to re-orientating separation tank from vertical to horizontal to lower profile in the landscape, figure 4.5b;

- Development of a painting palate to better integrate with various landscape settings, Figure 4.5brehabilitation of landscapes around gas well to achieve visual integration, Figure 4.5c;
- The natural visual effects of distances of sensitive receptors from gas wells quickly reduces the visual effect of a gas well, figure 4.5d;
- The natural screening and visual integration effects of the topographic folds of even gently undulating topography and sparse scrub, open woodland or scattered trees as well as distance integrate and screen a gas field into a panoramic view, figure 4.6b

Further to these measures and where reasonable and practicable, the following mitigation measures should be considered:

- Carefully plan the location of wells within the viewshed of any residence;
- Consideration of appropriate distances between gas well infrastructure and existing residences;
- Minimise construction time close to sensitive receptors, i.e. residences;
- If a well is closer than 300m, then landscape treatment at the well and/or around the residence will be required to reduce impact;
- Minimise the extent of vegetation clearing to allow for well pad earth works;
- Minimise the amount of cut and fill required to establish the pad consistent with achieving gentle batter slopes for rehabilitation and post operational land use activity;
- Paint all well head elements 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;
- Rehabilitate well site areas following establishment of the well;
- Recreate the pre-construction landscape characteristics of disturbed areas to maximise visual integration; and
- Where requested by a resident consider landscape works adjacent to the plant or around the residence to achieve screening or satisfactory levels of visual integration.

Figure 4.6a | *Laying back cut and fill batters to create gentle slopes ensures a better visual integration of final land forms with the adjoining topography and the landscape.*

Figure 4.6b | *The more recent use of use of pale sandy colour / cream colour of the separator tank and the grey colours of other infrastructure and fencing minimizes colour contrast with the surrounding grasslands. Horizontal alignment of the separator tank , generally decreases its visual effect in the landscape.*

Figure 4.6c | *Once the well pad is rehabilitated, contrast is reduced allowing for better integration with the landscape. Note the replacement of colours used in this well, to the more recent colours used in newer wells (figure 4.5b) and re-orientation of separator tanks.*

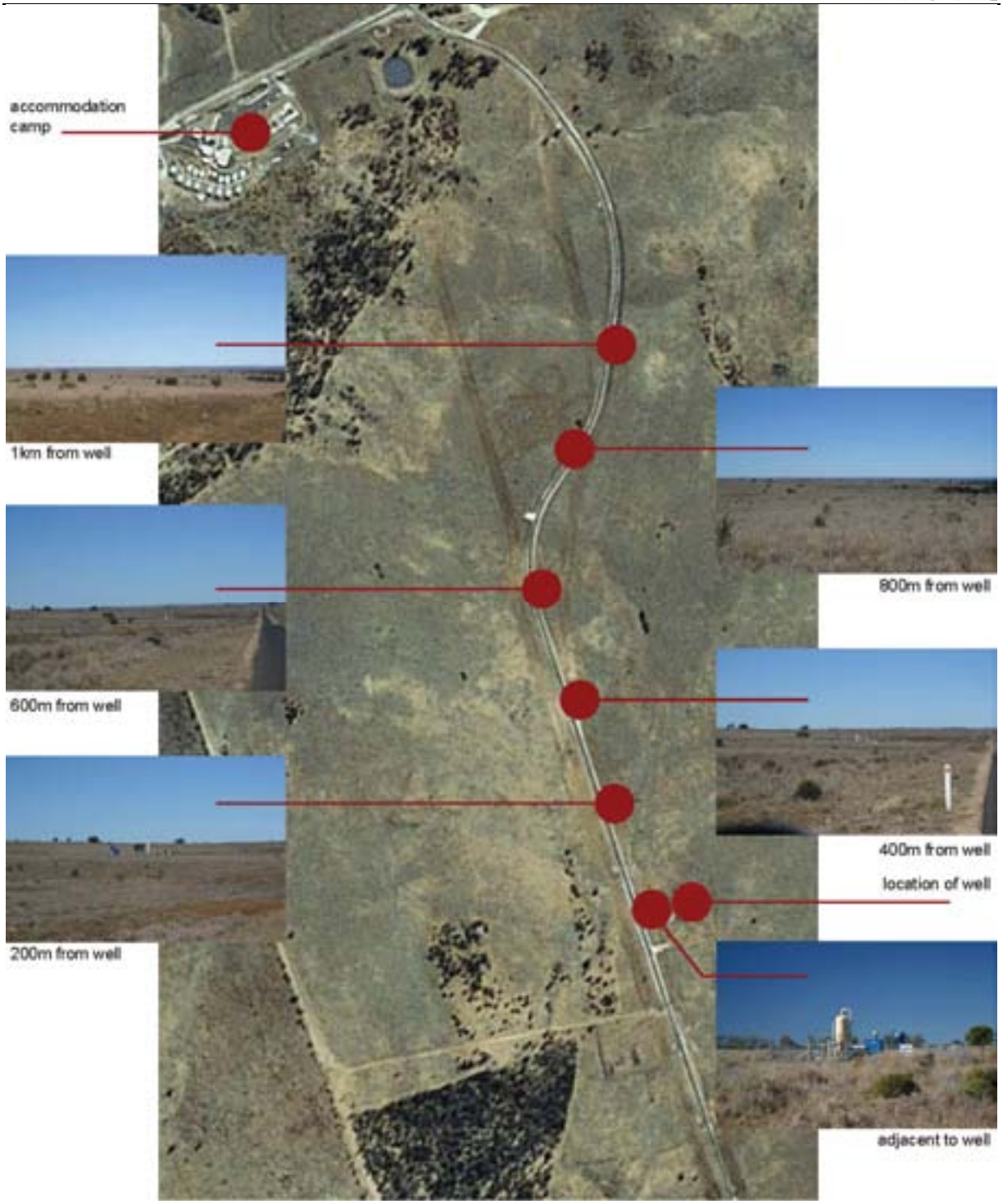


Figure 4.6d | *Gas wells are generally small scale elements in the landscape and quickly become small parts of a view when seen from increasing distances. Beyond 500m wells occupy less than 0.5% of the primary view zone as outlined in figure 2.3.*

4.4 Gas Processing Plant

Gas produced from the field will be transferred via the low pressure gas and water underground gathering network to the 'in field' gas processing plants. The gas pressure is increased for transfer into the main transmission pipeline which enables delivery to the LNG plant, on Curtis Island. A typical gas plant is shown in figures 4.7 - 4.8.

The typical facilities associated with the gas processing plants consist of processing equipment described below:

- Compression units, likely to be driven by engines using a small portion of the CSG as fuel;
- Power generation facilities, anticipated to be large gas engine driven generators fuelled by CSG;
- Dehydration unit;
- Flare facilities for transient safe combustion of CSG during periods when supply from the wells exceeds demand; and
- Administration and maintenance facilities.

Based on current development assessments, it is possible that up to seven gas processing plants could initially be constructed across the Walloons development area, likely to comprise four in the eastern area and three in the Western Walloons. Other gas plant sites may or may not be utilised throughout the field development lifetime.

Figure 4.7 | *Spring Gully gas processing plant. The plant is of industrial character with a significant horizontal shape and form.*

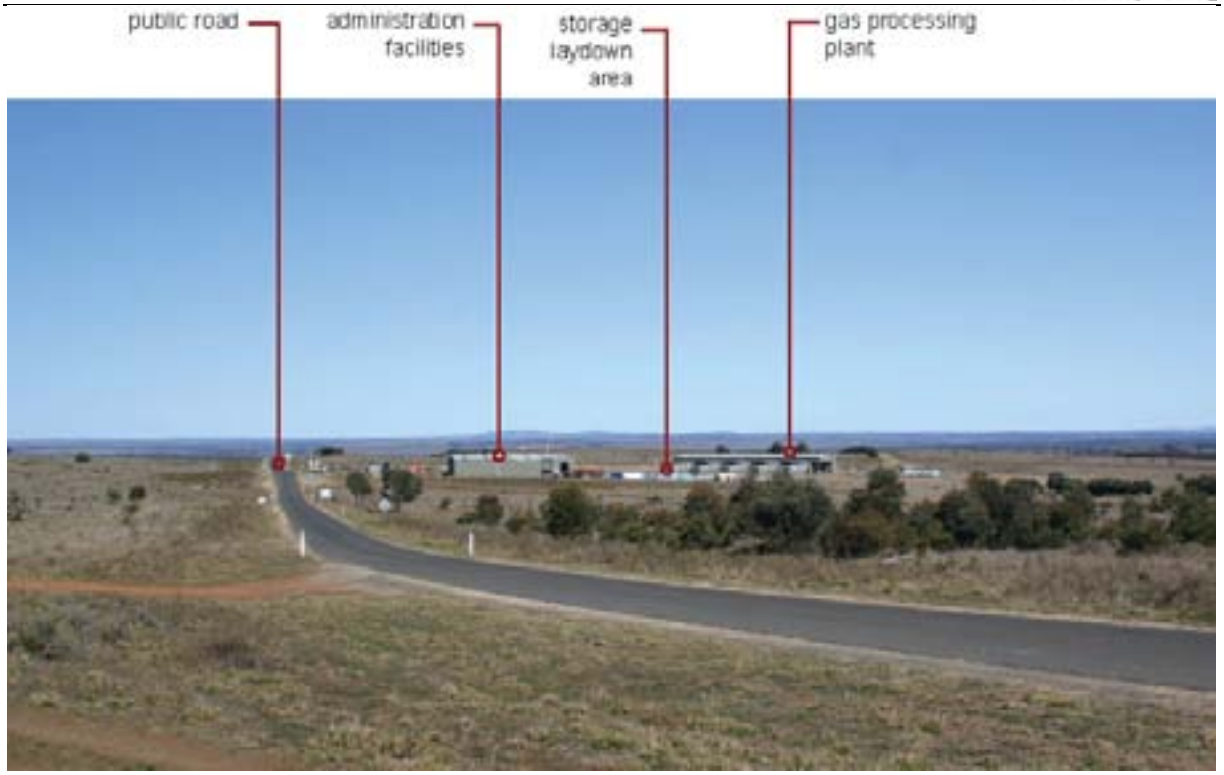


Figure 4.8 | *View to the Spring Gully gas processing plant. Due to the plants low vertical scale it can successfully be integrated with the existing landscape.*

4.4.1 Visual Analysis

The gas processing plant is a large scale industrial element and would create a strong and large scale contrast to the visual shape, form, colour and line values of the surrounding rural landscapes. The processing plant would be a large form and shape, with a significant horizontal scale, the vertical scale would be less significant.

Gas Plant Pad and Plant Establishment

In the first instance, it is necessary to remove vegetation and topsoil, subsoil and potentially rock stratum to create a platform for the processing plant. This would create a temporary colour contrast with the surrounding landscape. Generally batters are rehabilitated but the platform itself is fully utilised for gas plant elements and buildings containing some gas plant elements. Pad areas are gravelled or left as bare earth for fire safety reasons.

As with gas well establishment, the establishment of the gas plant will involve an increased flow of vehicles related to supply and construction of the plant itself. While such vehicle movement will create an increase in vehicles on various rural roads, the visual effect is not considered significant and is mainly restricted to the plant establishment period.

Gas Plant Operation

The gas processing plant would be typically light in colour causing higher colour contrast with the landscape. While the gas processing plant is made up of a number of elements including large turbines, tanks, piping, flare elements and other industrial components, from a distance they present as simple large sheds and structures. The fact that the plant must be on one pad ensures that the development sits well into the landscape.

The overall plan dimensions of the gas processing plant including land take would be approximately 1000m by 500m, However gas plant elements usually occupy a visual area of approximately 400m by 300m based on the Spring Gully Gas Plant Figure 4.8 illustrates the horizontal scale of the gas plant, with the projection into the view consisting of the vertical project of the building over the length of the development element being approximately 300m. Components such as gas plant wetlands will have a negligible visual effect due to the limited vertical projection into the visual view shed.

The gas processing plants are likely to be located away from sensitive receptors such as residents, major roads and townships. Generally the plant is located low in the landscape and sky line effects will be limited due to topography providing some visual integration, reducing the overall visual effect.

Gas Plant in different VCUs

As with gas wells, but on a much larger scale, the Gas Plant will have a different visual effect depending on where the Plant is located. The placement of a plant within a forest will provide good visual screening while creating a greater visual effect due to tree clearing. In woodland there would be less tree clearing, however the visual effect would be less and given a distance of say 500m, good visual screening and integration would be achieved. Obviously grassland would have a lower screening capability; however 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 this will enable the buildings and facilities to site into the landscape more than on flat land. This assumes good rehabilitation of surrounding batters.

Night Light

Once established, the gas processing plants are predominantly lit to allow for safe pedestrian circulation around the site only (refer to Figure 4.3c). Gas processing plants are generally not lit to a high intensity on a regular basis at night. Only if there is a requirement to carry out an emergency maintenance or repair task will stronger illumination be provided. The stronger yellow light apparent in figure 4.3c illustrates the occasional gas flare that is experienced from time to time and does not represent a typical night lighting situation.

The gas flare can be a bright source of direct light and is operated primarily as a plant safety measure. In this instance, the amount of gas being flared is dependent upon how effectively the plant is operating, and can be increased when the gas supply exceeds when gas supply exceeds processing and transmission capabilities.

4.4.2 Visual Effect

The gas processing plant would be a significant structure in the landscape and would create strong contrast due to the associated earth works and large scale industrial elements, such as large sheds, power generating facilities, pumps, compressor units, tanks, etc as well as associated piping. The location of the plants low in the landscape generally means that visual integration with the landscape is high to moderate.

Distance from Viewer	Area of Primary View Zone	Visual Presentation of gas processing facilities	Percentage of primary view zone occupied by gas well	Visual Effect Level
300m	46,759sq.m.	Allow 400m horizontal by 20m vertical projection 8000sq.m.	17%	high
500m	129,888sq.m.		6%	high
800m	332,514q.m		2.4%	moderate
1000m	519553sq.m.		1.5%	moderate
1500m	1,168,995sq.m.		0.6%	low
1700m	1,501,509sq.m		0.5%	Very low

Based on a horizontal distance allowance of 400m and allowing for a vertical projection into the view of 20m, the Visual effect could be high up to a distance approximately 600m with a moderate visual effect (see Figure 4.8) being experienced up to approximately 1000m and then decrease to low up to 1500m with a very low effect beyond this. This is based on the total exposure of the gas plant. These visual effect levels would increase if the gas plant is seen from a position of substantially higher elevation as the vertical projection into the view would increase.

These visual effect levels are reflective of a plant that has no visual integration by topography or vegetation. While it is possible to determine visual effect levels for a particular view the above serves as a guide to average visual effect levels.

Post Operations Phase

Upon closure of gas processing plants and associated infrastructure, the normal procedure will include the decommissioning and removal of structures and equipment. Land forms are generally reinstated and the land rehabilitated to be consistent with surrounding land cover. The visual effect is generally reduced to very low levels.

4.4.3 Proposed Mitigation Recommendations

Where reasonable and practicable the following mitigation measures should be considered: Consistent with use requirements, minimise the size of earthworks required to accommodate the gas plant and other facilities;

- Create separate pads for auxiliary facilities as needed;
- The external cladding of the buildings should be compatible with the surrounding landscape by using olive greens and greys, avoiding light colours that contrast strongly with the landscape;
- Ensure that all lighting is shielded to avoid direct light impacts and is directed inwards and downwards to minimise intense glow beyond work areas to sensitive receiving locations;
- Carry out detailed visual analysis of the visual catchment of each gas processing plant to establish if there are any sensitive receptors within 1000m of the gas processing plant. Where needed establish planting strategies to screen or integrate the gas processing plant into the landscape using on site and or at viewer landscape measures;
- Prepare a landscape planting plan for each gas processing plant and implement tree planting programmes using recycled water to establish tree belts around and through the various gas processing plant areas to achieve higher visual integration of plant elements as seen from distant views;

- Consistent with operational and safety needs paint buildings and other plant elements in a colour that will minimise colour contrast with the surrounding landscape, bearing in mind seasonal variation; and
- Where requested by a resident consider landscape works adjacent to the plant or around the residence to achieve screening or satisfactory levels of visual integration.

4.5 Water Treatment Facilities

Water treatment facilities collect and process the associated water and utilise or dispose of the water and water products. Associated 'brine' water from coal seam gas production generally contains salinity levels which preclude general use, except for some applications, such as wash water in coal mining and cooling water in power generation. Water not used sustainably in an untreated form will be processed at a central location by using an integrated membrane system, including reverse osmosis (RO) and ion exchangers, for beneficial use in the environment, irrigation of agriculture crops, urban and industrial uses.

The brine water which is produced during the water treatment process will initially be contained in ponds.

The water treatment facilities (see figures 4.9 – 4.10) are typically comprised of permanent and portable components. Permanent components include ponds, reverse osmosis plant, power plant, concrete foundations, buried piping, Portable temporary components include pumping systems, membrane filtration and RO systems, dosing and monitoring equipment.

Water treatment facilities and associated water ponds would be constructed early in the development process. Conventional plant, civil and mechanical construction methods would be used to deliver water treatment facilities. Where possible, facilities design would minimise the requirement for off-site disposal of construction spoil to minimise total disturbance area and haulage impacts. Wherever practical, plant facilities and ponds would be located in pre-cleared areas.

As with the gas plant facilities, the initial development plans to meet the start-up of the LNG facilities, do not require all planned water treatment facilities operating. Based on current development assessment, only two water treatment facilities will initially be constructed; one in the eastern area and the other in the western Walloons area. In addition, the existing water treatment facilities at Talinga will be used to treat water from selected areas in the eastern area.

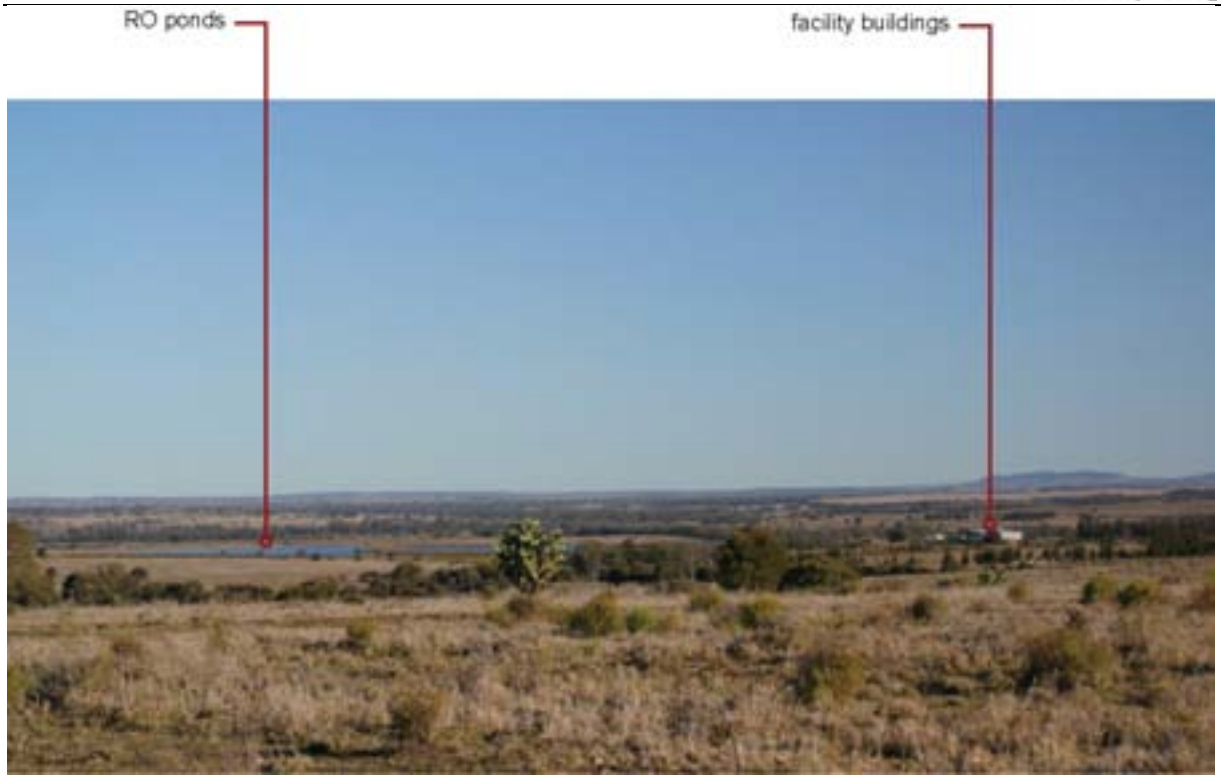


Figure 4.9 | *Water treatment facilities are well integrated with the existing landscape due to the low vertical scale of the facilities.*

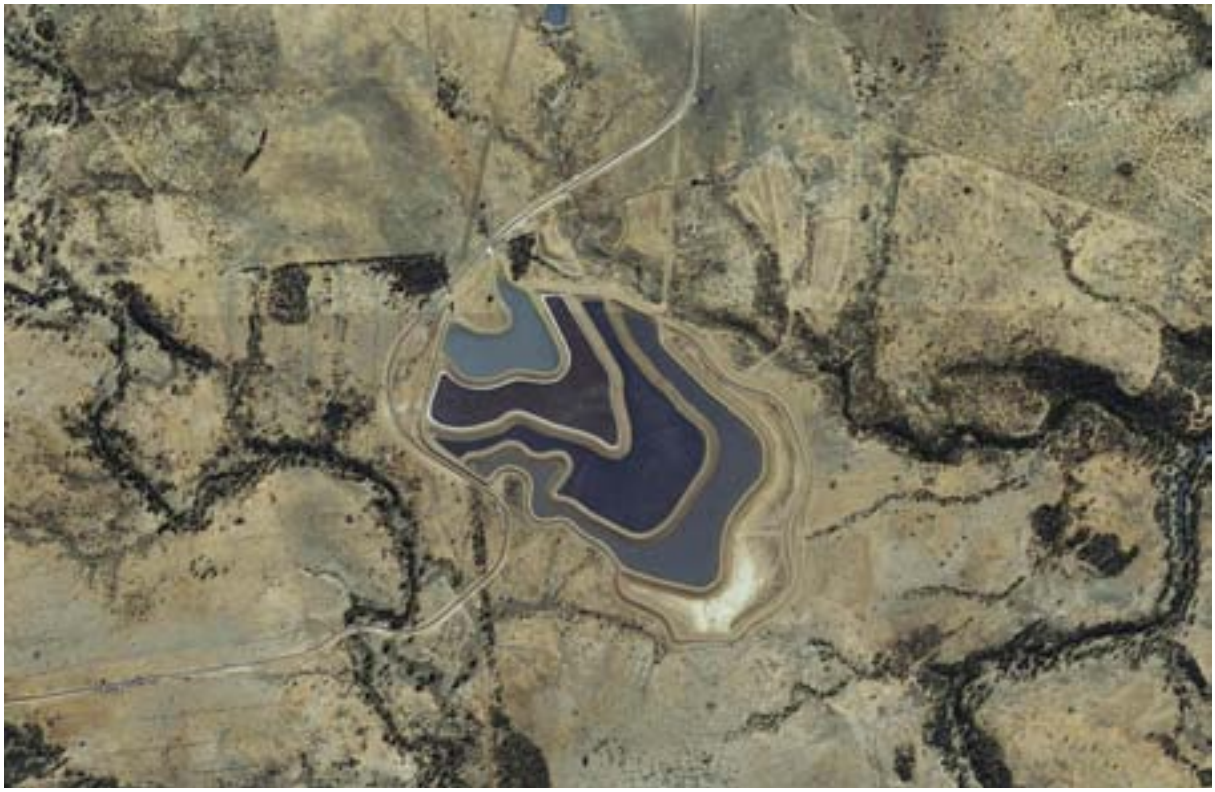


Figure 4.10 | *Aerial image of the Spring Gully RO Plant ponds. Although the horizontal scale of the ponds are expansive creating line and colour contrast with the existing landscape, from a visual perspective at ground level the effects will be low.*

4.5.1 Visual Analysis

Establishment and Operations of a Water Treatment Facility

Initial earth works will create a pad for the treatment building. Much more extensive will be the creation of the water retention ponds. This consists of up to 6 ponds covering up to 20ha. Generally pond walls are no higher than 5m. Each Water Treatment Facility also has a Brine Pond that is a large evaporation pond that can be up to 200ha in area.

The horizontal scale of the water ponds is expansive with the anticipated pond area made up of feeder and a brine pond potentially up to 300 hectares in size. Figure 4.10 illustrates the expansive horizontal scale of the RO ponds in the landscape. The ponds will create minimal line and colour contrast with the existing surrounding landscape.

The water treatment facility buildings will create contrasting form, shape, line and colour in the rural landscape. Generally however these buildings will be of a single storey and are not likely to cause major visual effect (Figure 4.9). This low visual effect level will be further aided if mitigation measures include tree and shrub planting to screen or visually integrate these building elements into the existing landscape. The overall plan dimensions for the water facility buildings are approximately 200 metres by 200 metres.

All treatment facility operations are internal to the RO building so that night light is not an issue.

As with other elements the visual effect of the water treatment facility in different VCUs will vary. While the normal screening capabilities of forest woodland grassland and cropland as discussed above apply it is considered that the effects of clearing in a forest would be very high, given the need for over 200 hectares of land for the treatment ponds.

The facility can be easily integrated into all VCU types due to the limited vertical scale of elements within it.

Vehicle movement will be greatest during the construction phase but is not considered to be visually significant.

4.5.2 Visual Effect

The visual effect of the water treatment facility is created by the buildings and the ponds. The buildings have strong contrast and moderate integration while the ponds have moderate to low contrast and have a high visual integration.

From a visual perspective, although covering a sizable land area, the water treatment ponds have significant horizontal dimension only. The ponds have limited vertical dimension limited to the height of the pond walls and consequently do not significantly project into the visual view shed in the landscape of the gas fields. The ponds are therefore not visually significant. The water treatment facilities such as buildings however, have a vertical dimension creating visual change in form, shape, line and colour, and therefore may have a stronger visual effect.

Where practicable the gas processing plants are likely to be located away from sensitive receptors such as residents, major roads and townships. Generally the plant is located low in the landscape and sky lining of the plant will be limited due to topography providing some visual integration, reducing the overall visual effect.

The gas processing plants are likely to be located away from sensitive receptors such as residents, major roads and townships. Generally the plant is located low in the landscape and sky lining of the plant will be limited due to topography providing some visual integration, reducing the overall visual effect.

It is considered that because of the low contrast and high levels of integration of pond elements (Figure 4.9) the 500m by 20m projection into the view would create a high visual effect in the immediate foreground adjacent to pond walls up to approximately 200m. This effect quickly drops from moderate to low by 500m and very low by 1000m.

The scale of the treatment building is of a large farm work shed, machinery shed. Allowing for a building and site projection into the view of 50m by 15m elevation and would similarly low visual effects beyond 400m, see figure 4.9

The visual effect is considered to be moderate up to 0.5km and low when viewed from distances greater than 1km.

Post Operational Phase

Remove all the plant facilities when no longer needed. Consider potential reuse of settlement ponds for farm uses. Any ponds that cannot be used for this purpose should be regraded and rehabilitated to be consistent with surrounding vegetation to allow for ongoing land use activities

4.5.3 Proposed Mitigation Recommendations

Where reasonable and practicable the following mitigation measures should be considered:

- Locate water treatment facilities at least 500m from nearest residence;
- Minimise vegetation clearing outside footprint of building and retention ponds;
- Minimise earth works consistent with achieving gentle batters for rehabilitation purposes;
- The external cladding of the buildings should be compatible with the surrounding landscape by using olive greens and greys, avoiding light colours that contrast strongly with the landscape;
- Complete a detailed visual analysis of the visual catchments of the water treatment facilities to establish if there are any sensitive receptors within the visible area of the plant. If there are any sensitive receptors within 500m prepare a detailed landscape plan to screen or integrate plant and pond elements into the landscape;
- Implement a tree planting strategy using recycled water to achieve visual integration; and
- Where requested by a resident consider landscape works adjacent to the plant or around the residence to achieve screening or satisfactory levels of visual integration.

4.6 Accommodation Camps

Accommodation camps are co-located with the gas processing facilities. These camps are located within close proximity to facilities and include accommodation (single ensuited bedrooms) to house up to 200 personnel in permanent camps and up to 400 in temporary camps along the pipeline route. Also provided are kitchen facilities, a mess room, gym and recreation area, wet area, parking areas and food stores, refer figures 4.11 - 4.12. Each accommodation module accommodates 4 people, calling for 50 units in addition to the auxiliary facility buildings.

Multiple accommodation camps will be established in the local region. These facilities will increase incrementally as the requirement for gas plants increases. Camps include temporary construction camps that are established where major facilities are being constructed. These include gas processing facilities, water treatment facilities, and the main pipeline Permanent camps will be established to service a collective of gas processing facilities and water treatment facilities.

Figure 4.11 | *Temporary contractors accommodation which will be relocated once construction is complete, create temporary visual contrast in the landscape.*

Figure 4.12 | *View to accommodation camp from public road. The camp contrasts with, however is integrated into the landscape setting of the locality*

4.6.1 Visual Analysis

The proposed accommodation facilities will be a cluster of single storey buildings, although the accommodation facilities will create contrasting box shape forms, rectilinear shapes, straight lines and lighter colours in the rural landscape. The low building heights and the tight clustering of buildings will assist in minimising the scale of building mass and bulk in the existing landscape. Their locations on the broader lower slopes ensure they sit well and are integrated by virtue of position and scale.

Establishment and Operation

The temporary camps will be placed in areas that require minimal earthworks and all pedestrian circulation systems will be on raised metal walkways. Temporary roads and can parks will be gravelled to avoid mud and dust issues.

Permanent camps will have cut and fill to better accommodate buildings and facilities and will include sports facilities such as tennis courts. Roads will be sealed and the areas landscaped to achieve better living conditions, microclimate while also assisting in visually integrating building elements into the landscape.

Vehicle movement associated with the camp will be more constant during the operational phases than with other development elements. However vehicle type and volume is not considered to be visually significant.

Accommodation Camps in different VCUs

Again the VCU with a higher proportion of tree cover would better integrate or screen the accommodation camps. However as can be seen from the permanent camp at Spring Gully, even in open grassland there are clumps of trees in the paddocks and borders of trees along gully lines that create screening and integration elements.

Night Light

By definition there will be night light associated with both internal and external lights at the camp. However lighting is low intensity for pedestrian circulation or internal uses. Additionally there may be vehicle lights coming and going from the camp.

4.6.2 Visual Effect

The accommodation facilities will be integrated with the landscapes within which they sit. Initially there would be strong contrast due to the shape and clustering of buildings with the existing landscape. However by virtue of position lower in the landscape and relative scale compared to the broad landscapes, accommodation camps will be integrated with the landscape

This level of integration will be increased with the implementation of long term landscape amelioration and enhancement plantings.

Permanent camps will cover an area of approximately 300m by 100m. However presentation to a view is generally restricted to 300m the longest dimension of the camp by 10m which would represent 3 layers of buildings in the view, a conservative estimate that would only happen on moderate to steep terrain or with a view from an elevated location

Distance from Viewer	Area of Primary View Zone	Visual Presentation of accommodation camp	Percentage of primary view zone occupied by gas well	Visual Effect Level
200m	20,782.m.	Allow 300m horizontal by 10m vertical projection 3000sq.m.	14%	high
400m	83,128sq.m.		3%	high
500m	129,888.m		2.3%	moderate
800	332,514sq.m.		0.9%	low
1200m	748,157sq.m.		0.4%	Very low
1400m	1,018,325sq.m		0.3%	Very Low

In this situation, a high visual effect of a new camp, without any landscape screening would be created up to 500m beyond which visual effects quickly decrease to moderate and low past this distance. In reality due to existing landscapes and the terrain these visual effects could be lower.

4.6.3 Proposed Mitigation Recommendations

Where reasonable and practicable the following mitigation measures should be considered:

- Consistent with operational needs locate accommodation camps further than 800m from sensitive receptors;
- Building modules are typically in colours that contrast with the landscape, for human amenity purposes. However they should be colours that are harmonious with the landscape and primary colours should be avoided;
- Minimise earth works and if needed create multiple terraces rather than create one large cut and fill pad;
- Prepare and implement a landscape plan for the camp that will provide appropriate screening and or integration planting as well as planting to enhance the experience of camp inhabitants;
- Ensure that night lighting, including that associated with vehicle movement is considered in the development of the landscape plan;
- Where requested by a resident consider landscape works adjacent to the plant or around the residence to achieve screening or satisfactory levels of visual integration.
- On decommissioning of the camp remove all buildings and rehabilitate vacated terraces. As appropriate retain landscape plantings.

4.7 Microwave Towers

Data and voice communications will be deployed to construction sites via the proposed microwave backbone infrastructure which will interface with a telecommunication carrier's service offerings at designated centres. The existing communication infrastructure at the Talinga Gas Production Facility will form an integral part of the proposed microwave backbone. Figure 4.13 shows the preferred sites to erect nine 50 metre high telecommunications masts. The disturbance area for the tower however should not exceed 70 metres by 70 metres with the tower as the central point. This area will form a fenced compound including the anchor points utilised to stabilise the respective tower.

Microwave towers will be strategically positioned on highest available terrain so as to provide the greatest area of signal coverage. This approach will minimise the total number of towers. The towers will also be

utilised for wireless communication mediums, such as radio for two-way radio and wireless data. Radio provisioning for the two-way radio and wireless data (telemetry) will be installed on the telecommunications towers.

The towers are a single 50m thin lattice tower with three anchor cables, radiating out from the tower and securing it to the ground. At the base of each tower there will be a small 4m by 3m equipment hut, 44.13. Access tracks to the microwave tower sites are to be provided for in as direct a route from the main APLNG roads as the terrain will allow. These access tracks will range between 6 to 10 metres in width for establishment purposes but could be substantially reduced for the operational life of the facility.

Nine microwave communication towers are proposed for the project, 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.

The microwave communication system is temporary until the optic fibre system is fully established. It will use pipeline trenches for co-location of optic fibre so that no additional visual effect and impact is experienced.

Vehicle movement is not considered visually significant in relation to this development element.

149.00 149.50 150.00 150.50 151.00

-26.00 -26.50 -27.00

SEE INSET MAP 2

SEE INSET MAP 1

INSET MAP 1

0 20km

Spring Gully (existing)

Muggleton 2 Preferred

Muggleton

Ewingdale

Conoli

Wandoan

Guluguba

Wallumbilla

Yuleba

Jackson

Dulacca

Drillham

Miles

Dalwogan 2

Dalwogan (was Condabri) Preferred

Condamine

Talinga (existing)

Orana

Orana 2 Preferred

Roma - Condamine Road

Auburn Road

Burncluith

Chinchilla

Brigalow

Warra

Kogan

Macalister

Jandowae

Jimbour

Cecil Plains

Horrane

Kumbarilla

Tipton

Dalby

Braemar South

Captains Mountain Preferred

Captains Mountain 2

Turallin

Millmerran

HORSE CREEK

HORSE CREEK EAST BRANCH

WOLEEBEE CREEK

JUANDAH CREEK

TCHANNING CREEK

YULEBA CREEK

DULACCA CREEK

DOGWOOD CREEK

CONDAMINE RIVER

WAMBO CREEK

CRAWLEYS CREEK

COORANGA CK

LEGEND

- Town
- Existing Infrastructure
- Pipeline licence (Application)
- Pipeline licence (Granted)
- Existing railway
- Road
- Major watercourse
- High Voltage Above Ground Powerlines

Walloons Gasfields Development Areas

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

Proposed Infrastructure

- Main APLNG Pipeline Option 3E
- Proposed Surat to Gladstone Pipeline (SGP)
- High pressure gas network
- Alternate high pressure gas network
- Brine Pond (BP)
- Gas Plant Facility (GPF)
- Water Transfer Station (WTS)
- Water Treatment Facility (WTF)
- Communications Tower Location
- Communications Tower 2km Buffer
- Tenure block identifier
- EIS Study Area

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SGP pipeline route digitised from Initial Advice Statement dated December 2008

Communication Tower Locations supplied by client 07/10/2009

0 12.5 25km

SCALE - 1 : 300,000 (at A1)

Latitude - Longitude
Geocentric Datum of Australia 1994

N W E S

Rev	Date	Revision Description	KM ORIG	WTi CHK	ENG	APPD
0	08/10/2009	Issued for use				

WorleyParsons resources & energy

AUSTRALIA PACIFIC LNG LIMITED

AUSTRALIA PACIFIC LNG PROJECT
Proposed Microwave Communications Tower Locations

Project No: 401001-00502	Figure: Q-LNG01-05-MAP-0009	Rev: 0

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Figure 4.14 | *The microwave towers create a vertical linear contrast in the landscape.*

4.7.1 Visual Analysis

The removal of vegetation and topsoil, and cut and fill batters required to create a small level pad for the tower and components will create a colour contrast with the adjoining undisturbed landscape. However, due to the elevated location of towers, disturbance to the ground surface will not be highly visible. Vegetation removal is required for the facility and also the guy wires.

The microwave towers create a simple, vertical element in the landscape with a strong linear form that supports one or more microwave dishes. Dependant on sun and cloud cover conditions the materials of which the microwave towers are constructed 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 contrast of line and shape of the tower to the low rolling hills on which they are placed will remain.

Potential visual effects arising from construction activities such as traffic and the use of heavy machinery will be temporary.

Microwave towers in different VCUs

The impact of the tower in different landscape character types varies according to tree cover and height. Generally tree growth in the region would vary from 10 to 15m; hence tree cover has the potential to reduce the visual effect of the tower's height in both forest and woodland. Perhaps, more importantly, these features would be able to screen the more complex configuration of the communication hut, guy wires and perimeter fence.

A tower is not likely to occur in crop lands but may occur in grasslands where the ground level components of the facility would be fully exposed

4.7.2 Visual Effect

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 by the microwave dishes attached to the poles.

Without the dishes the towers would create a clean line that contrasts with the rounded hills that support it. However with the dishes this clean line is compromised.

The towers will have low visual integration and maximum contrast because they sit above the landscape and are more often than not silhouetted against the sky. If however, in some limited situations the towers are viewed with a landscape background with varied shapes, form, line and colour the towers will be better integrated.

Of more concern would be the composition of the tower and communications hut being on a treeless hill where both hut and tower silhouette against the sky.

The visual effect of a tower alone 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. These elements become a minor element in the landscape and would have a low visual effect beyond 200m.

4.7.3 Proposed Mitigation Recommendations

Where reasonable and practicable the following mitigation measures should be considered: Remove towers as soon as they are no longer required for communication purposes;

- Remove all hardware from the site;
- As required restore landforms so that they do not compromise ongoing land use activities; and
- Restore ground and vegetation cover similar to the existing surroundings.

4.8 Coal Seam Gas and water gathering pipelines, including valves

The low pressure gas from the wellhead separators flows into a buried pipeline. This forms the gas gathering system to direct CSG to the central gas processing plant, refer figures 4.15 - 4.17.

A gas processing plant generally will serve an area of wells covering an approximate circle of up to 9km radius. The pipeline is underground other than within the fenced well site and gas processing plant where it will appear above ground.

The water produced from each of the wellhead separators flows into a buried pipeline. This forms the water gathering system to direct water to the nearest water treatment facility.

Valves are typically located at the crest of hills where air is likely to collect in the pipeline and low points.

The major construction activities that will occur during the installation of a gas or water gathering network include:

- Clearing;
- Grading;
- Vegetation mulching;
- Access road forming and sheeting;
- Pipe stringing and welding;
- Trenching;
- Pipe laying, valve construction and backfilling;
- Protection signage;
- Pipeline testing and commissioning; and
- Clean-up and rehabilitation,

Figure 4.15 | *CSG and water gathering pipeline. There is a high visual colour contrast between exposed ROW and adjacent vegetation during the construction of the pipeline.*

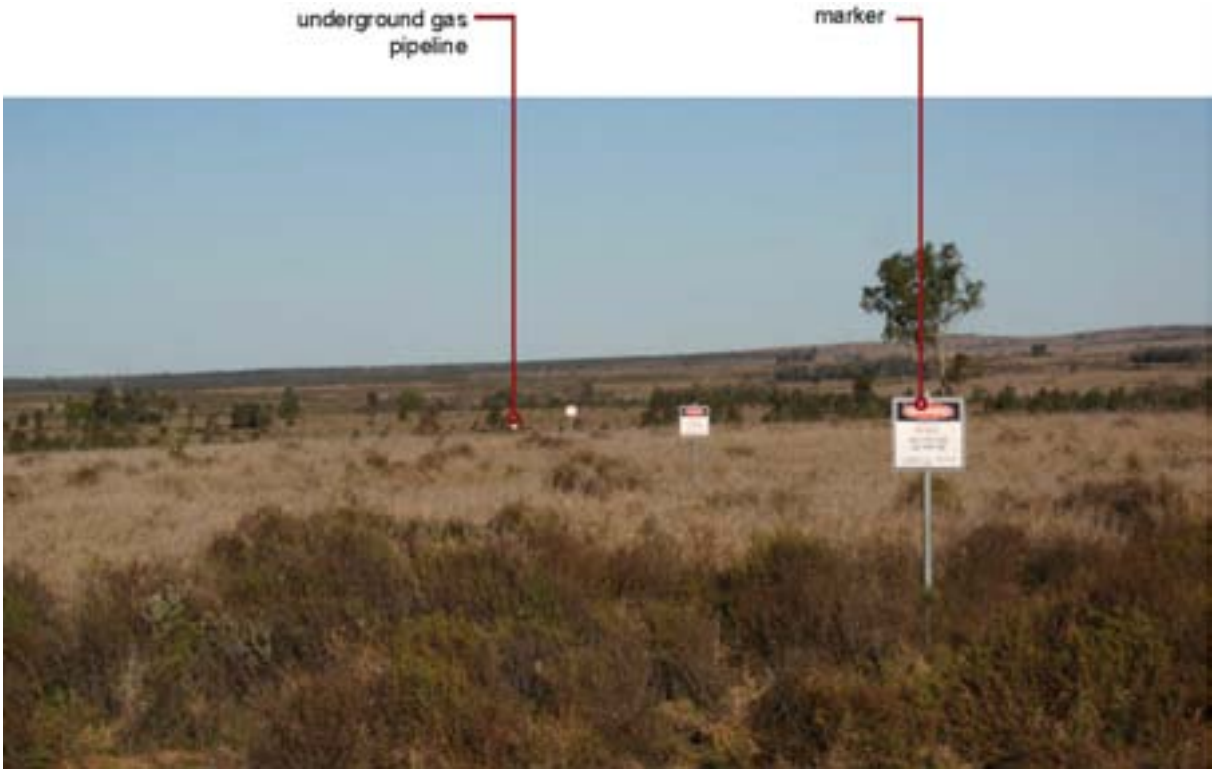

Figure 4.16 | *View of existing underground pipeline. Note that the visual effect through grassland once corridor has rehabilitated is minimal.*

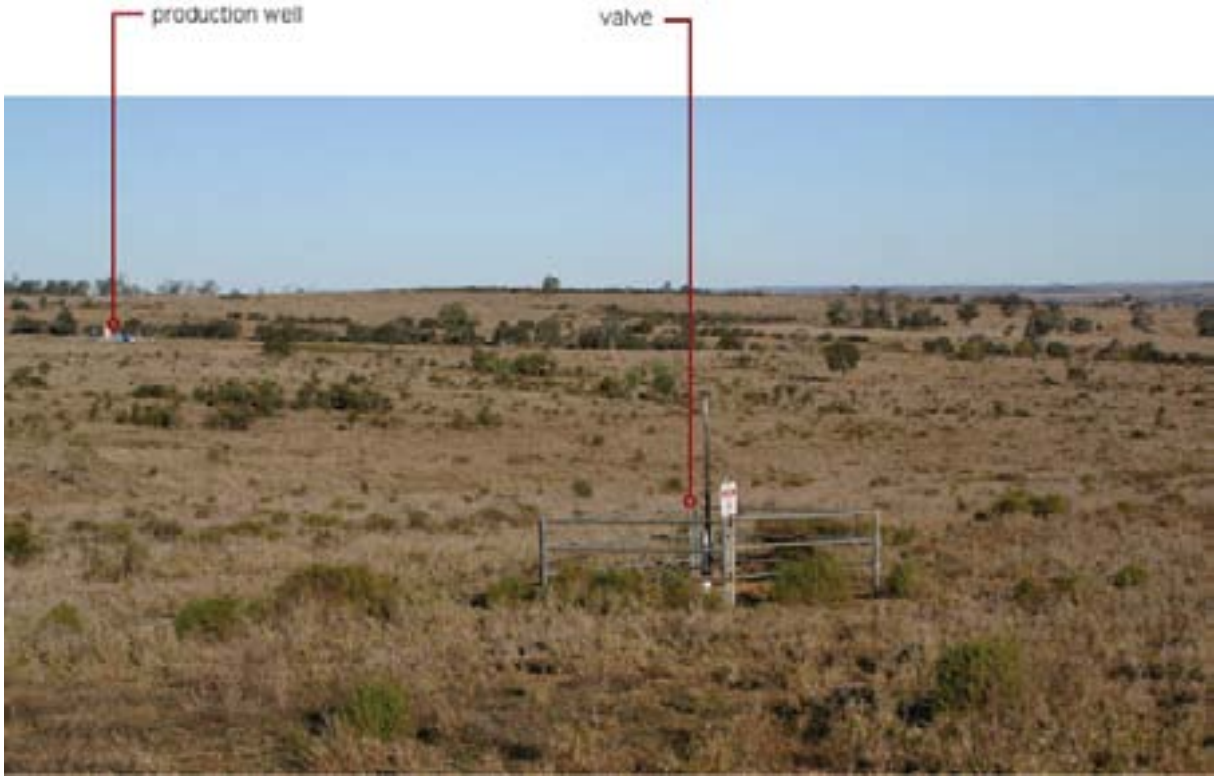

Figure 4.17 | *View of existing underground pipeline and production well. The colours of the production well are contrasting in the landscape however are only small scale.*

Figure 4.18 | *Water treatment facilities creating berms in the landscape will have a low visual effect level.*

4.8.1 Visual Analysis

The first step towards installation of the pipelines involves clearing and grading of the route. This creates line and colour contrast. Following, the network routes are trenched using a trencher or equivalent. Spoil is stockpiled separate from the initial topsoil and vegetation to avoid mixing. This will result in the creation of a high visual colour contrast between exposed soil and the adjacent vegetated landscape. The pipe stringing and laying process then follows, involving the delivery of pipe to location, where the pipe is strung and welded. Once the pipe is welded it is then raised and lowered into the trench using a Side boom or similar. Again all of these operations create temporary linear, colour and form contrasts with the existing landscape.

The rehabilitation process occurs immediately after the trench is backfilled, along with removal of waste and construction equipment. Typically, there is minimal surplus excavated material as the majority of the spoil is used as backfill. The area will then be re-profiled to be consistent with surrounding land contours. Following rehabilitation processes the visual effect will generally be low.

The pipeline protection signage is put in place on top of pipelines following the placement of the pipelines.

Where possible, gas and associated water gathering systems are generally installed at the same time, and where these follow the same routing, are installed in a common trench.

The level of contrast created by the construction of the pipeline will be dependent on the existing landscape character through which the pipeline passes. In areas of open grassland and agricultural land the extended linear character of the pipeline corridor will create strong linear and colour contrast.

In areas of woodland and forest, where clearing of trees will be necessary, the level of contrast will be increased when viewed from a short distance. When viewed from a longer distance however the remaining vegetation will assist with screening the corridor.

4.8.2 Visual Effect

The visual effect will only be high during the construction phase, since during the operational phase the majority of the pipelines will be buried. As with other components of the Project the removal of vegetation and topsoil will create a colour contrast that will be a perceivable difference to the colour and textural values of the surrounding landscape.

This visual effect impact will be greater on locations that look down over the construction works as elevated locations provide longer views of the pipeline easement than when viewed from flatter locations. Valves will generally only be visible from local roads and residences and will have low visual significance, appearing similar to farm infrastructure.

4.8.3 Proposed Mitigation Recommendations

Where reasonable and practicable the following mitigation measures should be considered: Plan pipeline route so as to avoid sensitive landscape areas and close proximity to residences;

- Minimise clearing of vegetation and damage to vegetation adjoining easement;
- Minimise permanent earthworks in terms of cut and fill;
- Store top soil from trenching for use in rehabilitation works;
- Mulch vegetation clearing material for use in rehabilitation;
- Following pipe installation ensure that pipe trench is backfilled with proper compaction techniques to ensure an even ground level is achieved and maintained without slumping;

- Develop appropriate drainage structures to avoid scour of pipeline trench and the easement as a whole;
- Rehabilitate pipeline route to achieve vegetation cover consistent with surrounding land cover or in the case of forest, appropriate grass and or shrub cover; and
- Appropriately locate gas pipeline signage as per regulatory requirements.

4.9 Water Transfer Stations

Associated water from individual wells will be collected at localised transfer sites. In general, these transfer sites will be located at lower elevations within the field. Each site will require a lined storage pond and pump station to transfer water to the water treatment facility, Figure 4.18.

The typical facilities associated with the water transfer station consist of associated water pond, pumps, small maintenance building and power generation.

As with the gas plant facilities, the initial development plans to meet the start-up of the LNG facilities, do not require all indentified water treatment facilities operating. Based on current development assessment, it is estimated that eight water transfer stations could initially be constructed; three in the eastern area and five in the Western Walloons. Eventually a total of 33 water transfer stations will be required for the project.

4.9.1 Visual Analysis

The water transfer stations will have similar visual effects as the water treatment facility; however the stations will be of a reduced scale. Building components will create contrasting form, shape, line and colour in the landscape. The ponds however will create line and colour contrast only in the landscape due to its limited vertical dimension. The overall plan dimensions of the pond and components of the stations will be approximately 300 metres by 200 metres.

4.9.2 Visual Effect

The visual significance and effect of the water transfer stations will be similar to that of the water treatment facilities, however at a much reduced scale.

4.9.3 Proposed Mitigation Recommendations

Where reasonable and practicable the following mitigation measures should be considered: Where possible locate water transfer stations away from sensitive receptors;

- If this cannot be avoided complete a visual analysis of how the transfer station is located in any critical view and design and implement landscape strategies to screen or successfully integrate the facility into the view;
- Carry out earthworks to ensure that final land forms aside from the retention ponds grade back into the existing land forms; and
- Ensure that protective fencing is appropriately finished and signage co-located.

4.10 Access roads

Access roads will be required throughout the Project development area for construction of facilities, inspections, on-going maintenance and decommissioning purposes, refer figure 4.19. These will be a

combination of public and site specific access routes on private lands with some of the access tracks on private lands utilising, where possible, established tracks.

Access roads leading to individual wells will be required. Generally the unsealed access road leading to individual wells will be situated within a cleared area to avoid the removal of remnant vegetation to reduce the visual effects of colour variation and contrast. Roads leading to major infrastructure such as gas plants and water treatment facilities may require all weather access.

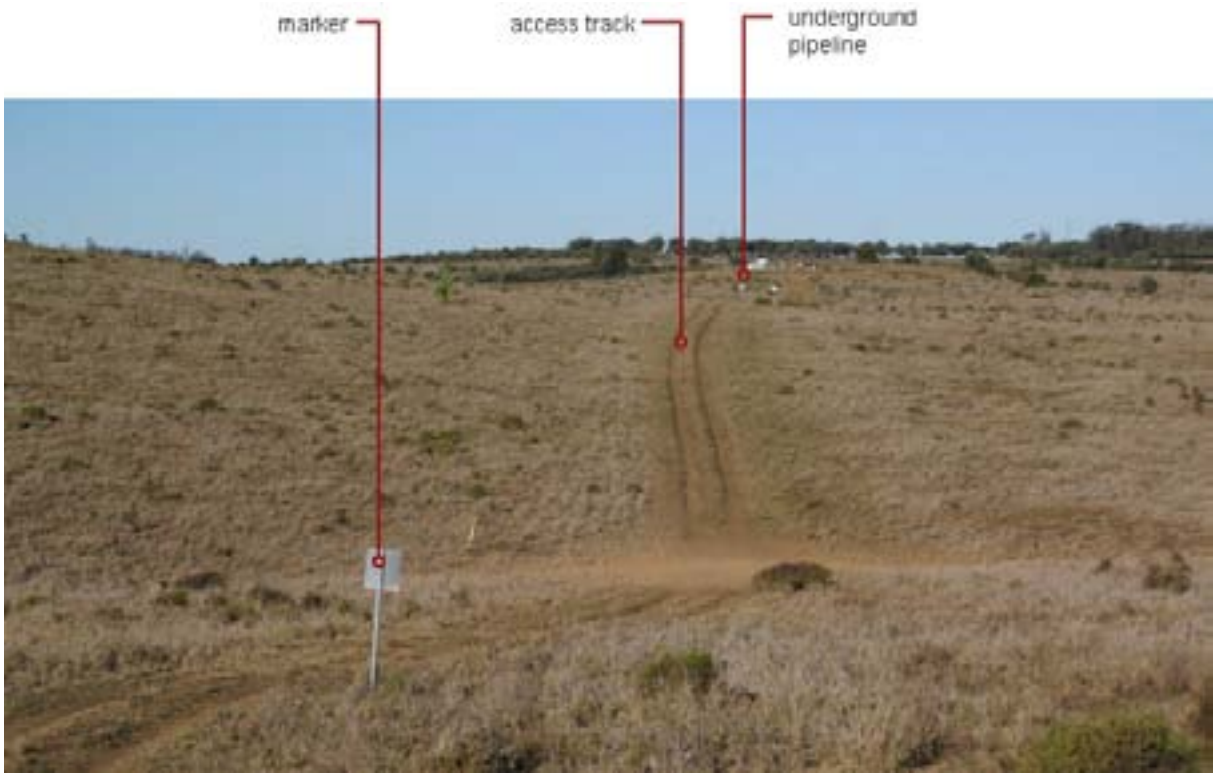

Figure 4.19 | *An access track along easement corridor creates line in the landscape however is generally integrated and creates low visual effect.*

4.10.1 Visual Analysis

The visual contrast between the access roads and the landscape in which they are located may be created by vegetation removal, topsoil stripping and earth works where required. These operations may create line and colour contrasts with the existing landscape. The colour of the road surface and cut and fill batters will contrast with adjoining grass and tree covered areas.

4.10.2 Visual effect

Vegetation clearing and earth works may create colour contrast with 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 limited horizontal dimension and lack of vertical projection. Its effect can greatly increase if the alignment is straight for significant distances parallel to critical view lines.

4.10.3 Suggested Management Recommendations

- Where reasonable and practicable the following mitigation measures should be considered: For sealed major roads ensure alignment is sympathetic to the landscape, following contours to minimise earth works and achieving better visual integration outcomes;
- Where possible co-locate access roads on existing roads and farm tracks;
- Where practical, avoid sensitive landscape areas including prominent ridges and other highly visible landscape areas;
- Establish routes and gates in consultation with the land owner;
- Minimise clearing for access roads and trails;
- Minimise damage to adjoining vegetation;
- Store topsoil and mulch cleared vegetation for use in rehabilitation;
- Avoid straight line tracks and allow tracks to follow natural terrain minimising width to suit needs;
- Develop track or road to a standard that is appropriate for its level of use;
- Avoid use of non gravelled trails in wet weather where practical;
- Rehabilitate edges of roads and trails to be consistent with surrounding vegetation cover; and
- Remove the road or track when no longer required.

4.11 Storage and lay down areas / logistic centres

Development of the Project will require storage and lay down areas as well as logistics centres for large amounts of materials and equipment as well as vehicles, Figure 4.20. These areas will be a parcel of land fenced and generally flat. Although each storage and lay down area will vary in size each will support all types of material from pipe, material, equipment and hazardous chemical storage. These areas could also include a number of small scale buildings for administration and maintenance activities.

Maintenance activities in relation to the storage and lay down areas are minimal. The progressive increase of these storage areas and lay down areas will depend on the construction schedule and future gas plant and water facility locations.

4.11.1 Visual Analysis

The storage and lay down areas will from time to time have various construction components that will include pipe and production well components, creating visual contrast of form, shape, colour and line with the surrounding landscape.

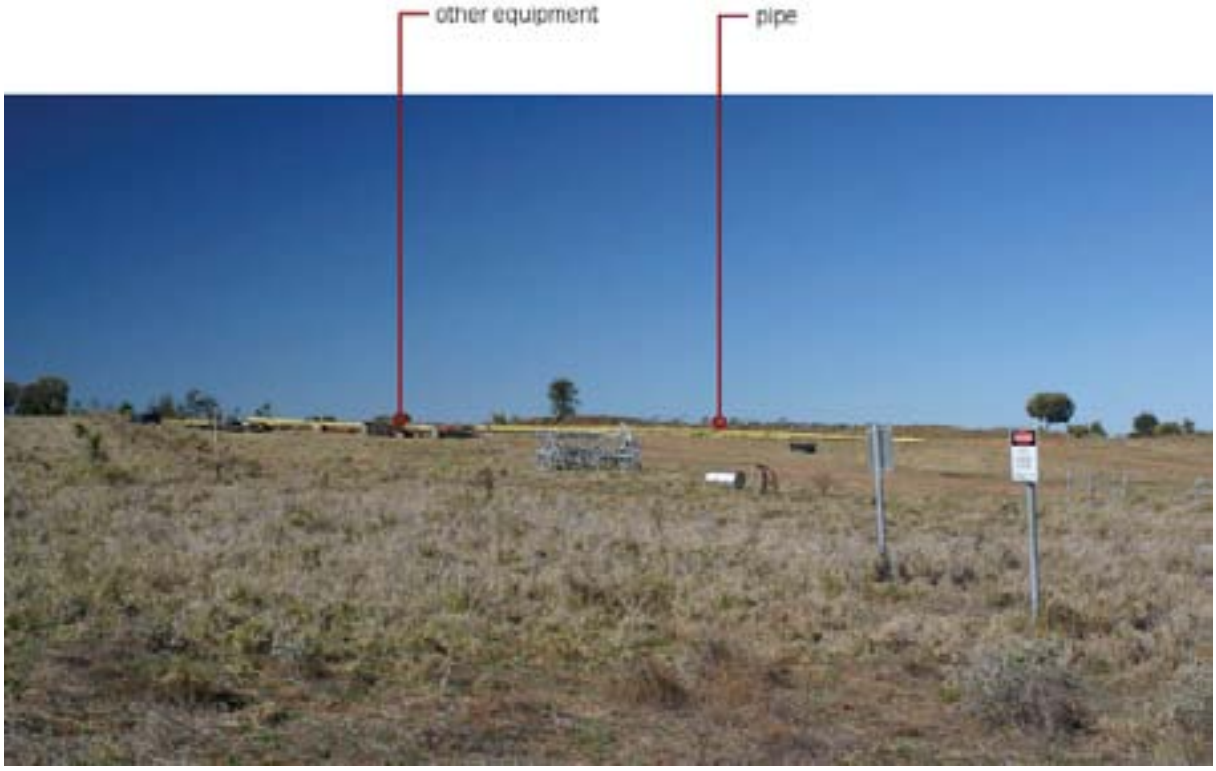

Figure 4.20 | *Storage and laydown area, creates temporary line and colour contrast with the landscape.*

4.11.2 Visual Effect

The visual effect of temporary storage and lay down areas may be high during the construction and operational phase, however once the pipeline has been installed in a particular section, rehabilitation will occur in these areas.

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

4.11.3 Suggested Management Measures

Where reasonable and practicable the following mitigation measures should be considered: Avoid the view sheds of sensitive receptors such as residences, highways and towns where practical;

- Where visible from towns or residences consider pre-construction viewing point landscape treatments (e.g. planting of vegetation), as an immediate visual treatment that will have landscape benefits beyond the timeframe of the initial construction period.
- Select a location that minimises earthworks and vegetation clearing, but perhaps utilises existing vegetation for screening purposes;
- Mulch removed vegetation;
- Minimise earthworks and use of external gravels or pavements;
- Construct appropriate drainage structures to avoid erosion of exposed areas;
- Rehabilitate landforms when decommissioning the lay down area so that the landforms are integrated into the surrounding areas; and

- Restore vegetation cover consistent with surrounding vegetation cover

4.12 Gas Transmission Pipeline Construction

The gas transmission pipeline will be approximately 450km and will be located underground. It will be constructed using a conventional pipeline trench and backfill techniques where practical. Construction works will operate seven days per week for duration of approximately 18 to 24 months.

The Right Of Way (ROW) width will typically be 40m to 50m wide. It is expected that most of the pipeline will be constructed within a 40m wide ROW; however some additional area may be required at larger crossings. The width may be reduced for limited distances through sensitive areas. The length of open trench at any one time will typically be 30km or more, however this will vary depending upon number of construction teams and progress. Expected time between clear and grade, and restoration will be approximately around three and five months.

The scope of work involved with the installation of the gas transmission pipeline will include:

- Temporary pipe lay down areas;
- Temporary construction camps;
- Detailed Survey;
- Clear and Grade;
- Stringing;
- Welding;
- Trenching;
- Bedding and Padding;
- Lowering-in and Backfill;
- Restoration and Rehabilitation; and
- Signage.

Temporary camp sites

It is anticipated that a peak construction workforce of approximately 800 people will be required to construct the main transmission pipeline. This workforce will be accommodated in a number of temporary construction camps established near the pipeline easement. Generally there are four workers housed in an accommodation module. These modules will be complemented by ablutions modules, kitchen and relaxation modules. External facilities will include roads and connecting pathways. Pathways will be constructed with portable steel sections.

Detailed Survey

The centreline of the main transmission pipeline is surveyed. Markers (pegs) are placed along the entire route to identify the pipeline easement and ROW. Vegetation clearing boundaries will be defined and marked.

Clear and Grade

Earthmoving equipment is used to clear the ROW of vegetation and topsoil ready for construction to commence. Vegetation and topsoil is stockpiled separately on the side of the ROW. Topsoil will typically be graded to a depth of 100 to 150mm for a blade width over the trench line.

Stringing

Steel pipe is trucked to the construction site in lengths approximately 18m long, which are laid end to end next to the future trench in preparation for welding.

Welding

Pipe lengths are welded together into sections (refer figure 4.21).

Trenching

After the gas pipeline route is cleared and the pipe is welded, a trench is dug for the pipeline either by an excavator or trenching machine. Trench spoil is stockpiled on the non-working side of the right of way (refer figure 4.21& 22). Trench spoil is stockpiled separately to topsoil.

Distances trenched each day will vary from 200 to 2,000m a day depending on ground hardness and terrain. Where rock cannot be excavated by conventional excavation, rock hammering equipment or controlled blasting will be used.

Bedding and Padding

In some areas it may be necessary to place a layer of rock free material in the trench to protect the pipe coating from abrasion damage. Padding machines are generally used to generate bedding and padding by sieving the excavated trench subsoil to remove coarse materials. The fine material generated by the padding machine is used to prepare the trench bottom prior to the placement of the pipe and to pad around the pipe prior to backfilling the pipe trench.

Lowering-in and Backfill

Side booms, crawler cranes and or excavators are used to lower the welded pipe sections into the trench (refer figure 4.22). Sections of pipe are then welded or tied in to form a continuous pipeline segment. Trench spoil is then returned to the trench and material compacted to eliminate the likelihood of soil subsidence over the pipe.

Restoration and Rehabilitation

Pipeline construction generates very little waste. All waste materials will be removed from the work area. As soon as practical after pipe laying and backfill, the easement is re-contoured to match the surrounding land (refer figure 4.22). Separately stockpiled topsoil is then respread evenly across the disturbed area. In cleared areas or along a vegetation line, vegetation will be shredded and spread evenly across the disturbed RIGHT OF WAY to assist with soil retention and provision of seed stock (refer figure 4.23 & 4.24).

Signage

Pipeline marker signs are located at inter-visible points along the pipeline (refer Figure 4.25). The marker signs are placed on either side of road, tracks, and railway and watercourse crossings, at property fence lines, at utility crossings and at each change of direction.

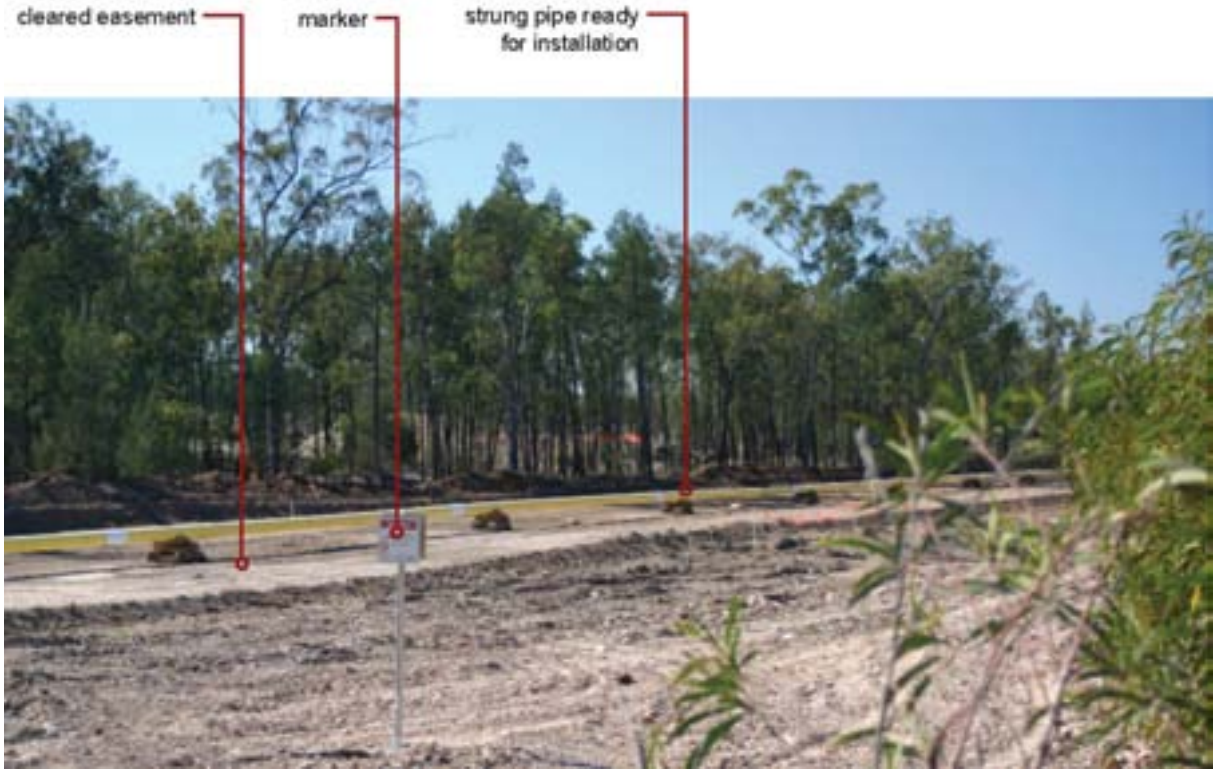

Figure 4.21 | *Pipe has been strung ready for installation. This section of the pipeline is in a forest woodland zone.*

Figure 4.22 | *The pipe is lowered into the trench using a Sideboom or similar. There is a high visual colour contrast between exposed soil and adjacent vegetation during the construction of the pipeline.*

Figure 4.23 | *Existing underground pipeline. The easement is re-contoured to original land form. Access roads such as this would have less visual contrast if other gravel colours were implemented.*

Figure 4.24 | *One of the restoration and rehabilitation methods. Spreading the shredded vegetation across the ROW will assist with reducing the colour contrast of exposed soil.*

Vehicle Movement

The general level of vehicle movement associated with the construction of the pipeline will be high during the construction phase. Vehicle movement will be associated with supply of pipeline components, movement of pipeline components to the pipeline easement, preparation of the pipeline easement, laying of the pipeline, reinstatement and rehabilitation of the easements and general transport for equipment and personnel.

Movement may be visually significant but would only be for short periods in any one section of pipeline until pipeline construction is complete. Vehicle movement during the operational phase will be low and have no visual significance.

Figure 4.25 | *View of existing underground pipeline and easement corridor. Note that the visual effect through grassland is minimal whereas the clearing of vegetation through the forest remains as a moderate effect.*

4.12.1 Visual Analysis

The long term visual impacts of the main transmission pipeline will be largely negligible; however the short term impacts can create strong visual effects.

The most significant visual effect of the main transmission pipeline will occur during the construction phase, as during the operation stage the majority of the pipeline components will have low visual significance. Generally visual impact may be greater in locations that look down over the construction works as elevated locations give longer views of the pipeline easement than when viewed from flatter locations.

The pipeline construction process could alter the local landscape character. This change would be created by the stripping of ground cover be it grass or shrub cover, the excavation of pipeline trench and the temporary stockpiling of soil material. The resultant exposure and excavation of the trench may create

strong colour contrast with the adjoining landscape area. The extended linear character of this change through the landscape may create strong line contrast.

In areas where woodland or forest occurs, the clearing of trees may also increase the level of contrast between the existing landscape and that of the pipeline easement, creating a strong visual effect. The timing however between clearing and restoration works along individual sections of the pipeline corridor will typically be within a three to five month period.

Earth moving equipment, excavators and other machinery used for construction will also be visible for a short period during the installation of the pipeline. The visual impact however will be relatively short.

Pipeline Location in various Visual Character Units (VCU)

The visual effect of the main transmission pipeline in various VCUs is the reverse of most of the other facilities associated with the project. All other elements achieve screening from forest or woodland vegetation. With pipelines the opposite is true in certain directions.

Pipelines like other elements require vegetation clearing. Other elements require the clearing of a relatively small area. But such areas are self contained. Pipeline clearing by definition is linear and continuous and generally proceeds in relatively straight lines or along gentle curves.

Although the visual effect of the construction activities of the main transmission pipeline may be screened through forest areas, it would not be through grassland. On the other hand, the long term effect of a cleared easement through forest could be significant where as in grassland and crop land rehabilitation over the top of the pipeline would reduce visual effects significantly.

In the case of woodland or scattered tree cover, the randomness of tree clumps or individual trees weakens the strong edge effect of an easement through forest.

4.12.2 Visual Effect

Much of the visual change is only experienced during the construction period, with form and colour contrast removed when restoration of ground cover is completed. Upon completion of a section of the pipeline, the corridor is planned to be reinstated to be consistent with the surrounding landforms and vegetation, the overall visual impact will be negligible.

In areas where vegetation is removed and cannot be reinstated, e.g. forested areas there would be a residual visual effect, however in most areas the proposed route alignment seeks to divert around woodland and forest areas where possible.

The above ground markers will have the most significant long term visual impact on the existing landscape. However due to the scale of the markers the visual impact of this element will be negligible in most situations, except in the immediate foreground of approximately 50-100m.

The visual effect of pipeline construction including pipe lay down areas and temporary accommodation camps may be high in all Visual Character Units with some screening occurring in forest areas.

The long term effect through grassland will be low once rehabilitation is complete.

The long term effect in woodland would be moderate to low depending on the density of tree cover in a location.

The long term visual effect of the main transmission line in forest country, especially in steep country will be high as there is a need to keep trees cleared from the pipeline and a maintenance track along the pipeline.

4.13 Other Pipeline Components

The visual character of the Project in relation to external views is created by a number of other facilities and associated infrastructure which will be required for the operation of the main transmission pipeline. The number and location of the above ground facilities will be determined at a later stage. These facilities will be in place for the life of the pipeline and include:

- Service Corridors;
- Inlet Station;
- Main Line Valves (MLV);
- Intermediate Scraper Stations (launcher/receiver);
- Delivery and Meter Station (Curtis Island);
- Future Pipeline Compressor Station;
- Cathodic Protection and Stray Current Earthing System; and
- SCADA System

The locations of these elements, along the main transmission pipeline, are indicated in below.

Approx. Kilometre point	Facility	Dia.	Comment
Main APLNG Pipeline			
0	Launcher, Metering, Isolation Valve	36	At GPF CNN_04; Start pipeline
30	Main Line Valves	36	
60	Header between Lateral and Main Pipeline	36/42	⇔ KP37.5 of Wolleebee Lateral
90	Main Line Valves; Launcher-Receiver	42	
120	Main Line Valves	42	
150	Main Line Valves	42	
180	Main Line Valves; Launcher-Receiver	42	
210	Main Line Valves	42	
240	Main Line Valves	42	
270	Main Line Valves; Launcher-Receiver; connection for future compression	42	Possible future booster compression station
300	Main Line Valves	42	
330	Main Line Valves	42	
360	Main Line Valves; Launcher-Receiver	42	
375	Main Line Valves	42	
390	Main Line Valves	42	
405	Main Line Valves	42	
420	Isolation valve; Receiver; Metering; Pressure control	42	End pipeline
Wolleebee Lateral			

Approx. Kilometre point	Facility	Dia.	Comment
0	Launcher, Metering, Isolation Valve	28	Start lateral
37.5	Receiver, Isolation Valve	28	⇔ KP60 of Main APLNG pipeline

Service Corridors

Wherever practicable the existing road network and private access tracks will be used to access the proposed easement and associated pipeline construction sites and for moving equipment and personnel. Most of the roads along the route are unsealed public roads and private access roads. Many of these roads will be used for access to the main transmission pipeline corridor by vehicles associated with the pipeline construction.

The width of any new access track will be restricted to the minimum practical to enable safe vehicle movement. Existing clearing in tree lines will be utilized where possible and additional clearing avoided.

Inlet Station

An inlet facility as well as the initial scraper launcher station will be installed at the start of the pipelines near Woleebee and Miles. This facility will include:

- A launcher trap;
- Emergency isolation;
- Pigging equipment;
- Materials storage;
- A water tank; and
- Other facilities as required.

The new inlet station will be connected to the High Pressure Gas Network allowing the transfer of coal seam gas from the gas processing facilities to the main transmission pipeline. A provision will be made for installation of meter runs as required.

Main Line Valves

Main Line Valves will be located at regular intervals along the pipeline for maintenance and emergency isolation purposes, Figures 4.26 & 4.27. These facilities will be used for depressurising the pipeline when required. Scraper stations will be integrated at a number of main line valves along the main transmission pipeline.

Intermediate Scraper Stations

Intermediate Scraper Stations will be located at extended intervals along the main transmission pipeline for launching and receiving of pigs and are typically combined with a main line valve, requiring form description

Delivery and Meter Station

An outlet delivery and meter station will be installed at Curtis Island just prior to delivering gas into the LNG Plant. The station will consist of a:

- Pig receiver;
- Potential heaters;
- Dry gas filter;
- Meter run;
- Pressure regulating run;
- A water tank; and other facilities as required.

Being located at Curtis Island it is not considered to be visually significant.

Future Main Transmission Pipeline Compressor Stations

To increase the main transmission pipeline capacity provision will be made into the design of the pipeline system for future pipeline compressor stations. These facilities would have a similar visual effect as the main gas compressor stations at the beginning of the pipelines, Figures 4.6 & 4.7. However they may be smaller in scale.

Cathodic Protection and Stray Current Earthing System

A cathodic protection system is incorporated into the pipeline to protect it from corrosion. All of these elements will be installed underground thereby avoiding any visual impact. In addition, cathodic protection test posts are connected to the pipeline and located approximately every 2 to 5km. These posts are usually sited alongside the marker posts, ideally along roads and tracks

Figure 4.26 | *Pipe laying showing pipe and Main Line Valve Station. The unfilled portion of the trench in the foreground shows colour and form contrast. The back filled port on of trench in the background shows restored landform and revegetation will restore colour contrast.*

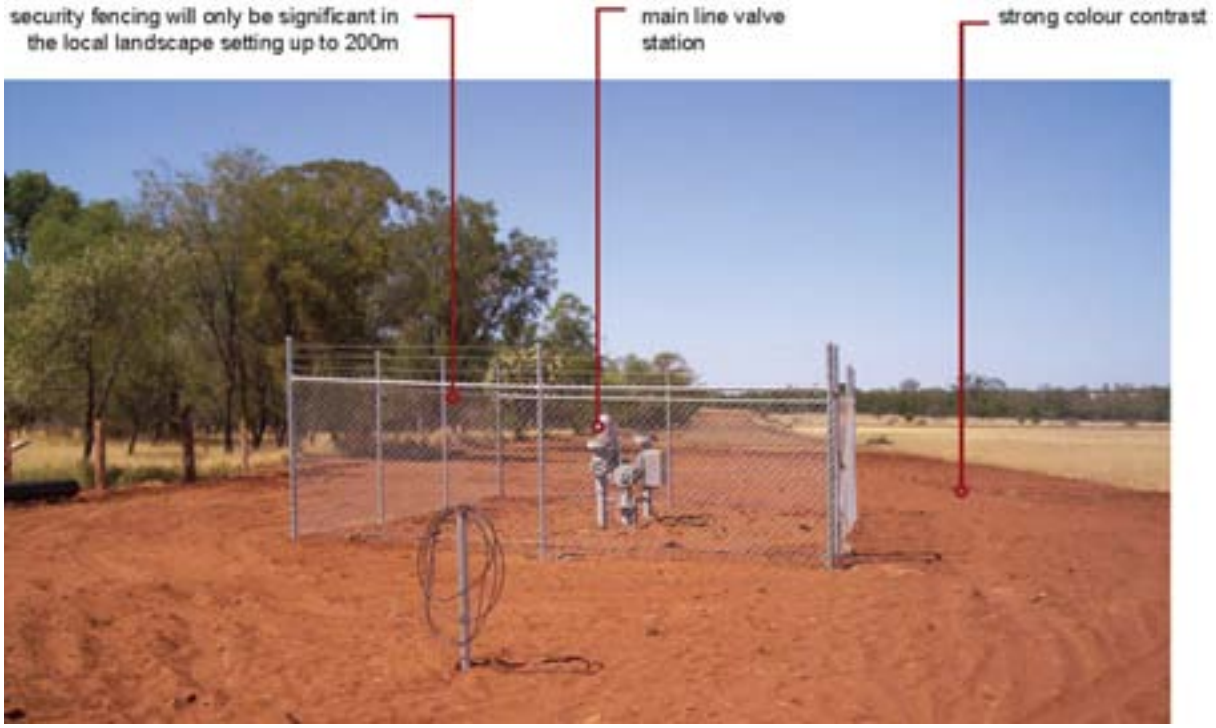

Figure 4.27 | *Recently constructed pipeline and Main Line Valve station. There is a strong colour contrast between the adjacent grassland and the pipeline corridor, however the contrast will be negligible once rehabilitation occurs.*

4.13.1 Visual Analysis and Effect

All elements are limited in elevation although some elements such as the inlet station and scraper stations may have a moderate sized footprint. The visual effect of the minor elements will be localised and is generally not significant beyond its immediate setting of approximately 100m.

4.13.2 Suggested Management Measures for Gas Transmission Pipeline

Where reasonable and practicable the following mitigation measures should be considered: Limit the construction time within the view of sensitive receptor locations;

- Minimise clearing of forest and woodland cover where possible, but especially in the vicinity of sensitive receptors;
- Minimise operational time at sensitive locations such as highway crossings;
- Consider the establishment of shrub/small tree visual barriers adjacent to major roads with plant species 3-5m high to break up long views down cleared easements and along Right of Ways of the main gas transmission line;
- Where practical locate temporary camps outside the view sheds of sensitive receptors such as residences;
- Where practical locate auxiliary facilities outside the view sheds of sensitive receptors or at least outside the range where a moderate to high visual effect may result;
- Following the laying of pipes ensure that ground levels are consistent with surrounding features;
- Create appropriate drainage structures to ensure that rehabilitation works are not eroded;

- Rehabilitate disturbed areas to be consistent with surrounding vegetation types; and
- In forest areas, where view lines are important, consider the re-establishment of scrub cover outside of pipeline route maintenance corridors to diminish the contrast between the adjoining forest and the easement.

4.14 Summary

The visual effects resulting from all construction activity may be high. However the range of effect will vary depending on the scale of the element. The level of visual effect of the construction phase does not bear a relationship with the visual effect of the operational phase. For example the visual effect of establishing water treatment ponds over 100-200 hectares along with associated treatment plant is high, whereas the visual effect of the established ponds and treatment facilities would be much more limited.

It is also the case that the visual effect of all construction activities is higher than that of the operational phase of the various elements. This is due to the added effects of movement and night lighting, these factors, considered together with noise, impact on the appreciation of landscape as a whole.

All elements have limited projection past 1km depending on the horizontal scale of the elements, so that avoiding this range will decrease the potential visual impacts of various Project components.

An analysis of a field of gas wells, with wells at approximately 750m centres illustrates that the visual effect of the gas field is determined by the closest gas well. The visual effect of gas wells beyond this well, dramatically decrease due to their small scale.

The main transmission pipeline from the Walloons Fields to Curtis Island may have high visual effects during the construction period. However long term effects are low with moderate effects limited to some forest areas.

Proper management of the visual effects of various Project components will successfully result in appropriate management of visual impacts.

5.0 VISIBILITY, VISUAL SENSITIVITY, VISUAL IMPACTS AND MITIGATIONS IN WALLOONS GAS FIELD

The Project, or more specifically the numerous gas field and pipeline components have the potential to create an adverse visual impact on areas surrounding the Project elements, especially on sensitive visual receptors such as residences and highways. This potential impact would be based on these elements being visible from such receptors. This Section of the report discusses different land uses, their sensitivities and the different visibility characteristics that can be found in the various landscape zones.

The visual impact of the Project is determined by evaluating the visual effect of the Project Elements, discussed in Section 4 of this report and the visual sensitivity of receptors from which the Project is visible. The varying levels of impact depend on the various values of visual effect and sensitivity as outlined in Figure 2.4.

5.1 Visibility and Sensitivity

All parts of the gas fields and even some areas outside it will, regardless of visibility to gas field components be assigned a visual sensitivity rating based on what view locations those areas are seen from. In the first instance they are given a background sensitivity rating reflecting the land use, e.g. farm uses, forestry, etc. Then more sensitive land uses are considered such as residences, villages, highways, etc. The areas seen from these more sensitive land uses would be ascribed the higher sensitivity rating. This would create irregular balloons of higher sensitivity around nodes such as a residence and corridors along roads and rail.

The scale of the project, both in terms of the number and diversity of sensitive receptors as well as the number of gas field production elements precludes spatial definition of seen areas and sensitivities. Rather they are defined in qualitative terms, i.e. high, medium and low sensitivity, based on predictive modelling. In other words, if elements are seen then a certain visual sensitivity would result. These sensitivity patterns vary between the gas fields on the basis of land use patterns and the ability of certain landscapes to limit visibility, e.g. forest areas in the Dalby Character Zone.

Three levels of visual sensitivity would apply to views of Project elements (refer to figure 2.3). For example, sensitivity levels when Project elements are views from less than 1km away are:

Low Visual Sensitivity: views from broad acre rural lands and minor local roads where the view may be partially obscured by topography, landscaping, or structures. The Project elements are noticeable however will not cause any significant adverse effect.

Moderate Visual Sensitivity: views from main roads and less utilised public lands in state forest, national parks etc. The Project elements are readily noticeable and may have significant effects, however, may be able to be mitigated.

High Visual Sensitivity: views from towns and rural residences, recreation areas and highways. The Project elements form a significant part of the landscape view, causing extensive adverse effects that cannot be avoided.

Visibility and Sensitivity of the Project elements was defined by evaluation of maps, aerial photography and field investigations. The CSG fields and surrounds were divided into three zones on the basis of landscape character (see section 3). From these characteristics it is possible to carry out a qualitative assessment of visibility and sensitivity of various use areas to the Project. These zones are as identified in section 3.0, Zone 1 Roma CSG Fields, Zone 2 Chinchilla CSG Fields and Zone 3 Roma CSG Fields (refer figure 1.2).

Relevant land use types appropriate to the gas fields and pipe lines that are part of this project include:

- Towns/Villages/Rural residences;
- Recreation areas;
- Major tourist routes;
- Other main roads;
- Local roads; and
- Rural lands.

All of these locations have been considered in terms of a sensitivity rating as illustrated in figure 2.3. In summary the most sensitive locations will be both town and rural residences. Of lower sensitivity are major tourist highways and roads, while the lowest sensitivity being production lands within state forest and rural lands. The exception to state forest areas having a low sensitivity would relate to any areas that supported a recreation function be it a forest drive, a picnic area, or camping area.

These sensitivities have been applied to the land use types and are discussed below in relation to all Landscape Character Zones within the gas fields and along the main gas pipeline between the Walloons Gas Fields and the LNG Plant on Curtis Island.

5.2 Visibility, Sensitivity and Impacts of the Walloon Gas Fields Landscape Character Zone 1 – Roma CSG Fields

There are extensive open views across open grassland and agricultural land for a large portion of the Roma CSG fields. Views are screened however through woodland and forested areas. Roadside vegetation also assists with screening views. Significantly there are large relatively flat crop and grassland areas adjacent to the Warrego Highway.

5.2.1 Visual sensitivity and Impacts in rural, village and town residences

Houses in villages such as Dulacca and Drillham as well as rural residences would have the same visual sensitivity to project elements, including wells, gas stations and pipelines, as residences in Landscape Zone 2 & 3, within the Walloons Gas Fields as well as the residences adjoining the 14 identified landscape character zones along the main transmission pipeline from the Walloons Gas Fields to Gladstone.

The visual sensitivity of all residences depends on visibility to the various components. Visual amenity is a functional component of the enjoyment of a view from recreational areas and relaxation areas in and around a home. If a gas field component is seen from such an area, as opposed to work areas around the home a high visual sensitivity has been ascribed up to a distance of 2.5km, with moderate and low sensitivities going beyond this.

Visibility will depend on the position of a house in the landscape, with houses on hills having the greatest potential for long views. Other residences tend to have an inward view towards garden elements, where others will have combinations of both and at times have limited views to areas external to the residence garden in one or more directions.

Views from villages and towns will generally be limited due to the flat to gently undulating topography, but more significantly the screening effects of adjoining buildings and town elements. Potential views are therefore limited to houses on the edge of towns that may take advantage of the adjoining rural views.

It would not be possible to keep all project elements out of views of all residences. Rather it is important to attempt to keep larger scale ones such as gas processing facilities out of the primary view areas of residences and smaller elements such as gas wells sighted with regard to such views. Such elements need to be considered in relation to each residence to minimise interaction with the most sensitive view zones.

Views to project elements from residences would have a high sensitivity to Project elements up to 2.5km beyond which a moderate sensitivity rating is appropriate given the scale of project elements.

5.2.2 Visual Sensitivity and Impacts in Designated State Forests

There are a number of state forests in the Roma Landscape Zone. Combabula State Forest, Dinquin State Forest and Woodduck State Forest are located entirely within the Roma VCZ, while the Gurulmundi State Forest has a small portion located within the VCZ.

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

5.2.3 Visual Sensitivity and Impacts on Designated Tourist Roads and Highways

The major travel corridors in the Roma LCZ include the Warrego Highway, that runs east west through Dalby, Chinchilla, Miles and Roma and the parallel Western Railway Line. These travel routes have state and regional significance.

They would have a high to moderate rating, with immediate foreground areas up to 500m having a high sensitivity with moderate sensitivities being appropriate after that.

5.2.4 Visual Sensitivity and Impacts on Other Main Roads

In terms of the 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.

This road has been assigned a moderate sensitivity up to 500m and low after that.

5.2.5 Visual Sensitivity and Impacts on Local Roads

There are numerous local roads in all landscape character zones. These roads would have a moderate sensitivity up to 500m beyond which a low sensitivity is appropriate. Dulacca north road, Yuleba Taroom Road, Wallumbulla North Road are the main north south local roads with roads such as Cattle Creek Road and Myranga, Homebush, Mantovas Roads and Clarks and Crossroads Road providing east west linkage, with numerous other minor roads making linkage between them.

These roads would have a moderate sensitivity in the immediate foreground up to 200m, beyond which sensitivity would be low

5.2.6 Visual Sensitivity and Impacts in Broad Acre Land Uses

The broad acre land uses are common to the Walloon Gas Fields as well as the main transmission pipeline route and would generally have a low sensitivity to Project elements as visual quality does not relate to the functionality of these land uses. This includes the minor roads that service properties within the landscape character zone. *These work areas have a low sensitivity.*

5.3 Visibility, Sensitivity and Impacts of the Walloon Gas Fields Landscape Character Zone 2 – Chinchilla CSG Fields

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

Although it is similar to the Roma CSG Fields in that this zone consists of large areas of agricultural land use, the Condamine River and its associated flood plain make a significant difference.

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

Forest areas are restricted to small areas around Miles and small sections of 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.

Settlement is reflective of 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.

5.3.1 Visual Sensitivity and Impacts on residences in rural areas, village and towns

The township of Miles and village of Kogan are within this landscape character zone. However the gentle terrain ensures that any potential views to Project elements are limited to areas on the outer edges of the settlements, as outer edge houses and other town elements prevent views from houses away from the town edge. In the case of Miles even views from outer edges are limited due to the occurrence of open forest and woodland in many parts. In Kogan this is also the case although there are areas with more open rural lands adjoining in this village

A feature of this area is the increased number of rural residences that reflect the more intense farming that can be supported along the flood plain of the Condamine River. The flat terrain and cropping lands of the flood plain also create opportunities for long open views to gas field elements.

Views to Project Elements as seen from town, village and rural residences will have a high sensitivity to Project elements up to 2.5km, beyond which a moderate sensitivity rating is appropriate given the scale of project element. Due to the openness of much of the zone and the relatively dense spread of residences much of this zone would have a high sensitivity.

5.3.2 Visual Sensitivity and Impacts in Designated State Forests

Only a small portion of Condamine State Forest is within the Condabri Field.

This area would have low sensitivity based on its timber production land use in this locality.

5.3.3 Visual Sensitivity and Impacts on Designated Tourist Roads and Highways

The major travel corridors in the Chinchilla CSG Fields include the Warrego Highway, that runs east west through the northern part of the Condabri field and Talinga Field. Running South from Miles is the Leichardt Highway. Both of the highways would have open views across crop lands and grass lands 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 similarly has open views to the gas fields where it crosses the Condabri and Talinga Fields

They would have a high to moderate rating, with immediate foreground areas up to 500m having a high sensitivity with moderate sensitivities being appropriate after that.

5.3.4 Visual Sensitivity and Impacts on Other Main Roads

In terms of the community values these roads retain a moderate visual sensitivity to visual change in foreground areas.

There are two regional roads in this location the Cogan 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 after that.

5.3.5 Visual Sensitivity and Impacts on Local Roads

Between the Warrego Highway and the Cogan 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 would have a moderate sensitivity in the immediate foreground up to 200m, beyond which sensitivity would be low

5.3.6 Visual Sensitivity and Impacts in Broad Acre Land Uses

The broad acre land use in this zone is dominated by improved pastures along the flood plains of the Condomine 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 would have a low sensitivity, with forest cover limiting the extent of visibility.

5.4 Visibility, Sensitivity and Impacts of the Walloon Gas Fields Landscape Character Zone 3 – Dalby CSG Fields

The Dalby CSG fields comprise of 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 LCZ is dominated by forest 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, but especially the forest cover would limit long distant views within the zone and also limit sensitivity levels

Four distinct Landscape Character Units have been identified within the Dalby LCZ as shown on figure 3.4.

5.4.1 Visual Sensitivity and Impacts on residences in rural areas, village and towns

Residences in this unit are generally limited to the open areas adjacent to Cattle Creek/Weir River Road and 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.

With the exception of houses in the cleared areas views would be limited. However, houses retain the usual sensitivity levels of high to project elements up to 2.5km beyond which a moderate sensitivity rating is appropriate given the scale of project elements.

5.4.2 Visual Sensitivity and Impacts in Designated State Forests

State forest and other forest areas dominate this landscape zone.

This area would have low sensitivity

5.4.3 Visual Sensitivity and Impacts on 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 potentially limiting views. However, in the vicinity of the *Condamine Farms* the highway is in open country, but has limited connection with the gas fields

They would have a high to moderate rating, with immediate foreground areas up to 500m having a high sensitivity with moderate sensitivities being appropriate after that. Visibility would be very limited enabling forest edges to screen gas field elements.

5.4.4 Visual Sensitivity and Impacts on Other Main Roads

There are no main roads in this zone that would have visual connection with the gas field areas

5.4.5 Visual Sensitivity and Impacts on Local Roads

The main local roads are Cattle Creek / Weir River Road and 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 would have a moderate sensitivity in the immediate foreground up to 200m, beyond which sensitivity would be low. Views would be moderately open given the undulating character of sections of the road that are in grassland and restricted in forest areas.

5.4.6 Visual Sensitivity and Impacts in Broad Acre Land Uses

The broad acre land use in this zone is dominated by state forest and forest in private lands. Grazing land uses, with some improved pastures also evident, occur in the cleared lands within the zone

All of these areas would have a low sensitivity based on the productive character of the land use for grazing and timber production. In addition forest cover would reduce visibility to CSG production elements.

6.0 VISIBILITY, VISUAL SENSITIVITY, VISUAL IMPACTS AND MITIGATIONS ALONG MAIN TRANSMISSION PIPELINE

The landscape character along the main transmission pipeline would influence the visual effects that occur during the construction phase of the pipeline as well as during its operation as discussed in Section 4.0 of this report

This section will consider general issues of visibility and sensitivity of various land use areas that may have views to the pipeline. Based on this and with a consideration of visual effects the potential visual impacts of the main transmission pipeline along the route are assessed.

6.1 Landscape Character Zone 1 – Condabri CSG Field to Pipeline Intersection

The main transmission pipeline is predominantly within forested lands that, while creating a high visual effect, may have limited visual exposure and there are no sensitive receptors along the route.

The exceptions are the Warrego Highway and the Western Railway that would have high sensitivity in the foreground up to 1km, however speed of travel and the linear nature of pipeline activities may severely limit views from these two travel routes.

The main gas transmission pipeline crosses the Warrego Highway and the adjacent Western railway within 10km of Miles. In this context, the crossing is a sensitive viewing location requiring particular attention as outlined below.

Visual Impact

The impact during the construction period would generally be moderate, due to the lack of sensitive receptors with views to the pipeline.

The exception to this may be the temporary high visual impact that is experienced at the Leichardt Highway during the construction period, reflecting the visibility of this zone from the highway and railway.

Specific Proposed Mitigation Recommendations for this Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

Consistent with the needs to maintain access and keep plant material off the main transmission pipeline,, if practical, establish a visual screen of low trees to avoid views along the pipeline and into the gas processing facility at this location.

6.2 Landscape Character Zone 2 - Woloobee CSG Field to Pipeline Intersection

The main transmission line route traverses hilly, cleared grazing land well away from rural residences, with the closest being at Baileys Road. At this point, approximately 19km along the pipeline route there are two residences some 1.5-2.5km away.

The pipeline route crosses the Leichardt Highway between 22 – 23 km in cleared country. This section of the highway would have high sensitivity.

Visual Impact

A temporary high visual impact could be experienced by two rural residences and would be experienced at the Leichardt Highway during construction. This impact would become low following completion of construction period.

Specific Proposed Mitigation Recommendations for the zone

Implement general Proposed Mitigation Recommendations for pipelines

Given the high visual effect in this location, a high visual impact may result until the pipeline easement is rehabilitated following pipe laying.

6.3 Landscape Character Zone 3 - Pipeline Intersection to Old Chinchilla Road

General

The gas pipeline route runs mostly within forested areas just outside the western boundary of Barakula State forest. The visual effect may be high as the route crosses steep, rocky, forested slopes. It also crosses small sections through open grassed paddocks that have been contoured for drainage control and that have retained trees along gully lines.

The proposed construction camp at this location is well sited to be screened from surrounding sensitive receptors.

Visual Sensitivity

The visual sensitivity of this sector is low reflecting state forest general usage and open grazing lands There are two houses on Upper Downfall Creek Road but it would not have view lines to the pipeline clearing within forest, but may have views to the pipeline passing through open fields

Visual Impact

The visual effect in the forest and grassland areas would be high during the construction period. Visual Impacts in the grassland could be high during construction due to views from houses on Upper Downfall Creek Road but would be low after rehabilitation following construction period. Impacts in the forest area would be moderate/low reflecting the moderate residual visual effect through steep forest ridges

The visual effect of the temporary accommodation camp in this location would be high, however, sensitivity of the location is low creating a moderate to low visual impact. Further, this impact is temporary.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

Specific care should be taken with restoring steep forest ridges

6.4 Landscape Character Zone 4 - Old Chinchilla Road to Glendoan Road

General

From Old Chinchilla Road the main transmission pipeline route travels in a northerly direction. This LCZ consists of open grassland grazing with some cultivated areas and scattered trees predominantly along drainage lines and road reserves. There are few remnant patches of enclosed vegetation.

Topography is predominantly flat with elevations ranging from 298m to 324m. Several residences are within viewing distance of the pipeline route throughout this zone, namely two houses on Zilmans Road that are only approximately 400m away and residences on Roche Creek Road that are approximately 1.5-2.4km away.

Visual Sensitivity

The visual sensitivity of the southern section of the main transmission pipeline in this LCZ is low reflecting the grazing land use. However northern areas have a high sensitivity reflecting the location of the pipeline route in open country within the proximity of some residences.

Visual Impact

The visual effect may be high during the construction phase creating a moderate impact in the southern section of the LCZ and a high impact in the northern sector. These impacts would be reduced to low following completion of the pipeline rehabilitation and grass cover is restored.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

6.5 Landscape Character Zone 5 - Glendoan Road to Big Valley Road

The main transmission pipeline route progresses in a north direction traversing a mix of semi-enclosing woodland/regrowth forest and enclosed forest through the zone . This LCZ is typically undulating with elevations ranging from 290m to 332m. A network of tracks, which could include property boundaries and fire trails, organised in a geometric form are a dominant feature of this landscape pattern in the south with more natural lines dominating clearings and landscape pattern north of the 44km mark along the pipeline.

Visual Sensitivity

The dominant land use is grazing with residual forest areas retained in rural holdings. The visual sensitivity of the zone is low.

Visual Impact

The visual effects of the construction phase could be high resulting in moderate impacts. These impacts reduce to low following construction and are not significant.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

6.6 Landscape Character Zone 6 - Big Valley Road to Deearne Road

This LCZ runs parallel to the Auburn Range. The pipeline route continues to traverse north through open grassland with scattered trees and remnant patches of vegetation along drainage lines and road reserves.

The route crosses Cockatoo Creek and a series of other small creeks which drain into Cockatoo Creek, such as Nine Mile Creek, Kennedy Creek and Rocky Creek. The route also crosses Pine Creek and runs parallel to the creek for approximately 6kms.

Topography is generally undulating with elevations showing a slight variance from 370m to 390m.

This zone would also support a temporary accommodation camp in the vicinity of Cockatoo Creek. The camp would cover approximately 10ha.

The route is traversed by Flagstone Rd (56km) Ponty Creek Road (58km) Pine Creek/Bowings Roads (60km), Red Range Road and Cockatoo Creek (69km) and Deearne Road (88km).

There is little evidence of residences in proximity to the main transmission pipeline except at approximately 76km.

Visual Sensitivity

The visual sensitivity of the LCZ is low reflecting the dominant rural land use for grazing.

Visual Impact

The visual effect of establishing the pipeline would be high, but would be low after rehabilitation. The visual impact during construction would therefore be moderate and reduce to low after rehabilitation at the end of the construction phase.

The visual effect of the construction camp may be high. However it would not be visible to sensitive receptors so a moderate to low visual impact would result.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines and construction camps.

6.7 Landscape Character Zone 7 – Deearne Road to JP Gully

For the first 15km the route crosses through rugged forest. From there on the route traverses semi cleared country to the Eidsvold Theodore Road.

Elevations are much higher through this zone ranging from 300m to 480m.

Visual Sensitivity

There are no sensitive receptors in this LCZ so the area has been assigned a low sensitivity reflecting forest cover and marginal grazing land

Visual Impact

The visual effects of construction may be high in both forest and grassland/woodland areas during construction. Both would be restored to a moderate visual effect level resulting in a moderate to low impact during the operational phase of the Project.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

6.8 Landscape Character Zone 8 – JP Gully to Oxtrack Creek

This section of the main transmission pipeline runs in the vicinity of Defenders Road. The pipeline route is for the greater part in cleared grassland, occasionally crossing treed areas adjacent to drainage lines and other occasional belts of trees along roads or within paddocks.

There are approximately five residences in the vicinity of the pipeline route, however they would generally have limited views.

Several creeks are crossed including Delusion Creek, Horse Creek and Oxtrack Creek.

Topography is gently undulating with elevations ranging from 370m to 410m.

Visual Sensitivity

The visual sensitivity of the LCZ is low with the exception of view zones around residences.

Visual Impact

The visual effect may be high during construction but would revert to low on completion of rehabilitation. Visual impacts would be low following rehabilitation.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

6.9 Landscape Character Zone 9 – Oxtrack Creek to Keen Creek

The pipeline route continues in a north westerly direction through enclosed forest with patches of semi-enclosed woodland, crossing several unsealed tracks. Topography is moderately undulating with elevation ranging from 400m to 470m.

The pipeline route crosses South Creek and Keen Creek and generally follows the Crowsdale Camboon Road.

There are only two houses in the vicinity of the pipeline route. The house at 165km would be unsighted by topography and or vegetation, while the residence at the end of the northern end of the LCZ at 175km may have a glimpses of the pipeline on hills to the east

Visual Sensitivity

The visual sensitivity of the LCZ is low with the exception of the seen areas of the two residences. Generally there would be no view to the pipeline from the southern house so this locality would retain a low sensitivity. A high sensitivity may be ascribed to the pipeline in the vicinity of the northern house.

Visual Impact

Again visual effects may be high during construction and low following rehabilitation at the end of the construction phase. Visual impacts may be moderate during the construction phase with the possible exception of the area adjacent to the northern residence, where a high impact during construction may be experienced.

Following rehabilitation impacts levels would reduce to low.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

6.10 Landscape Character Zone 10 – Keen Creek to Dawson Highway (south)

From 175km to 183 km the pipeline route passes through gently undulating terrain dominated by open woodland and is parallel to an existing pipeline that still displays the woodland clearing. From 183-225 the terrain remains gentle but is dominated by grassland and follows parallel to the Crowsdale Camboon Rd and Prospect Creek. There is a slight increase in woodland crossed between 214km and 225km.

There are a number of residences along the pipeline route with most concentrated in the lower portion of the LCZ adjacent to Prospect Creek.

Visual Sensitivity

The visual sensitivity of the LCZ is low with a moderate rating to 200m along Crowsdale Camboon Road. The areas around the residences may have a high sensitivity.

Visual Impact

The visual effects of the main transmission pipeline construction may be high but would reduce to low following completion of construction.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

6.11 Landscape Character Zone 11 – Dawson Highway (south) to Dawson Highway (north)

Within this zone the pipeline route crosses the Dawson Highway and the Burnett Highway. From the Dawson Highway the route travels in a northerly direction for approximately 10kms at which point the route changes bearing and heads in a north easterly direction.

This LCZ is predominantly grazing land with few patches of remnant woodland along creek lines and road reserves. Topography is generally undulating with broad creek flats in the middle of the valley that are to a large extent used for improved pastures and cropping.

Much the same as other LCZ's along the route, the pipeline crosses several creeks. LCZ11 crosses Back Creek, Kroombit Creek, Kroombit Creek (west channel), Callide Creek and Callide Creek (old channel).

After crossing the creeks Woodland again becomes a feature of the route and once again the existing service corridor becomes visible.

Visual Sensitivity

The LCZ is dominated by agricultural activity. However the improved quality of the land results an increased number of residences with high sensitivities to 1km and highway zones with high sensitivity.

Visual Impact

The visual impact of the main transmission pipeline construction may be high as seen from residences along the route but would reduce to low following completion of construction.

Specific Proposed Mitigation Recommendations for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

6.12 Landscape Character Zone 12 – Dawson Highway (north) to Coal Road

LCZ12 traverse through the Callide Ranges which consists of enclosed forest covered ranges and valleys. The pipeline route generally follows adjacent the Dawson Highway in a north easterly direction to the top of the Callide Range and then heads east along Collards Creek.

The pipeline route crosses Collards Creek in several locations throughout this LCZ. Topography is moderately undulating through this section of the route with elevations ranging from 350m to 400m.

Visual Sensitivity

The visual sensitivity of the LCZ is generally low. However the immediate foreground of the highway is high.

Visual Impact

The visual effect in this section would be high during the construction period, reflecting the need for tree clearing of the easement. This would return to moderate following the completion of the construction period.

Visual impacts would be high during the construction period as seen from the highway and moderate in other areas due to lack of visibility from sensitive receptors. The western section of the route to the top of the range may be visible from some residences in the valley creating a high impact up to a distance of 5km. A high impact would remain during the operational phase where the pipeline clearing is visible to the highway up to 500m and to residences up to 5km.

Suggested Management Measures for the Zone

Implement the general Proposed Mitigation Recommendations for pipelines.

Complete a detail visual assessment of potential views to the western portion of pipeline route from adjoining rural lands and as needed implement on site or at viewing point strategies to reduce visual effects or visibility.

Where reasonable and practical, at highway locations implement plantings of shrubs/small trees to screen views onto cleared easement and restore roadside landscape amenity.

6.13 Landscape Character Zone 13 – Cool Road to Sneaker Gully

The landscape character changes through zone 13 to undulating grassland with scattered trees and patches of remnant vegetation on undulating terrain from 270km to 285km, beyond which the pipeline alignment in located adjacent to the Dawson Highway and follows tributaries of Running Creek over creek flats crossing the Calliope River. From this point the route runs across the gentle undulating terrain crossing Sig Sag, Harpers, Alarm Creek and Sandy Creek before heading north adjacent to Mt Alma Road again in grassland with scattered trees crossing Gravel Creek and Larcom Creek to the Bruce Highway

The highway at this location is within a band of trees and adjacent woodland approximately 700m wide.

From this location the route heads north through wooded foothills crossing the Gladstone Mount Larcom Rd, then heads north east across cleared and wooded slopes to a coastal range associated with Mount Larcom.

Visual Sensitivity

The sensitivity of the LCZ in the vicinity of the pipeline route is generally low reflecting gazing land use patterns. Exceptions are created by the Dawson Highway from 276 – 294 km where a high sensitivity band would enclose the highway up to 500m. Similarly the crossing of the Bruce Highway would have a high sensitivity. The crossing of the Gladstone Larcom Road could have a moderate sensitivity.

In addition there are a limited number of residences located on Mt Alma Rd west of the Bruce Highway and the Narrows Road east of the highway that could have a high sensitivity.

Visual Impact

The visual effect of the construction operation may be high but this would revert to low following completion of pipe laying and rehabilitation of the pipeline easement. The exception to this may be at the Dawson and Bruce Highway where the route alignment passes through remnant open forest. Here the visual effect following restoration works would remain high to moderate.

The visual impact for the route would be low. The exception is the Dawson Highway section during construction where impacts would be high. However this would reduce to low following rehabilitation, except in forested areas. The impact at the Bruce highway would also be high during construction and could remain high due to tree clearing along the easement

Suggested Management Measures for the Zone

- Implement the general Proposed Mitigation Recommendations for pipelines; and
- Adjacent to the Bruce Highway implement a planting strategy on each side of the highway to screen views along the easement.

6.14 Landscape Character Zone 14 – Sneaker Gully to Curtis Island

This LCZ traverses in an easterly direction through the Mount Larcom Ranges. It does so by following up Larcom Creek along Sneaker Gully, crossing the range at a low and narrow point. This section supports grassland in the valley and forest and woodland on the slopes. On the eastern side of the range the route alignment crosses the terrain through grassland, crops. Orchards and open forest to the beginning of the coastal mangroves at 349km. From this point the route crosses salt marsh, mangroves and creek inlets before crossing the Narrows to Curtis Island.

Significantly the pipeline route runs for another 3km through open forest across moderately steep terrain to the site of the LNG Plant.

Visual Sensitivity

The sensitivity of most of the alignment would be low reflecting lack of visibility from sensitive areas. However it may be possible to see part of the forested Hills 347 – 349km as well as Salt flats and mangroves from Curtis Inlet. Certainly the section of pipeline on Curtis Island would be visible from the inlet and this area would be highly sensitive, due to the recreational and tourist significance of Curtis Passage and Graham Creek.

Visual Impact

The visual effect of the pipeline during construction in all areas may be high. However the lasting effects on forested country on Curtis Island and to a lesser extent the coastal hills may have a high visual effect following completion of the construction phase.

The visual impacts in this LCZ would be moderate to low through most of the unit. However there is potential for high visual impacts to be sustained on Curtis Passage Mangroves and on Curtis Island itself, due to the high sensitivity of Curtis Passage and Graham Creek.

Suggested Management Measures for the Zone

- Implement the general Proposed Mitigation Recommendations for pipelines;
- Where practicable retain mangrove and other water side vegetation to prevent view lines along the easement; and

- Revegetation of the easement on Curtis Island with scrub and small tree species that would restore colour values to the easement.

6.15 Cumulative effect of pipelines in common user corridor.

The common user corridor extends approximately 70km back from Curtis Island. The common user corridor is located in landscape character zone 13 – Coal Road to Sneakers Gully and landscape character zone 14 – Sneaker Gully to Curtis Island.

Both of these units are located on the coastal plain, east of the Callide Range.

Construction Phase

It is likely that the higher impact construction phases of the three pipelines will vary so that at any one time construction impacts will be similar as for one line as defined in section 6.13 and 6.15.

The major alteration in the construction phase will occur through forested areas where each pipeline will require separate clearing creating a cleared corridor potentially three times the size of one pipeline, creating major visual effects. This effect is limited to small sections of steep forested country, that are none the less close to sensitive view locations on the Dawson and Bruce Highways.

The visual impact in these locations is potentially high due to the major visual effects close to the sensitive

Operational Phase

In the operational phase the visual effect will be significantly reduced except where the pipelines pass through forested areas. Again the major areas of concern remain the forested locations close to the Dawson and Bruce Highways.

Also of visual concern is the potential proliferation of pipeline signage especially as seen from the sensitive view locations on the highways.

Suggested Management Strategies for common user corridor

- Implement recommended strategies for landscape character zones 13 & 14
- Consider strategies to minimise pipeline signage on the three pipelines
- Evaluate the visual implications of the common user corridor especially near the highway and implement landscape strategies to minimise visibility to sensitive receptor locations, especially the highways.

7.0 MITIGATION

7.1 General

The establishment of project facilities in the Walloons gas fields, processing and transmission from gas wells to the final destination of the LNG Plant require a large number of operations and facility development. Both the operations and the various facilities have potential visual effects. To mitigate these effects a wide range of suggested visual amenity mitigation strategies have been developed to mitigate visual effects and to complement other environmental mitigation strategies.

A range of mitigations pertinent to decreasing the visual effects of production elements in the gas fields as well as the gas transmission pipeline have been defined in various sections above. They are summarised here to illustrate the full range of visual treatments that should be considered to ameliorate visual effects and impacts.

7.2 Suggested Management Measures for Gas Wells

The gas wells are the most numerous element of the CSG Gas extraction and transmission system. These elements would be dotted across the landscape at approximately 750m intervals. Careful consideration of their placement, establishment, visual presentation and at times landscape treatment is important to the overall impression of the project as a whole.

The visual effect of a gas well can be mitigated and significantly reduced by implementing the following visual treatments, where reasonable and practical:

- Carefully plan the location of wells within the viewshed of any residence;
- Attempt to not place a well closer than 300m from a residence;
- If a well is closer than 300m then landscape treatment at the well or at or around the residence would be required to reduce impact;
- Minimise the extent of vegetation clearing to allow for well pad earth works;
- Minimise the amount of cut and fill required to establish the pad consistent with achieving gentle batter slopes for rehabilitation and post operational land use activity;
- Paint all well head elements in colours that minimise colour contrast within the varied landscape settings within which they are placed, taking into consideration predominant land cover as well as patterns established by various land covers in any viewshed;
- Develop a limited palate of appropriate colours for well head elements for use in various landscape settings;
- Minimise construction times for wells, especially close to sensitive receptors;
- Rehabilitate well site areas following establishment of the well, initially with grassing;
- Recreate the pre-construction landscape characteristics of disturbed areas to maximise visual integration;
- For wells that create a high landscape effect consider the preparation of landscape mitigation treatments designed on the basis of proper view analysis; and

- In this context, consider landscape treatment at well sites and or at sensitive receptor viewer location.

7.3 Suggested Management Measures for Gas Processing Facilities

The gas processing facilities are large scale industrial complexes that along with administration buildings can cover a substantial area. Implementation of mitigation strategies will ensure the appropriate screening and integration of the facility into the landscape. The following mitigation strategies are recommended for implementation where reasonable and practical:

- Consistent with use requirements minimise the size of earthworks required to accommodate the gas plant and other facilities;
- In addition to the main pad required for the compressor plant, create separate pads for auxiliary facilities as needed;
- Allow for landscape areas between pads, subject to safety considerations. These areas may support tree cover that would assist in visually integrating development elements;
- Ensure that all lighting is directed inwards and is hooded;
- Carry out detailed visual analysis of the visual catchment of the plant to establish if there are any sensitive receptors within 1500m of plant and establish planting strategies to screen or integrate the plant into the landscape using on site and or at viewer landscape strategies;
- Prepare a landscape planting plan for each gas processing facility and Implement tree planting programmes using recycled water to establish tree belts around and through the various gas plant areas to achieve higher visual integration of plant elements as seen from distant views;
- Consistent with operational and safety needs paint buildings and other plant elements in a colour that would minimise colour contrast with the surrounding landscape, bearing in mind seasonal variation; and
- As needed consider landscape treatment at sensitive receptor viewer location.

7.4 Suggested Management Measures for Water Treatment Facilities

Water treatment facilities consist of two main components: a large scale 'shed' that houses the water treatment facilities and a series of ponds covering several hectares that retain treated water at different levels of treatment. The 'shed' is not unlike large scale sheds that may be found in the rural setting of farms to house large scale farm machinery. The ponds although large in horizontal scale do not project vertically, limiting their potential visual effect. Also the ponds sit low in the landscape and are similar to farm dams often seen in rural landscapes.

Where reasonable and practicable, the following mitigation measures should be considered:

- Locate at least 400m from nearest residence;
- Minimise vegetation clearing outside footprint of building and retention ponds;
- Minimise earth works consistent with achieving gentle batters for rehabilitation purposes;
- Complete a detail visual analysis of the visual catchments of the water treatment facilities to establish if there are any sensitive receptors within the seen area of the plant. If there are any sensitive receptors within 500m prepare a detail landscape plan to screen or integrate plant and pond elements into the landscape;

- Implement a tree planting strategy using recycled water to achieve visual integration; and
- As needed consider landscape treatment at sensitive receptor viewer location.

7.5 Suggested Management Measures for Accommodation Camps

Construction of CSG wells, gas processing facilities, water treatment facilities, gas and water pipelines and the gas transmission pipeline itself would require significant levels of man power on either a short or long term basis. To respond to these needs accommodation camps to cater for 100 – 500 construction staff would be established from time to time as permanent or temporary camps. The following visual impact mitigation strategies should be implemented where reasonable and practical:

- Consistent with operational needs locate accommodation camps further than 800m from sensitive receptors;
- Minimise vegetation clearing and earth works and if needed create multiple terraces rather than create one large cut and fill pad;
- Stockpile top soil and mulch vegetation material for use in rehabilitation works;
- Building modules can be colours that contrast but should be harmonious colours, bright primary colours should be avoided;
- Prepare and implement a landscape plan for the camp that would provide appropriate screening and or integration planting as well as planting to enhance the experience of camp inhabitants;
- As needed consider landscape treatment at sensitive receptor viewer location;
- On decommissioning of the camp remove all buildings and rehabilitate vacated terraces;
- Re-establish vegetation land cover so that it is consistent with surrounding land cover, but in the case of permanent camps consider retention of tree plantings depending on needs of land owner; and
- As appropriate retain landscape plantings.

7.6 Suggested Management Measures for Microwave towers

These facilities would only be required in the short to medium term and until fibre cable can be co-located with pipelines running from wells to gas processing facilities. Where reasonable and practicable the following mitigation strategies should be considered:

- Remove towers and other hardware including cable anchors and blocks as soon as they are no longer required for communication purposes;
- As required restore earth forms so that they do not compromise ongoing land use activities; and
- Restore ground and vegetation cover so that it is consistent with surrounding conditions;

7.7 Suggested Management Measures for CSG Pipelines

Where reasonable and practicable, the following mitigation strategies should be considered:

- Plan pipeline route so as to avoid sensitive landscape areas and close proximity to residences;
- Minimise clearing of vegetation and damage to vegetation adjoining easement;
- Minimise permanent earthworks in terms of cut and fill;

- Store top soil from trenching for use in rehabilitation works;
- Mulch vegetation clearing material for use in rehabilitation;
- Following pipe installation ensure that pipe trench is backfilled with proper compaction techniques to ensure an even ground level is achieved and maintained without slumping;
- Develop appropriate drainage structures to avoid scour of pipeline trench and the;
- Rehabilitate pipeline route to achieve vegetation cover consistent with surrounding areas or in the case of forest, appropriate grass and or shrub cover; and
- Appropriately locate gas pipeline signage as per regulatory requirements.

7.8 Suggested Management Measures for the Main Transmission Pipeline

The main transmission pipeline would cover approximately 450km and may have a high initial visual effect during construction. However this effect would become low in a short period of time if mitigation strategies are implemented. Therefore where reasonable and practicable the following mitigation strategies should be considered:

- Minimise clearing of forest and woodland cover where possible, but especially in the vicinity of sensitive receptors;
- Properly fell trees and clear easements so as to not damage adjoining vegetation;
- Mulch felled material for reuse in easement rehabilitation works;
- Store topsoil correctly to enable its use in rehabilitation works;
- Consider alignment options in locations where the pipeline route passes through forest areas within the viewshed of sensitive receptors, to avoid long views along cleared easements;
- Establish pipe lay-down locations away for sensitive receptors and minimise cut and fill required to receive, store and dispatch pipes;
- Re-establish ground levels and ground cover consistent with surrounding land once lay-down area is no longer required;
- Minimise operational time at sensitive locations such as highway crossings;
- Consider the establishment of shrub/small tree visual barriers adjacent to major roads with plant species 3-5m high to break up long views of signs down cleared easements and along the gas pipeline Right of Way;
- Locate temporary camps outside the view sheds of sensitive receptors such as residences;
- Locate auxiliary facilities, e.g. compressor stations, scrubber inlet /outlet stations, etc , outside the view sheds of sensitive receptors or at least outside the range where a moderate to high visual effect would result;
- Following the laying of pipes ensure that ground levels consistent with surrounding land are achieved;
- Create appropriate drainage structures to ensure that rehabilitation works are not eroded;
- Rehabilitate all areas back to conditions of consistent with surrounding ground cover; and

- In forest areas, where view lines are important, consider the re-establishment of scrub cover to diminish the contrast between the adjoining forest and the easement.

7.9 Suggested Management Measures for water transfer station

Water retention ponds cannot take advantage of natural terrain so that regular shaped ponds have to be created. Where reasonable and practicable the following mitigation strategies should be considered:

- Locate away from sensitive receptors;
- Carry out earthworks to ensure that final land forms aside from the retention ponds grade back into the existing land forms;
- Ensure that protective fencing is appropriately finished and signage co-located; and
- Is viewed from sensitive receptors compete a visual analysis, develop and implement landscape strategies to achieve screening and or visual integration of elements.

7.10 Suggested Management Measures for access roads and trails

Access roads and tracks are one of the most visible signs of the Project but generally have limited visual effect as they are normally part of the rural landscape. Where reasonable and practicable the following mitigation strategies should be considered:

- Where possible co-locate access roads on existing roads and farm tracks;
- Avoid sensitive landscape areas including prominent ridges and other highly visible landscape areas;
- Establish routes and gates in consultation with the land owner;
- Avoid unnessisary clearing for access roads and trails;
- Avoid damage to adjoining vegetation;
- Store topsoil and mulch cleared vegetation for use in rehabilitation;
- Avoid straight line tracks and allow tracks to follow natural terrain minimising width to suit needs;
- Develop track or road to a standard that is appropriate for its level of use;
- Avoid use of non gravelled trails in wet weather;
- Rehabilitate edges of roads and trails to be consistent with surrounding ground cover; and
- Remove the road or track when no longer required.

7.11 Suggested Management Measures for storage and lay down areas

Lay down areas would be need in various parts of the project but especially along gas pipeline routes. These areas for storage of pipes would only be temporary and long term effects should be minimised by implementing where reasonable and practicable the following mitigation strategies:

- Avoid the view sheds of sensitive receptors;
- Select a location that minimises earthworks and vegetation clearing, but perhaps utilises existing vegetation for screening purposes;
- Mulch removed vegetation;

- Minimise earthworks and use of external gravels or pavements;
- Construct appropriate drainage structures to avoid erosion of exposed areas;
- Re-habilitate land to be consistent with surrounding land when decommissioning the lay down area; and
- Rehabilitate vegetation to be consistent with surrounding vegetation cover.

7.12 Suggested Sensitive Receptor Treatments

In exceptional circumstances, it is at times desirable to carry out visual Proposed Mitigation Recommendations at a viewing point in addition to mitigation at the development node or nodes. This can achieve the maximum visual effect benefit in the shortest time. Such situations could include a residence visually effected by a large number of gas wells in a panoramic view or a sensitive highway view point to various development elements. In such a case:

- Complete a visual analysis of the viewshed from the sensitive receptor;
- Prepare landscape strategies to screen or better visually integrate development elements;
- As appropriate develop concept alternatives for review by land owner or viewer; and
- Implement landscape works at receptor location.

8.0 CONCLUSION

8.1 Summary Visual Impacts and Suggested Management Measures for CSG Elements in Gas Fields.

The majority of the project elements are industrial in nature and therefore contrast strongly with the existing rural landscapes within which they are sited. All elements have the potential to create a high visual effect during the construction phase. These effects reduce at the end of the construction phase, however the extent of high or moderate visual effects depends on the scale of the elements.

Elements such as the microwave tower and the gas well are relatively small scale, occupy only small parts of the view and therefore their visual effects decrease over shorter distances than elements such as the gas processing facilities.

In addition to scale considerations, some components borrow visual character from the existing landscape, drastically reducing contrast and visual effect. This is the case with most of the pipelines in the project, the exception being pipelines in forest areas.

The visual impacts of all elements 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 in relation to gas wells and in some cases numerous gas wells.

An analysis of a theoretical gas field indicated that the level of visual effect and impact is defined by the closest gas well and more distant wells are so reduced in scale by distance that their cover in a field of view is very small and of reduced significance. None the less if the visual effect and impact on such a view were considered to be significant, treatments at the wells and or the residence should be designed by a qualified landscape architect and implemented as part of the environmental management plan actions.

It is possible to visually integrate all elements into the landscape, with colour and placement of gas wells being a significant tool in mitigation of impacts. Larger facilities should ideally be situated outside the view sheds of residences. But again, if they are within view sheds of these sensitive receptors, visual effects can be reduced by screening and or visual integration landscape treatments at the facility and or at the point of viewing.

8.2 Summary Visual Impacts and Suggested Management Measures for the Main Transmission Pipeline

The main transmission pipeline covers a distance of approximately 450km across a wide range of landscape settings from the tablelands of south west Queensland, through mountain ranges onto the coastal river systems and along various coastal valleys and plains to subtropical areas of the Queensland mid north coast in the Gladstone Region.

Visual Effects

Most of the terrain covered was gentle to moderate slopes but some steep areas were encountered in small sections of mountain forest. More significant was the vegetation cover as this environmental parameter determines the long term visual impact of pipeline construction. Following construction in grassland or woodland the visual effect is with the exception of immediate foreground low and of no visual significance. However in forest where there is a need to keep easement areas free of trees the visual effect is long lasting and is part of the operational effect of the pipeline. Such effects in highly sensitive locations create a high visual impact.

Visual Sensitivity

The land use along the pipeline route is dominated by agricultural land uses with low sensitivity. However there are sensitive receptors in terms of residences along the route and highway crossings. However these areas of increased visual sensitivity are limited.

Visual Impact

It is inevitable given the level of activity associated with pipeline laying that the visual effect of pipeline laying would be high. In low sensitivity locations, such as agricultural areas the visual impact would be low, reflecting the low sensitivity of that land use. However where such areas occur within the seen area of a residence or a highway a high impact may result, reflecting the sensitivity of those land uses.

Following completion of restoration work, visual effects and impacts can be reduced to low, even for high sensitivity areas. The except to this rule is in forest areas where a 35-40m wide easement would be cleared and maintained in that cleared state during the operational stages of the pipeline delivering gas from the gas fields to the LNG Plant.

In sensitive areas, it is recommended in the Proposed Mitigation Recommendations that in sensitive locations re-establishment of suitable species is undertaken to remove sight lines into the easement and or to carry out plantings with suitable species to reduce the colour contrast between the easement and the surrounding forest.

The most sensitive location along the pipeline route is at the end of the pipeline at the Narrows and on Curtis Island itself. This area is highly significant in terms of recreation and tourist use of the Curtis Island waterway. Treatments of visual effects in this location are important to reduce visual impacts.