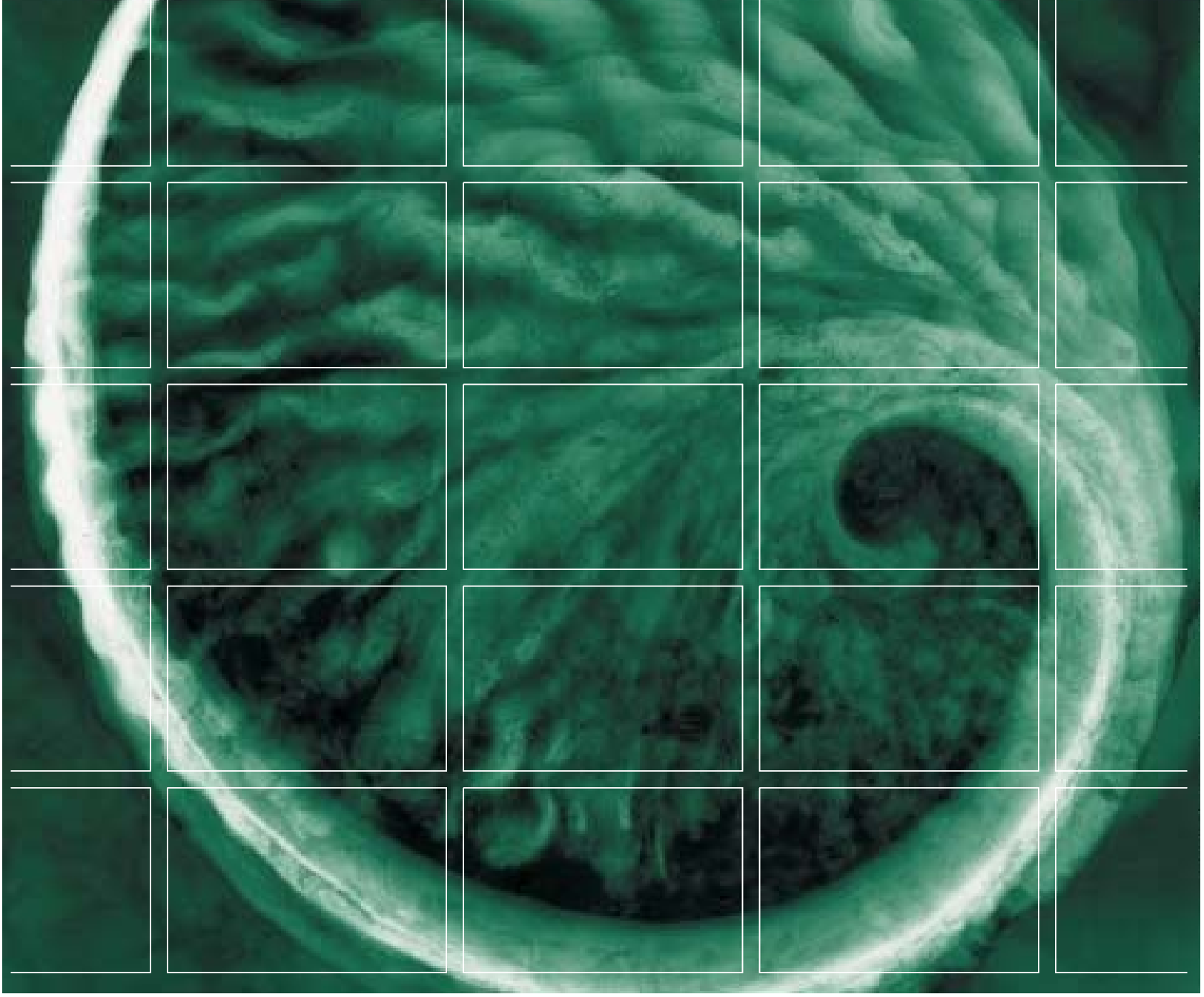

QGC Upstream Components

Landscape & Visual Impact Assessment

for

Queensland Gas Corporation

Completion Date: 20 January 2010

ERM Reference: 0094119

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FINAL REPORT

QGC Upstream Components

Landscape & Visual Impact Assessment

For Queensland Gas Corporation

January 2010

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FINAL REPORT

QGC Upstream Components

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For Queensland Gas Corporation

January 2010

Reference: 0094119_RPT1

For and on behalf of
Environmental Resources Management Australia

Approved by: _____ Allan Wyatt

Signed: _____

Position: _____Partner

Date _____ 20 January 2010

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ANNEXURES

1 INTRODUCTION

BG Group (BG) and Queensland Gas Company (QGC) seek to further develop existing gas fields located in the Surat Basin, Queensland. The upstream components cover the expansion of QGC's existing Coal Seam Gas (CSG) operations in the Surat Basin.

The delivery of this gas to Gladstone via a export pipeline and the proposed LNG plant on Curtis Island is not part of this assessment which examines the Upstream Components of the project.

The Landscape and Visual Impact Assessment (LVIA) is based on the description of the Project within the *QCLNG EIS REFERENCE CASE, 03-11-09.*

1.1 PROJECT OVERVIEW

The Upstream Components of the project include the works on the gas field. The Queensland Gas Company (QGC) currently holds nine Authorities to Prospect (ATP) covering 4,700 km² in the Surat Basin within the boundaries of the Dalby Regional Council. QGC also hold thirteen Petroleum Leases (PL) (including current applications) and four pipeline licences. These are shown in *Figure 1.1*.

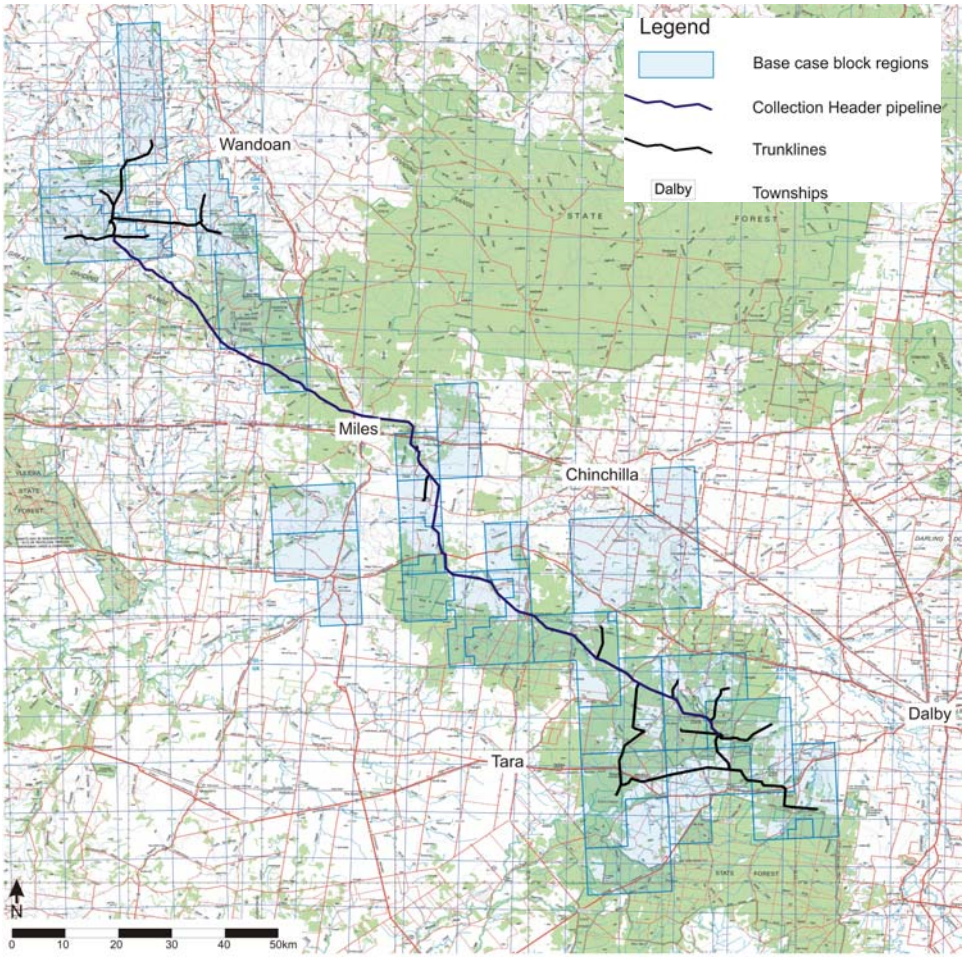


Figure 1.1 Petroleum Leases and Pipeline Licenses (Collection Header Route)

This Landscape and Visual Impact Assessment (LVIA) has been prepared for QGC, to assess the landscape and visual impacts associated with the construction and operation of the

Upstream Components of the Project. The results of this investigation should not be used for any other purpose than that for which it is specifically intended.

The Project has been declared a "Significant Project", for which an Environmental Impact Statement (EIS) will be required and the Terms of Reference for the EIS include considerations that will be examined within this Landscape and Visual Impact Assessment.

1.2 TERMS OF REFERENCE

The *Draft Terms of Reference for an Environmental Impact Statement Queensland Curtis LNG Project (BG – QGC)* include the following sections which are relevant to the preparation of this LVIA.

Description of Environmental Values

This section should describe existing landscape features, panoramas and views that have, or could be expected to have, value to the community whether of local, regional, state-wide, national or international significance. In particular, reference should be made to areas of state significance (scenic coastal landscapes) in the Curtis Coast Regional Coastal Management Plan. Information in the form of maps, sections, elevations and photographs are to be used, particularly where addressing the following issues:

- *major views, viewsheds, existing viewing outlooks, ridgelines and other features contributing to the amenity of the area, including assessment from private residences, Curtis Island National Park, the GBRMP and future transport corridors that service Curtis Island;*
- *identification of elements within the proposal and surrounding area that contribute to their image of the town/city as discussed in the local government strategic plan - city image and townscape objectives and associated maps;*
- *focal points, landmarks (built form or topography), gateways associated with project site and immediate surrounding areas, waterways, and other features contributing to the visual quality of the area and the project site;*
- *character of the local and surrounding areas including character of built form (scale, form, materials and colours) and vegetation (natural and cultural vegetation) directional signage and land use;*
- *identification of the areas of the project that have the capacity to absorb land use changes without detriment to the existing visual quality and landscape character; and*
- *the value of existing vegetation as a visual screen.*

Potential impacts and mitigation methods

This section should also discuss the visual impact of the construction and operation of the Project as it relates to the surrounding landscape on particular panoramas and outlooks.

The assessment should address the local and broader visual impacts of the Project structures. Appropriate simulations to portray the near views and far views of the completed structures and their surroundings from visually sensitive locations should be utilised. The significance of any clearing of vegetation, from a local amenity, landscape and visual perspective should be discussed.

Information should be supplied on the techniques proposed to minimise visual impacts. Special consideration should be given to public roads/ thoroughfares or places of residence, recreation, worship or work which are within the line-of-sight of the Project sites.

Details of the design and colour of any major structures, buildings or fixed plant and proposed screenings either vegetative or material should be described and discussed where relevant to the minimisation of the visual impacts of the Project.

The obstruction of sunlight due to the construction of buildings or alteration of landforms should be considered, as well as major illumination or reflection impacts on adjacent properties or roads.

Existing Light Sources

Determine the existing light sources within the Project site and its immediate surroundings. Of particular interest would be:

- *visual aspect at night in relation to the location of the project in a predominantly rural setting and impacts of the LNG facility on marine usage in Gladstone harbour;*
- *vehicular and rail movements at night within the surrounding area;*
- *impacts on port users in the northern section of the Gladstone harbour, in particular navigation of vessels on the North China Bay precinct; and*
- *Proximity of existing light sources to significant receptor areas such as fauna habitats, residential and business establishments.*

Potential impacts and mitigation methods

An assessment of potential impacts of lighting of the Project and means for mitigation of these projects should be undertaken both during the construction and operational phases, with particular reference to:

- *alterations to visual impact at night;*
- *potential impact of increase in vehicular and rail traffic in the area;*
- *effects of lighting from night operations and maintenance on residents; and*
- *Changed habitat conditions for nocturnal fauna and associated impacts.*

These Terms of Reference mention "*Curtis Island National Park, the GBRMP and future transport corridors that service Curtis Island*" and an assessment of the visual impacts on these locations will be undertaken as part of the LVIA for the pipeline and / or gas plant, neither of which are part of this assessment.

The following Chapter sets out the Methodology proposed to satisfy the requirements of the Terms of Reference.

2 METHODOLOGY

This Chapter outlines the methodology used to determine the visual impacts of the proposed QGC Upstream Components during both the construction and operation phases.

2.1 STEP 1 – PROJECT DESCRIPTION

The first step in any visual assessment must be to describe those elements of the project that may have a visual impact. For the Upstream Components, these will include both above ground infrastructure as well as the visual implications of below ground infrastructure.

This section of the report will describe the above ground components such as central processing plants, field compressor stations, well head infrastructure and overhead transmission lines. Minor above ground components can also be located along the pipelines' easements.

The underground components include pipelines and electrical infrastructure. These underground components are not visible however they are located within easements or construction corridors of varying widths and the visual impact associated with the creation of these occur as a result of clearance to install the underground components as well as the construction operations.

The height and size of these elements can largely determine the extent of their visibility and this extent of visibility is used to determine the study area.

2.2 STEP 2- DEFINE THE STUDY AREA

The study area will include the CSG investigation areas and QC LNG land tenement areas.

However many above ground elements as well as cleared corridors may be visible for some distance beyond the land tenement areas and for this reason the study area has been extended to include the viewshed, which is that area from which components of the project could be visible.

The study area is therefore that area surrounding the investigation and land tenement areas that may be visually impacted by the project.

2.3 STEP 3 – DESCRIPTION OF ENVIRONMENTAL VALUES

The Terms of Reference seek a description of the environmental values within the study area. These are assessed comprehensively within the fauna and flora, geological, geomorphological assessments etc, however within an LVIA the description of environmental values within the study area can be best described by identifying Landscape Units and assessing their sensitivity.

Landscape Units

Landscape Units are based on the physical characteristics of the area such as vegetation, topography and drainage patterns as well as the extent of man-made modifications. Man made modifications can also assist in determining Landscape Units as urban development and farmed areas also affect environmental values.

Focal points, landmarks, gateways and other features that "sign" a recognised location are also discussed.

Landscape Units sensitivity

The sensitivity of the Landscape Units is primarily an assessment of the extent to which the Landscape Units can accommodate further change. As a general principle, the greater the extent of man-made modification that exists within a Landscape Unit the lesser the visual sensitivity will be as a Landscape Unit can usually absorb further change.

2.4 *STEP 4 - ASSESSMENT OF POTENTIAL IMPACTS*

The visual impact of a development is determined by:

- location and extent of the proposed change in the view;
- The degree of modification within the surrounding landscape (sensitivity);
- Viewer numbers;
- Distance to the proposed alteration (where applicable);
- duration of impacts in the construction and operation phases; and
- Reversibility of the change.

Within this LVIA the visual impact is assessed using the following scale of effects.

Negligible effect – little or no change from a viewpoint with low, medium or high sensitivity, i.e., minute level of effect that is barely discernable over ordinary day to day effects. The assessment of a "*negligible*" level of impact is usually based on distance. That is, the Project or its relevant components are at such a distance that, when visible in good weather, it would be a minute element in the view across a man-modified landscape. However sometimes the screening afforded by vegetation can lead to a similar level of assessment.

Low adverse effect – low level of visual impact from a viewpoint with low to medium sensitivity/quality, i.e., adverse effects that are noticeable however, will not cause any significant adverse impacts. If the distance to the Project is great (i.e. towards the edge of the viewshed) then even if the viewer numbers and the landscape sensitivity where high, the overall visual impact would be minor as the Project would only just be visible in the landscape. If viewer numbers are low (i.e. few people can see the Project from the nominated publicly accessible viewpoint) then even if the Project was close to the viewpoint and the landscape sensitivity was high, the overall visual impact would be minor, as the change to the landscape is not seen by many viewers. In a LVIA it is important to differentiate between a "visual impact" and a "landscape impact". Viewer numbers are important in the assessment of a visual impact, for example, if no one sees a particular development then the visual impact is nil, even though there may be a significant change to the landscape and hence a large landscape impact. If landscape sensitivity was low (i.e. within a highly man modified landscape) then even if the Project was in close proximity to the viewpoint and it was visible to a large number of viewers, the overall visual impact would be low. This is, as the viewpoint is not in a landscape of such sensitivity that further change would be unacceptable.

Medium adverse effect – The assessment of a visual effect higher the Low or adverse, will depend on one or more of the assessment criteria being greater that low. That is, sensitivity of the Landscape Unit, distance and viewer numbers.

High or unacceptable adverse effect – The assessment of a "high" or "unacceptable adverse effect" from a publicly accessible viewpoint usually requires the assessment of all three elements, viewer numbers, landscape sensitivity and distance to be high. For example a highly sensitive landscape, viewed by many people, with the development in close proximity would be assessed as having an un-acceptable adverse effect or high visual impact. This assessment is also usually based on the assumption that such a view cannot be mitigated. An example may be a well frequented viewpoint within a national park, with infrastructure located in close proximity to a viewpoint that currently overlooks what would appear as a natural, pristine, un-

modified landscape. Landscape treatment would block this view and even though it would mitigate the view to the infrastructure, such a treatment would be un-acceptable as it would also block the view. This would therefore mean that there were also no landscape mitigation measures available to reduce the visual impact from such locations from a high level of visual impact to low.

2.5 *STEP 5 - MITIGATION MEASURES*

Mitigation measures are also considered. If required they may be appropriate in reducing the visual impact from publicly assessable viewpoints. For example, roadside planting along a section of a highway may significantly reduce the visual impact of the Project or the incorporation of a landscape buffer around the perimeter of a key piece of infrastructure.

2.6 *STEP 6 - IDENTIFICATION OF EXISTING LIGHT SOURCES WITHIN THE VIEWSHED*

In the identification of existing light sources within the viewshed the Terms of Reference discuss sensitive areas such as the Gladstone Harbour and the impacts to sensitive users such as port users in the northern section of the Gladstone Harbour in particular the areas around China Bay, residential and business areas. These are well removed from these upstream works which are the focus of this assessment.

Similarly light impacts on sensitive and significant fauna habitats are not part of this assessment but are discussed in the flora and fauna assessment.

This assessment will identify the existing light sources within the viewshed as well as those proposed as part of this project to clarify the changes to the number and extent of light sources within the viewshed.

2.7 *STEP 7 – LIGHTING MITIGATION MEASURES*

Based on the changes to the number and extent of light sources within the viewshed, this section will discuss mitigation measures that may be appropriate.

3 INFRASTRUCTURE - VISUAL COMPONENTS

The visual components of the project include both the above ground project infrastructure as well as associated clearing associated with the proposed above ground and underground infrastructure. Above ground project infrastructure includes:

- Central Processing Plants (CPP);
- Well Heads;
- Field Compressor Stations (FCS);
- Switching stations;
- Substations;
- Overhead 132kV transmission lines;
- Overhead 33kV transmission lines;
- Water treatment plants (WTP);
- Water storage ponds; and
- Easements for:
    - Access tracks;
    - Pipelines;
    - Trunk lines;
    - Collection header;
    - Gathering lines; and
    - Aboveground and underground transmission lines.

Flares will be located at every CPP, FCS and well heads and rather than describe the frequency and size of flaring events for each of these a description of flares will complete the description of the above ground infrastructure.

During construction, drill rigs and other construction equipment will also be visible. The visual implications of construction activity are discussed in Chapter 4.

3.1 CENTRAL PROCESSING PLANTS

There are up to four Central Processing Plants (CPP's) and will include between 1-3 compressors. The structures that form the Central Processing Plants will be located within an area of approximately 100 m in width by 120 m in length.

Figure 3.1 shows a Central Processing Plant located within the Windibri Camp.

Figure 3.1 Existing Central Processing Plant

The Central Processing Plant located at the Windibri Camp has eight compressors approximately 8.5 m in height, and although these are the most obvious visual element, a TEG unit is also part of a CPP and this unit, although far less visually obvious, it is approximately 14 m in height and approximately two metres diameter.

The proposed CPP's will have 1-3 compressors which will have a larger footprint but will still be approximately 8.5 m in height, however the proposed CPP's will also contain a TEG unit of similar height to the unit at the Windibri Camp.

Lighting

The existing lights that can be seen in *Figure 3.1* are for maintenance only and are controlled via an access panel within the control room and are manually operated. The only permanent lighting associated with the Central Processing Plants is for access to the control room. These well be low level shielded lights and will be similar to that found adjacent to the front door of a farm house.

3.2 *FIELD COMPRESSOR STATIONS*

There will be up to fifty –three Field Compressor Stations (FCS's) installed at various locations. The structures which form the Field Compressor Stations are located within an area of approximately 30 m long by 120 m wide. The tallest permanent structures are the screw compressors and coolers which are approximately 6 m high.

Figure 3.2 shows a Field Compressor Station located adjacent to the Windibri Camp.

Figure 3.2 Existing Field Compressor

There will be at least a single screw compressor at each FCS. However in areas where there is a high yield additional screw compressors are required.

Lighting

In *Figure 3.2* the work lights which are approximately 8.5 m in height are the tallest structures. These lights will not be installed at the working Field Compressor Stations as these lights were installed for construction purposes only. The only permanent lighting associated with the Field Compressor Stations is for the access to the control room. These will be low level shielded lights and will be similar to that found adjacent to the front door of a farm house.

3.3 *WATER TREATMENT PLANTS*

There will be three Water Treatment Plants (WTP's) proposed. The components of a WTP include pre-treatment facilities, reverse osmosis plant, brine concentrator as well as associated

plant and storage. These will be constructed within a cleared area of approximately 4 ha and the tallest element in the WTP's will be approximately 30 m high.

3.4 WELL HEADS

There will be up to 6000 investigation and production well heads spaced approximately 750 m apart. The above-ground or visible infrastructure at these locations may include well head gas separators, well lift pump, flare pits and well head compressor. The gas separator units which are the most visible components at the well sites are approximately 4.0 m in height.

The well heads setback at least 200 m from the closest residential dwellings. At 200 m and beyond, well heads are not a large visually evident element in the boarder landscape. This is illustrated in a later section of this report when discussing the existing well heads visible from *Viewpoint 7 – Noel Robinson Road* (Refer Section *8.2.1*).

During construction, well sites require a cleared hardstand of approximately 100 m x 100 m (1 ha) for the drilling rigs, storage of pipes, site offices and other temporary infrastructure. Once construction is complete, this area can be reduced to approximately 80 m X 60 m (0.48 ha) when the remaining area is rehabilitated. *Figure 3.3* shows a well head within a cleared area immediately after construction and before rehabilitation.

Figure 3.3 Well head

Lighting

No permanent lighting is proposed at the well heads. Because of the absence of night time lighting associated with the Well Heads, there is no night time lighting impact to be assessed, apart from that associated with flaring.

3.5 SUBSTATIONS

Substations will be constructed at each of the FCS's (53 no.) and CPP's (4 no) giving a total of up to fifty-seven substations. The substations will be located within a cleared, fenced enclosure, approximately 100 m X 70 m for a CPP and approximately 60 m x 60 m for a FCS. . The maximum height of the substation components will be 6 m.

Figure 3.4 Substation

Areas of underground cabling and above ground wire that enter or leave the substation will need to be kept clear of vegetation.

3.6 OVERHEAD 132KV TRANSMISSION LINES

There is approximately 50 km of 132kV transmission lines proposed to be constructed within a 50 m wide cleared easement at the following locations:

- 25 km between the Ruby CPP and Jordan CPP;
- 13 km between the Bellavue CPP and the Condamine Power Station; and
- 14 km between Woleebee Creek CPP to a substation operated by a third party.

A 132kV overhead transmission line is shown in *Figure 3.5.*

Figure 3.5 Single pole 132kV transmission line

The tower heights are typically around 37 m with a maximum of approximately 41 m. Trees and landscaping need to be kept a minimum of 20 m horizontally from overhead transmission lines.

3.7 *OVERHEAD 33KV TRANSMISSION LINES*

There may be approximately 500 km of 33kV overhead transmission lines constructed in an easement width of between 55 m– 72 m (when co-located with a gas pipeline easement) and strung on either timber or spun concrete mono poles. The overhead transmission line requires a 20 m wide easement, this easement still needs to be approximately 40 m from a gas pipeline. The height of the poles will be less than 20 m.

Figure 3.6 33kV Overhead Transmission line

Figure 3.6 shows an example of an existing above ground transmission on a timber pole that may not be identical to that proposed within the project description, however will be visually similar in height and scale.

3.8 *UNDERGROUND 33KV TRANSMISSION LINES*

There will be underground transmission lines as part of the project, however as these are not visible, their visual impact is discussed in the section of this report dealing with easements (refer Section *3.11*).

3.9 *WATER TREATMENT PLANTS*

There are 3 Water Treatment Plants (WTP) proposed in the Project. The WTP's may be located at Woleebee Creek CPP, Ruby CPP and 'Kenya Block'.

Each WTP will have a footprint of approximately 500 m x 500 m and some components will be located within a shed approximately 13 m high. The largest component of the WTP's is the brine concentration infrastructure which may be up to 30 m in height. An example of a brine concentrator within a WTP is shown in *Figure 3.7*.

Figure 3.7 A brine concentrator at a WTP

Landscaping can be established around the perimeter of a water treatment plant.

3.10 WATER STORAGE PONDS

There will be up to 135 water storage ponds totalling approximately 665ha in area. These water storage ponds are located within all blocks and will vary in size from small infield ponds to larger regional ponds.

Figure 3.8 shows the eastern edge of an existing water storage pond located within the Windibri Camp.

Figure 3.8 View along pond embankment

The bank of this water storage pond is newly constructed and is lightly scoured by erosion and no vegetation has yet been established on the embankment. This earthen embankment is raw and visible in the landscape, however with vegetation; it would be barely discernable from a distance.

3.11 EASEMENTS

A number of easements will be constructed throughout the viewshed. Easements will contain:

- access tracks;
- gas pipelines;
- water pipelines; and
- electrical lines.

Easements will vary in width and in their visibility. In many instances easements will have underground pipes or electrical lines with little above ground infrastructure that is visible. However, as these easements sometimes run through vegetated areas, there is a visual impact created.

Figure 3.9 shows a gas pipeline under construction. The construction access track can also be seen in the right of this figure.

Figure 3.9 Pipeline construction easement in partially cleared farmland

In this example, the pipeline construction easement is located in a partially cleared area, although some vegetation is visible in the background and there has been minimal vegetation removal required to construct the pipeline easement and associated access track.

Figure 3.10 shows the view looking in the opposite direction *Figure 3.9* and along the same pipeline easement through a vegetated area.

Figure 3.10 Pipeline construction easement in vegetated areas

In this example the pipeline construction easement has been located in a vegetated area. At this location vegetation removal was required to enable the construction of the pipeline easement and access track.

Easements will be located so as to minimise impacts to remnant vegetation where possible. Access tracks will be more prominent where vegetation removal has been required to construct them.

Access tracks

There will be approximately 4500 km of access tracks required for construction and maintenance of the pipeline easements, well heads and associated infrastructure. Access tracks will be approximately 4.0 m wide with a gravel running surface. Where possible, existing roads and farm tracks will be used to limit the construction of new roads and tracks.

Where new access tracks are required to be constructed on private properties, they will be constructed by the QGC in consultation with the respective individual landowners.

Access tracks will be located so as to minimise impacts to remnant vegetation. Where possible, the new tracks will also be constructed to be beneficial for the landowner. Any tracks that are not required after contraction works are complete will be removed and rehabilitated. Once the

access tracks have been constructed and rehabilitated, they will be visually similar to other farm access tracks already found in this area.

Access tracks will be more prominent where vegetation removal has been required to construct them.

Pipelines

There are several types of pipelines which include trunk lines, low pressure gas and water gathering lines and collection headers.

Trunk lines

Trunk line easements will connect the FCS's and the CPP's. There will be approximately 1,615 km of gas and water trunk lines. The trunk lines easements will be between 20-54 m wide.

In some locations, trunk line easements may be shared with power and water. There is anticipated to be approximately 580 km of shared trunk line easements. Where above ground transmission lines are required, the easement may be up to 92 m wide.

Collection Header

There will be approximately 180 km of collection header lines located in easements between 80-160 m in width. The width increases where multiple trunk line and collection lines are located within the one easement.

Gathering lines

There are both water and gas low pressure gathering pipelines in the Project which will run from the wellhead to the water storage ponds. The gas gathering line will run from the wellhead to the FCS. There may be up to 6,200 km of water and a further 6,200 km of gas gathering lines which are sometimes co-located within the same easement.

A total of approximately 9,500 km of easement 15-30 m wide will be required for the combined gas and water gathering lines.

Underground transmission lines

There will be up to 500 km of 33kV underground transmission lines in an easement width of between 20 – 54 m.

Easement rehabilitation

Rehabilitation and reinstatement measures for the areas disturbed throughout the construction of the access track and pipeline easements will occur in consultation with the relevant landholder / owner.

Rehabilitation and reinstatement involves removal of foreign material, surface contouring, and respreading topsoil, respreading vegetation and reseeding. Plant species will be comprise native grass or other approved species. No plant matter is to be removed from the easement, rather it is respread over the easement after construction to assist in both stabilising the ground and re-establishing vegetation regrowth.

Reinstatement of easements will be undertaken in accordance with the Australia Pipeline Industry Association *Code* (APIA). These works will ensure that:

- Topsoil cover is re-established and all land and waterways disturbed by Project activities are returned to a stable condition as soon as possible after construction;

- Land is returned as close as possible to its previous productivity;
- Stable landforms are re-established to original topographic contours;
- Natural drainage patterns are reinstated;
- Erosion control measures (e.g. contour banks, filter strips) are installed in erosion prone areas; and
- Natural regeneration of vegetation will be allowed to occur within these easements, where such regeneration does not interfere with pipeline operations. The areas immediately over the pipeline will be limited to grass only.

The aim is to leave the land such that full rehabilitation can be achieved as follows:

- 40% vegetation cover after 6 months;
- 60% vegetation cover after 12 months; and
- 80% vegetation cover after 18 months.

Landscape mitigation will be a key to minimising the visual impacts for the majority of the easements containing access tracks and pipelines.

3.12 *FLARING*

Flares will be located at every CPP, FCS and wellhead. Flaring events may last between several minutes to three, other than pilot well flaring. The worst case scenario for flaring events will be up to five wells in one area, which may last up to three days. Shorter frequency flaring events may occur approximately twice a year for duration of approximately five minutes up to two hours.

Pilot well flaring may occur at approximately 300 wells over the entire gas field (470,000 ha) for up to six months per well. Pilot wells will typically be at least a kilometre apart.

Flaring at the CPP

Flaring at CPP will be approximately 30 m high. This may occur up to 6 times per annum, at each of the four CPP locations. This duration is expected to be 0.5hours.

Flaring at the FCS

Flaring at FCS will be approximately 15 m high. This may occur up to ten times per year, at each of the 53 FCS locations. This duration is expected to be 0.5hours.

Flaring at the Well Heads

The most common flaring activity will be at the well heads. *Figure 3.11* shows an example of a flare during operation in daylight hours.

Figure 3.11 Typical gas separator and flair in operation

The flare in this example is located approximately 2 m above ground level.

3.13 *EXISTING INFRASTRUCTURE & EASEMENTS*

Existing infrastructure and easements already exist within the areas surrounding the project. It is worthwhile examining these as they illustrate a range of visual impacts and provide a measure of the likely level of visual impact that may occur due to the proposed Upstream Components which will be sited in similar landscape settings.

Infrastructure

There are a number of similar infrastructure components to those proposed for the Upstream Components within the viewshed. These include CPP's, FCS's, transmission towers and other infrastructure.

Figure 3.12 shows the existing Field Compressor Station located at the Windibri Camp.

Figure 3.12 View looking east towards Screw Compressor

It is important to note that although the light poles (which in this case are temporary) break the horizon, that the remainder of this facility sits below the vegetation line in the background. and therefore would be less visible.

Figure 3.13 shows a view to a second Field Compressor Station also at the Windibri Camp. This photograph is taken from a distance of approximately one kilometre to illustrate the relative scale of these facilities against the back drop of existing vegetation..

Figure 3.13 Field Compressor Station – taken from approximately 1.0 km distance

Figure 3.13 shows that visibility of these structures diminishes over distance and that even though the structures are still visible, they comprise a small component of the view and sit below the existing tree canopy.

The Condamine Power Station is located adjacent to the Warrego Highway. The power station is taller than either the Central Processing Plants or the Field Compressor Stations. *Figure 3.14* shows a view of the Condamine Power Station.

Figure 3.14 Condamine Power Station

The Condamine Power Station is a large structure found within the landscape of the Viewshed. It is nestled amongst an area of retained vegetation that assists to filter views to the site from the surrounding landscape. This is demonstrated in *Figure 3.15* which shows a view looking south towards the Condamine Power station from the Warrego Highway and which illustrates that vegetation is sufficient to screen the power station from view..

Figure 3.15 View towards the Condamine Power Station from the Warrego Highway

The Condamine Power Station is larger and, where visible, has a greater visual impact that any of the proposed structures associated with the Upstream Components.

Existing Easements

Some easements were also shown in the previous description (Refer Section 3.10), however the Roma to Brisbane gas pipeline is located within the project area. *Figure 3.16* shows the view looking east along the Roma to Brisbane Gas pipeline easement where it crosses the Montrose Road, approximately 15.0 km west of the township of Kogan.

Figure 3.16 Roma to Brisbane gas pipeline – within a heavily vegetated area

At this location existing vegetation located within the forest to the east has been removed to allow for the construction and maintenance of the gas pipeline. The warning signage posted on the fence line and the access gate highlight the fact that there is a buried gas pipeline at this location. In the absence of such signage, the existing pipeline easement would be visually similar to a farm or forest access track which is not uncommon in the surrounding area.

Figure 3.17 shows the view looking west from the same location where the vegetation is both sparser and less dense than on the opposite side of the road.

Figure 3.17 Roma to Brisbane Gas Pipeline – within less vegetated areas

Looking west, less vegetation appears to have been removed. The pipeline easement is less noticeable than on the opposite side of the road. The gas pipeline is noticeable due to the warning signs posted along the fence bordering the road reserve.

These examples have been included in this project description to provide baseline examples of the visual impact of similar components within this landscape.

4 CONSTRUCTION - VISUAL COMPONENTS

The visual components that are associated with the construction will include:

- The use of construction equipment;
- The construction of temporary camps for workers' accommodation; and
- The construction of borrow pits to win the material necessary for the hard standing areas and construction of the project.

4.1 CONSTRUCTION EQUIPMENT

Construction equipment will be used to clear vegetation and to undertake earthworks and trenches for pipelines, the establishment of lay down and hardstand areas as well as the construction of site compounds and well heads.

Visual impact throughout construction occurs with the use of heavy engineering equipment, deliveries and stockpiling of materials for construction. Construction equipment will include:

- Drill rigs;
- Excavators;
- Scrapers;
- Graders;
- Trenchers;
- Rock cutters;
- Side booms;
- Cranes;
- Forklifts;
- Generators;
- Welders;
- Compressors;
- Water trucks;
- Low loaders; and
- Semi- trailers.

The visual impact associated with construction may be more apparent from elevated viewing locations or across open areas with little or no intervening vegetation. Screening effects of vegetation can be less apparent than when viewed from flatter or forested areas.

There are no landscape techniques that can be employed to mitigate the visual impacts associated with the construction activities however construction management practices can be employed to minimise visual impacts associated with construction works.

4.2 CONSTRUCTION CAMPS

Up to ten construction camps may be required during the construction phase. These camps will be located at each of the four Central Processing Plants and along the collection header. These camps during peak construction may hold up to 4,000 people in total with between 250-1500 people and may be required to be in place and in various locations until January 2014.

The camp accommodation will comprise pre-fabricated units approximately 5 m wide, 3 m high and up to 15 m in length. Although the dimensions of the modules may vary, they are not expected to be over 4.5 m in height.

4.3 BORROW PITS

Up to fifty borrow pits will be located throughout the project area. These may be 2 m deep. Topsoil will be removed to an average stripping depth of 15 – 30 cm. Stockpile areas will be located in bunds with a maximum grade of 1:5 located between publicly accessible locations (e.g. roads) and the proposed borrow pits s that they will act as a visual screen to the activities occurring at the borrow pit.

4.4 *DRILLING*

Drilling of wells will involve clearing the well site of vegetation, levelling the site area and constructing gravel hardstands for drilling rigs, plant and equipment. This work will include the use of earth moving equipment, drill rigs and ancillary equipment. Drilling activity may take place over a two to three week period, at various locations throughout the project area and for the life of the project.

Although this activity may be undertaken throughout the life of the project, they drilling equipment will only be at the one location for a short period of time.

4.5 *EXISTING CONSTRUCTION ACTIVITY*

Construction activity is already occurring in the view shed on permitted pipelines and well heads. The construction of well heads and construction along the various easements are already a common occurrence within the viewshed. *Figure 4.1* shows a pipeline easement currently under construction adjacent to Montrose Road where vegetation appears to have been removed to create the construction easement.

Figure 4.1 A pipeline under construction - Montrose Road looking east

In other areas the vegetation removal can be less. *Figure 4.2* shows the view looking west from the same location, and shows clearly that even locations that are immediately adjacent can have completely varying degrees of vegetation required for removal.

Figure 4.2 A pipeline under construction - Montrose Road looking west

The construction of pipeline easements is more noticeable within vegetated areas where the removal of vegetation creates corridors of cleared land which alter the appearance of a road bordered by forested areas.

However, where the easement is constructed in the cleared farmland and this area is rehabilitated and returned to pasture then the only residual visual impact will be the hazard identification signage. Where an access track is required, this will also be similar to existing farm tracks and will not cause a noticeable change to the landscape.

5 THE VIEWSHED

The area that may potentially be visually affected by a development is called the viewshed. This is not the same as the extent of visibility as it may well be possible to see a development from areas outside the viewshed, but rather it is a delineation of the area from which the visual components of the project could create a recognisable impact within a man-modified landscape. The viewshed for the project is based on the characteristics of human vision. For readers not familiar with the parameters of human vision, these are outlined in Annexure A.

The viewshed for the QGC Upstream components has been calculated when the maximum height of development would take up less than 5% of the vertical field of view (ie. 5% of 10^{O} = 0.5^{O}). This is illustrated in *Figure 5.1*.

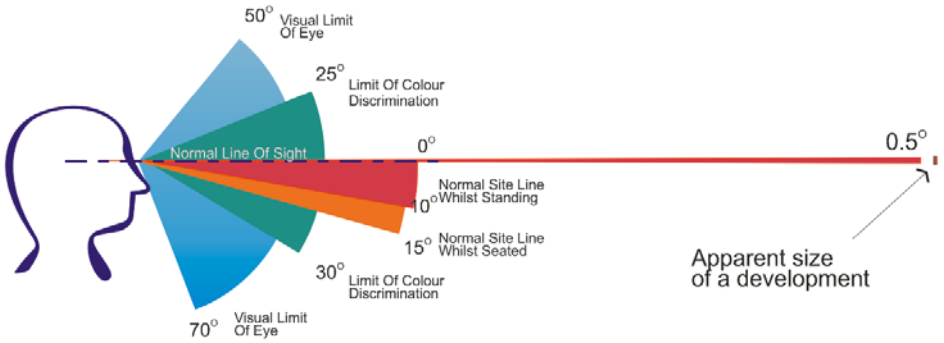


Figure 5.1 A development at the viewshed limit will take up less than 5% of the vertical field of view

It is stressed that this calculation is but a guide in determining the outer limits of a viewshed. Calculations are made more conservative by increasing the height of the development above that specified within the project description.

Zones of visual influence can also be similarly calculated based on these parameters of human vision, taking the most conservative figure of 10^{O} as representing the vertical central field of view.

When an object takes up 50% of the central cone of view (ie. 50% x 10^{O} = 5^{O}), it is considered to be potentially "*dominant*" in the landscape and if visible will be rated as having a **high** level of visual impact. It the development takes up between 25% and 50% of the vertical field of view, if visible it will be considered to have a **medium** level of visual impact. A **low** level of visual impact is given to developments that take up between 5% and 25% of the central field of view.

There are three main visual components of the project, which are:

- the development infrastructure;
- the transmission lines; and
- the above ground or visible components of the pipeline infrastructure.

Each of these will have a different viewshed.

5.1 VIEWSHED OF THE INFRASTRUCTURE

The above ground infrastructure is described in Chapter 3 and the main components and their sizes are:

- Central Processing Plants – 120 m wide x 9 m high for the compressors, although the TEG unit will be 14 m high ;
- Field Compressor Stations – 100 m wide x 5 m high;
- Well heads – 50 m wide x 4 m high; and
- Substations – 300 m wide x 15 m high.
- Water Treatment Plants – 30 m high.

To be conservative, the viewshed for the project has been based on a height of 30 m, which is based on the tallest element (WTP's) within the infrastructure listed above. Given a 30 m high structure in the landscape, the viewshed could extend out to a distance of 3.5 km. A high level of visual impact could occur within 340 m and a medium level could occur between 340 and 680 m.

For infrastructure within the project the viewshed has been calculated conservatively and the Zones of Visual Influence within the viewshed would be as follows:

- 0 – 0.5 km **high** level of visual impact;
- 0.5 –1 km **medium** level of visual impact;
- 1 – 3.5 km **low** level of visual impact; and
- > 3.5 km visually **insignificant**.

Figure 5.2 shows the viewshed of selected infrastructure.

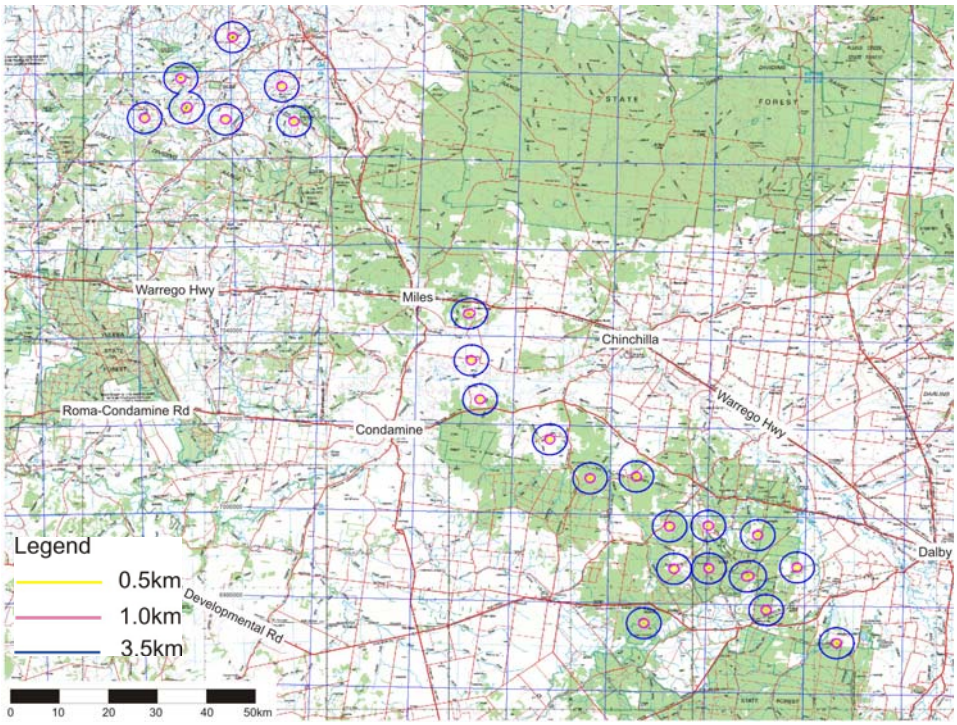


Figure 5.2 The viewshed for the infrastructure (CCP and FCS)

It must be stressed that this is a very conservative assumption and for elements such as the well heads and FCS's which are less than 5 m high, the viewshed and the zones of visual influence would be much less.

For a 5m high object the viewshed would only extend to approximately 500 m, with the zone of **high** visual impact extending only to 30 m, and **medium** level of visual impact being between 30-60 m. Between 60 – 500 m the visual impact of a 5 m high piece of infrastructure would be **low**.

5.2 VIEWSHED OF THE TRANSMISSION LINES

The maximum height of the 132 kV transmission poles is likely to be 41 m; however the viewshed calculations will be based on a height of 50 m. The viewshed and associated zones of visual influence for a transmission tower of this height are:

- 0 – 0.6 km **high** level of visual impact;
- 0.6 – 1.2 km **medium** level of visual impact;
- 1.2 – 6 km **low** level of visual impact; and
- > 6 km visually **insignificant**.

Figure 5.3 shows the viewshed of the proposed 132 kV transmission line.

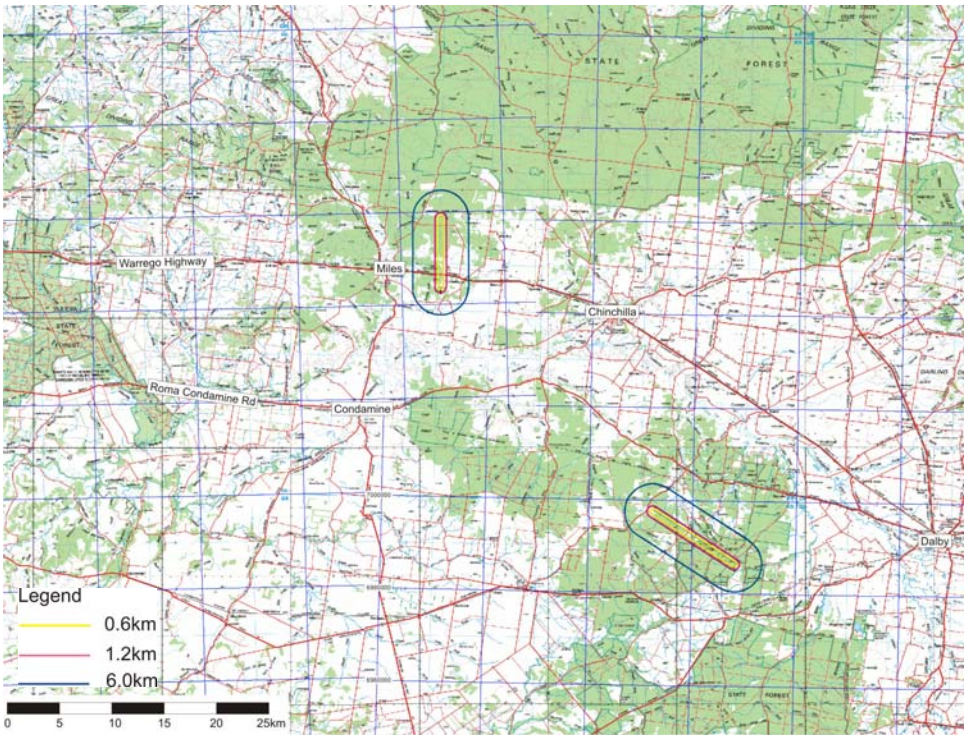


Figure 5.3 The viewshed for the 132 kV transmission line

The two lengths of 132 kV lines and the associated viewshed is shown in *Figure 5.3*. The majority of the above ground electrical transmission lines are 33 kV lines.

The 33kV transmission line would be lower in height, and basing the calculations on a height of 20 m, the viewshed and the associated zones of visual influence for a 33 kV line would be:

- 0 – 0.25 km **high** level of visual impact;
- 0.25 –0.5 km **medium** level of visual impact;
- 0.5 – 2.3 km **low** level of visual impact; and
- > 2.3 km visually **insignificant**.

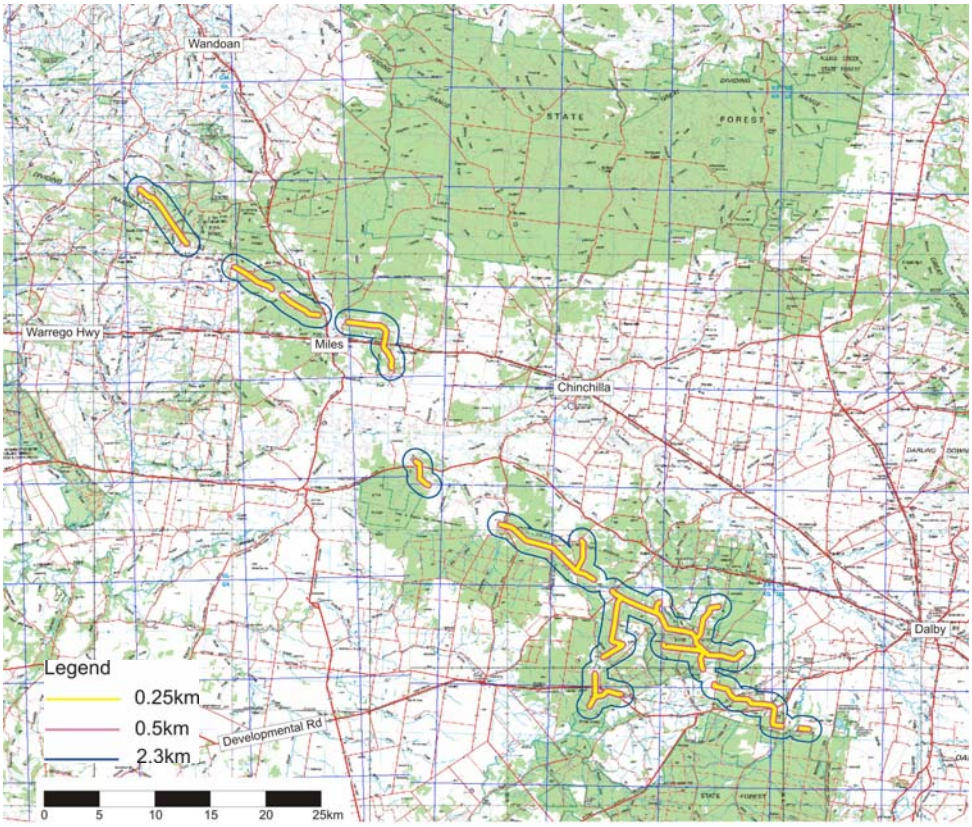


Figure 5.4 The viewshed for the 33kV transmission line

The 33 kV lines in *Figure 5.4* are more extensive than the limited lengths of the 132 kV lines shown in *Figure 5.3*. In some areas the transmission line is co-located within the pipeline easements which are discussed in the following section.

5.3 *VIEWSHED OF THE PIPELINE EASEMENT*

For the pipeline easement there are no direct visual impacts of the pipeline components as these are underground. However the construction of easements to contain the below ground infrastructure may involve the clearance of vegetation. Where this occurs, there can be a visual impact as these corridors of cleared vegetation can be defined by straight lines of vegetation on either side.

Given a cleared easement defined by 20 m high vegetation, the viewshed would extend out to a distance of 2.3 km. For such a viewshed the Zones of Visual Influence within the viewshed would be as follows:

- 0 – 0.25 km **high** level of visual impact;
- 0.25 – 0.5 km **medium** level of visual impact;
- 0.5 – 2.3 km **low** level of visual impact; and
- > 2.3 km visually **insignificant**.

Figure 5.5 shows the pipeline viewshed.

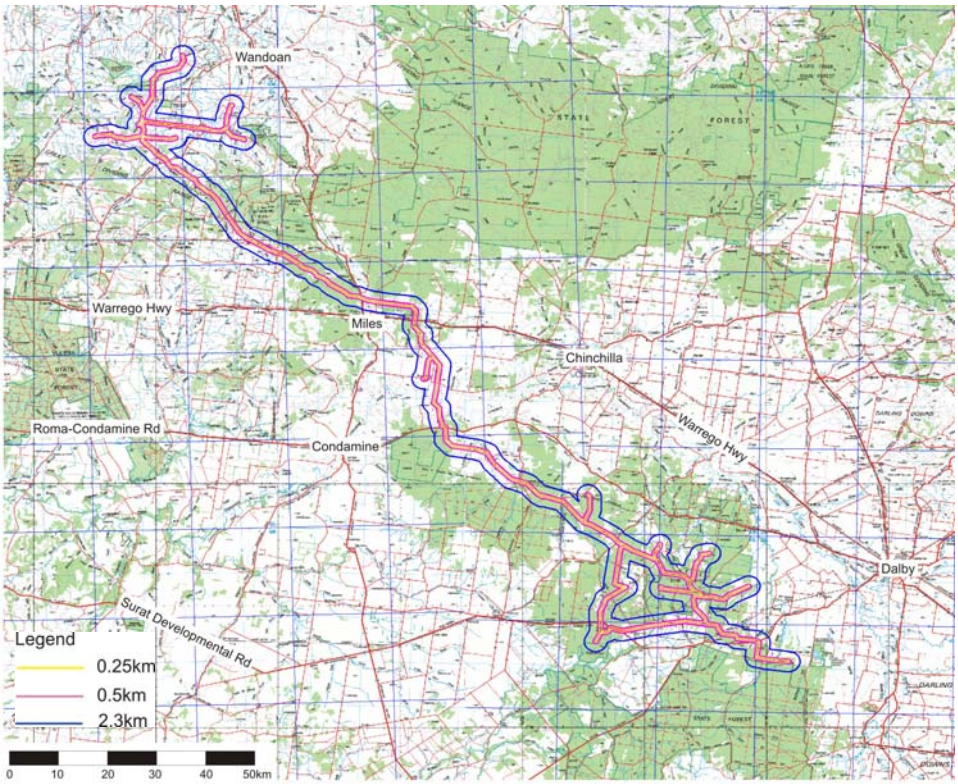


Figure 5.5 The viewshed for the pipeline

The pipeline viewshed aligns with part of the 33 kV transmission line route as shown in *Figure 5.4*.

5.4 OVERALL VIEWSHED OR STUDY AREA

The viewshed or the study area is shown on *Figure 5.6*. To be conservative a zone of 6 km has been drawn around the transmission line easements and a zone of 2.3 km has been drawn around the tenement areas as well as any pipeline routes crossing between these tenements. *Figure 5.6* shows the viewshed of the entire above ground infrastructure combined.

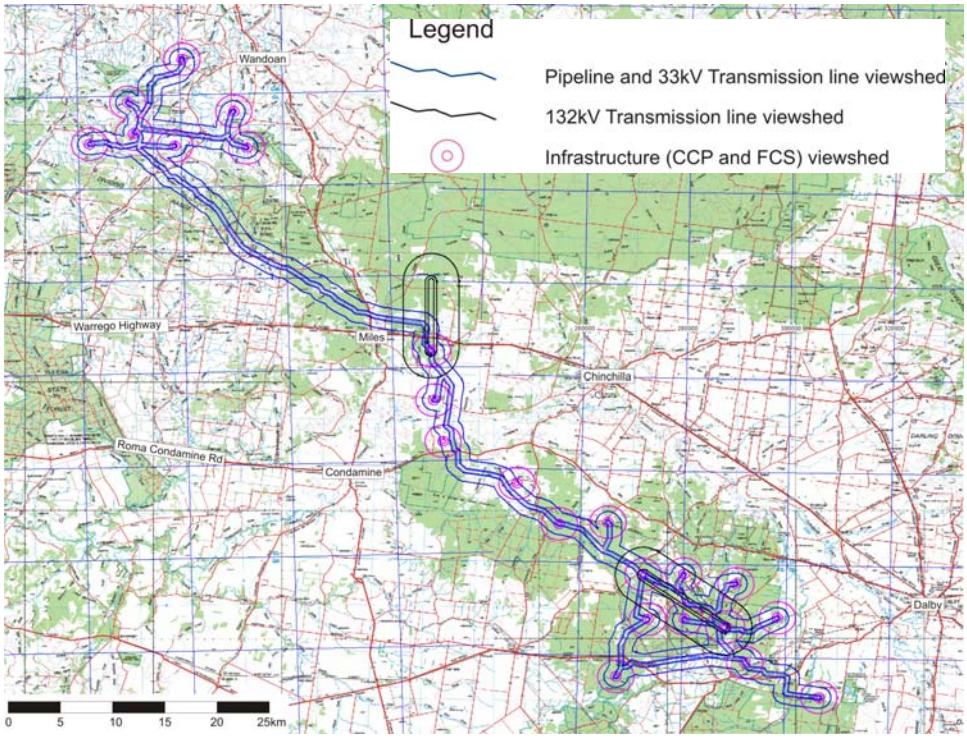


Figure 5.6 Overall project viewshed

Condamine and Miles are two townships that lie near the overall project viewshed. Other towns in the vicinity of the project, such as Chinchilla and Dalby, lie well outside the overall project viewshed.

6 DESCRIPTION OF ENVIRONMENTAL VALUES

A description of the environmental values is used to determine appropriate landscape units which assist in the assessment of the visual impact of the Upstream Components. The environmental values that determine landscape units are:

- Vegetation;
- topography and geological features; and
- land use.

6.1 VEGETATION

The landscape within the viewshed comprises a mix of mad- modified landscapes which are extensively cleared and areas of the landscape that appear undisturbed.

Man modified landscapes are the areas of cleared farm land which may also contain fences, farm access tracks, farm buildings etc. The landscape within the viewshed also has many elements of existing infrastructure such as roads, railways, transmission lines, communication towers, power lines, existing gas pipelines, well heads, processing equipment and power stations.

Other areas appear undisturbed and include areas such as the forested areas within the Braemar State Forest.

The distribution of existing vegetation is shown in *Figure 6.1.* The Project areas are defined by the yellow outline.

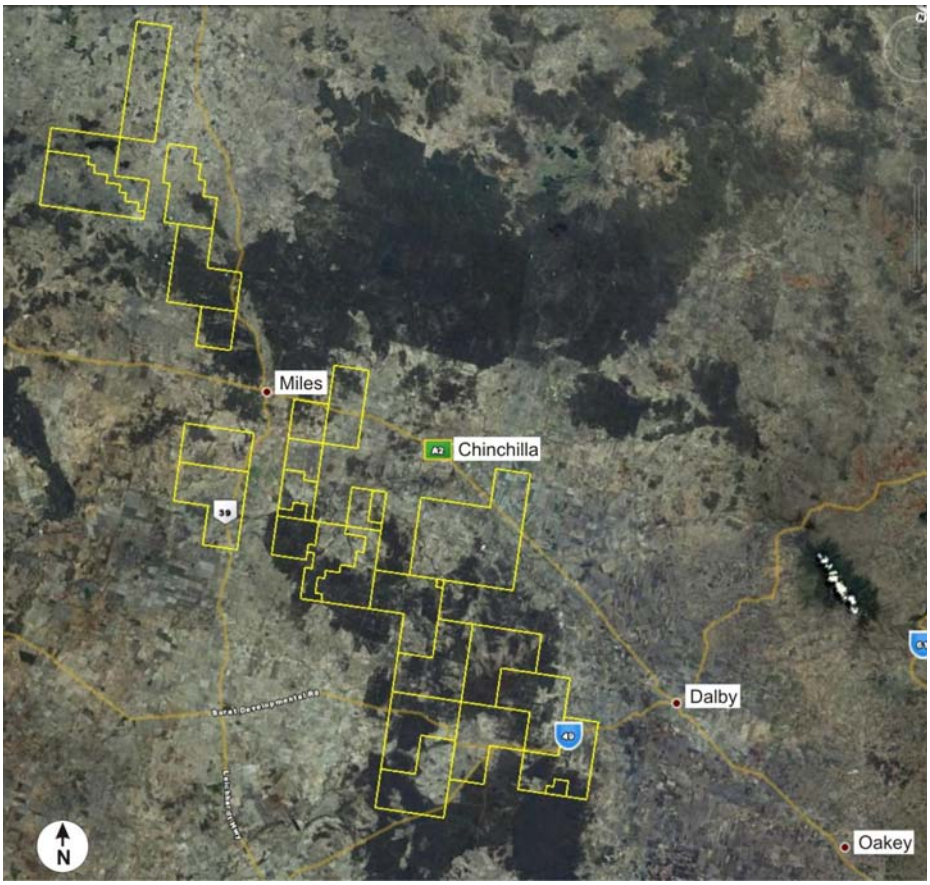


Figure 6.1 *Vegetation within the viewshed*

Areas of higher soil quality associated with alluvium deposits or better quality soils are cleared. In these areas, natural vegetation is limited to linear bands along streams, drainage lines and road sides. *Figure 6.2* shows an example of the shelter belts and boundary plantings that line roads, paddock and property boundaries

Figure 6.2 *Shelter belts and roadside vegetation*

Shelter belts also assist to screen views and are particularly effective in flat landscapes.

6.2 TOPOGRAPHY

The landscape within the viewshed and in the surrounding areas is predominantly flat. Most of the viewshed lies between 300 and 350 AHD.

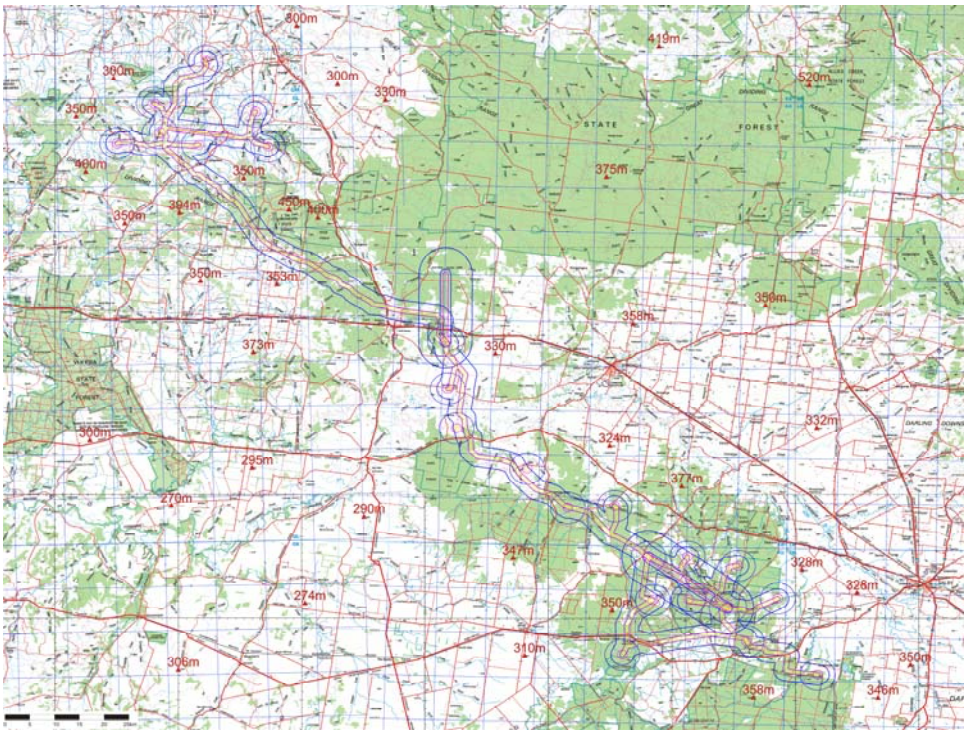


Figure 6.3 ***Topography***

There are limited areas that are higher with low hills reaching 390AHD and 400AHD towards the north-western land tenements. However these low hills are only 40-50 m above the surrounding plain.

Viewing outlooks and ridgelines

The Terms of Reference seek to identify "*major views, viewsheds, existing viewing outlooks, ridgelines and other features contributing to the amenity of the area*".

These viewing outlooks are a result of topographical variation and as seen in *Figure 6.3* there are no prominent topographical variations within the viewshed and no prominent elevated locations or lookouts were identified within the viewshed.

6.3 TOWNSHIPS AND SETTLEMENT AREAS

Townships and settlement areas are urban areas that may have low environmental values, but are undoubtedly the focus for many of the local community. These urban areas are shown on *Figure 6.4* .

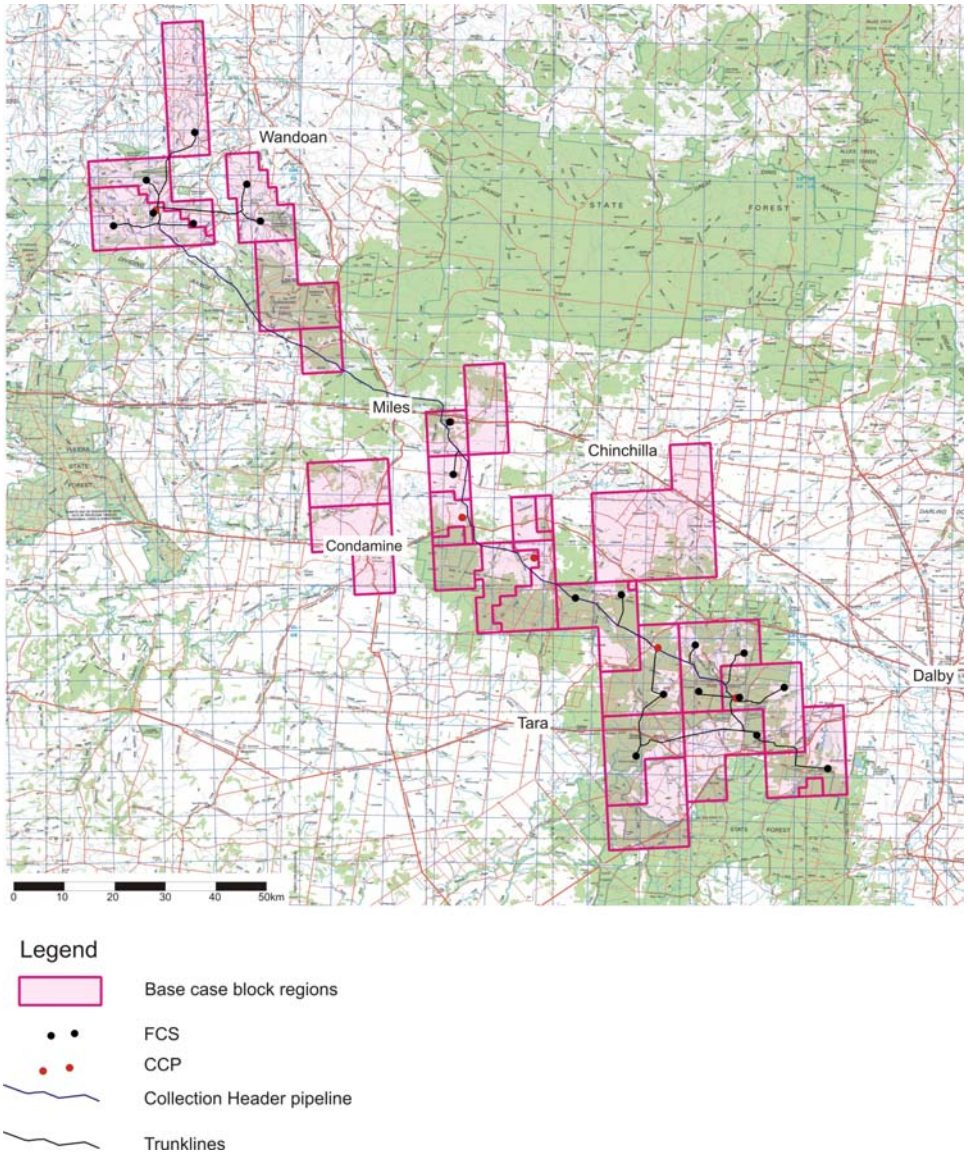


Figure 6.4 Townships

Condamine lies within the viewshed, whilst Chinchilla and Miles lie near the viewshed or within the "Base case block regions" shown in *Figure 6.4*; however there are several rural townships that are located close to the viewshed or to these regions and these are:

- Tara to the south;
- Dalby to the east; and
- Wandoan (to the north).

7 LANDSCAPE UNITS

Based on an analysis of the of preceding environmental values, particularly the vegetation, topography and man made elements, four landscape units s are used to assess the visual impact of the Upstream Components. These are:

- Landscape Unit 1 - Flat farmland;
- Landscape Unit 2 - Hilly farmland;
- Landscape Unit 3 – Forested areas; and
- Landscape Unit 4 - Rural townships.

The following provides a description of the landscape units that have been identified in the viewshed. They are as follows:

7.1 LANDSCAPE UNIT 1 – FLAT FARMLAND

"Landscape Unit 1 – Flat farmland" is the most common landscape unit within the viewshed. *Figure 7.1* shows an illustrative view of this landscape unit.

Figure 7.1 Landscape Unit 1 – Flat farmland

This landscape unit describes those areas of cleared paddocks, that may contain trees and other smaller vegetation along paddock or property boundaries and drainage lines.

The Flat farmland landscape unit also contains many man-made elements including the road and rail network, electrical infrastructure, farm buildings and fences.

7.2 LANDSCAPE UNIT 2 – HILLY FARMLAND

"Landscape Unit 2 – Hilly farmland" describes area of cleared hills used for agricultural practices. Landscapes of this type are usually limited to the north-western areas of the viewshed and those areas close to the Great Dividing Range.

Figure 7.2 Landscape Unit 2 – "Hilly Farmland"

As the landscape within the viewshed is generally quite flat, there are few locations in the viewshed where this landscape unit is evident and these lie in the north west corner of the project.

7.3 LANDSCAPE UNIT 3 – FORESTED AREAS

"Landscape Unit 3 – Forested areas" occur primarily in State Forests, State Parks, Regional Parks and local reserves. These areas include the Braemar State Forest, the Daandine State Forest, the Weranga State Forest, the Condamine State Forest, the Gurulmundie State Forest, the Hincheley State Forest, and the Mt Organ State Forest.

Figure 7.3 shows a view within the Braemar State Forest which shows the tall dense vegetation lining the roads.

Figure 7.3 Landscape Unit 3 – Forested areas

Views, even from cleared roads within these forested areas, are constrained by existing vegetation to linear strips through the forest. From within the forest, roads and other forms of man made modification are quickly screened as a viewer moves away from the clearing.

7.4 LANDSCAPE UNIT 4 – RURAL TOWNSHIPS

"Landscape Unit 4 – Rural townships" defines those urban areas that are located within the viewshed.

Figure 7.4 Landscape Unit 4 – Rural townships

As mentioned previously Condamine lies within the viewshed, whilst Chinchilla and Miles lie near the viewshed or within the "Base case block regions" shown in *Figure 6.4*; however although there are several additional rural townships that are located relatively close to the overall project viewshed they are not impacted visually by the project.

7.5 LANDSCAPE SENSITIVITY

Landscape sensitivity can be defined as the ability of a landscape to absorb visual change, and its visual influence thereof on the viewers. While change is an integral part of any landscape, development and infrastructure are significantly different to the natural processes that occur in a landscape. The sensitivity of viewers to change in the previously described landscape units will depend upon a number of factors, such as:

- **Location.** The sensitivity of a potential viewer varies according to location. For example, visitors to a National or State Park where the landscape appears untouched or pristine will be more sensitive to the imposition of new or artificial elements within that landscape. The same viewer travelling along a rural highway, which contains existing examples of modifications and artificial elements, will be less sensitive to the presence of new elements. Modifications or artificial elements are not confined to vertical structures or built form, they also include removal of native vegetation, visibility of roads, tracks, fences and other rural infrastructure all of which decrease the sensitivity of a landscape to further change.
- **The rarity of a particular landscape.** Landscapes that are considered rare or threatened are valued more highly by a particular community with an attachment to the particular landscape.

The scenic qualities of a particular landscape. Landscapes that are considered scenic as a result of dramatic topographical changes, the presence of water, coastlines, etc, may be extensive, however viewers have greater sensitivity to alterations within these scenic landscapes. As discussed above, the presence of modifications or artificial elements including built form, roads, tracks, fences, silos and rail as well as farming practices including land clearing, cropping and burning, all decrease the sensitivity of a landscape's scenic qualities.

The pre-European landscape of the area surrounding the proposed development has been heavily modified through agricultural practices that have included the clearing of native vegetation for cropping and grazing. The resultant cleared landscape is interspersed with

agricultural buildings including farmhouses, outbuildings, sheds, stockyards, access roads, silos as well as road and rail networks. Associated with these structures are plantings along roadsides or as shelter belts. This Landscape Unit is not rare, nor is it high in scenic quality and for these reasons the landscape sensitivity is considered to be low. However, it must be recognised that some people value the appearance of cleared farmland with minimal signs of built form such as houses and farm sheds. For these viewers change may be perceived as a high visual impact due to the presence of large-scale structures in a rural landscape.

Servicing the rural areas are settlements, which in the larger townships also include commercial and public buildings as well as recreational areas. These rural townships are not uncommon, nor are the scenic qualities particularly high as they often contain many forms of infrastructure and development. However given the concentration of housing, which is a sensitive land use these have been given a medium sensitivity rating.

*Table 7.1*rates the sensitivity of the various landscape units within the viewshed of the Project. These have been based on the analysis discussed of this report.

Table 7.1 Landscape Sensitivity

Landscape Unit	Sensitivity
Landscape Unit 1 – Flat farmland	Low This unit is highly modified, contains visible infrastructure, is not topographically dramatic and does not contain large areas of water.
Landscape Unit 2 – Hilly farmland	Low This unit is highly modified, contains visible infrastructure, is not topographically dramatic however is varying and does not contain large areas of water.
Landscape Unit 3 – Forested areas	Medium to High This landscape is attractive represents increasingly rare areas of vegetation that appear natural or are representative of a pre-European landscape. A high sensitivity would be given to forested areas visible from major roads and lookouts, while a medium level of sensitivity would apply to viewpoints on lesser used roads and forest tracks.
Landscape Unit 4 – Rural townships	Medium The concentration of houses increases the visual sensitivity of this Landscape Unit.

The following section will look at some indicative viewpoints within the viewshed to explore the visual impact of the proposed Upstream Components on these landscape units..

8 ASSESSMENT OF POTENTIAL IMPACTS FROM PUBLICLY ACCESSIBLE VIEWPOINTS

This selection of viewpoints seeks to provide representative views from publicly accessible areas within the viewshed. The locations of these viewpoints (WP01 – WP18) are shown on *Figure 8.1* in yellow and the overall project viewshed is outlined in blue.

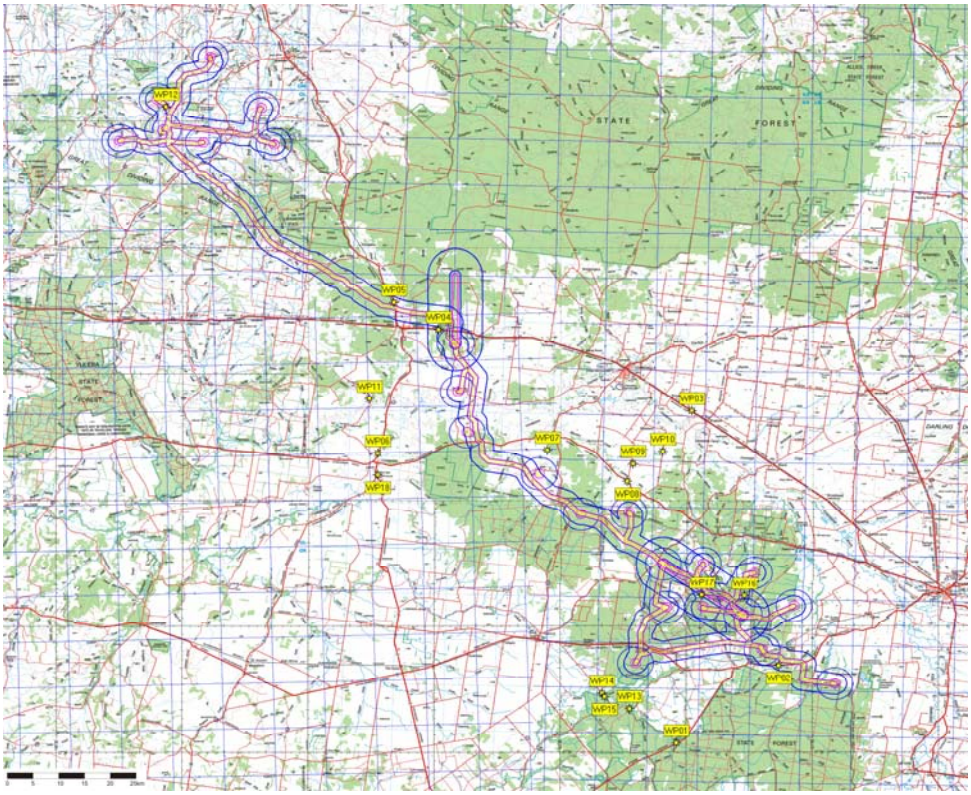


Figure 8.1 *Viewpoint Locations*

The following sections examine the potential visual impact of the proposed development on each of these viewpoints from publicly accessible locations. To assist in deriving a level of impact and appropriate measures to reduce that visual impact these viewpoints have been grouped in the following categories, which are:

- On main highways;
- On made and un-made roads
- From within forest areas;
- From visitor / community centres

The location of each viewpoint is set out in *Table 8.1*.

Table 8.1 Viewpoints

Highway viewpoints

VP1 Moonee Highway #1
VP2 Moonee Highway #2
VP3 Warrego Highway #1
VP4 Warrego Highway #2
VP5 Leichardt Highway #1
VP6 Leichardt Highway #2

Viewpoints on roads and tracks

VP7 Noel Robinson Road
VP8 Condamine – Chinchilla Kogan Road
VP9 Kummerow Road
VP10 16 Mile Hall Road
VP11 Kentara Road
VP12 un-named road

Viewpoints from within forested areas

VP13 Marmadua State Forest #1
VP14 Marmadua State Forest #2
VP15 Marmadua State Forest #3
VP16 Bremar State Forest #1
VP17 Bremar State Forest #2

Viewpoints from visitor community centres

VP18 Condamine Sporting and Recreation Centre

Each of these viewpoints is discussed in the following sections. The potential visual impacts on residential properties will be discussed in the following chapter (Chapter 9).

For each of these viewpoints the viewsheds of the nearest structures or facilities are also shown. Refer to Chapter 5 for a description and a map of each of the viewsheds shown in the Viewpoint maps.

8.1 VIEWPOINTS FROM LOCATIONS ALONG HIGHWAYS

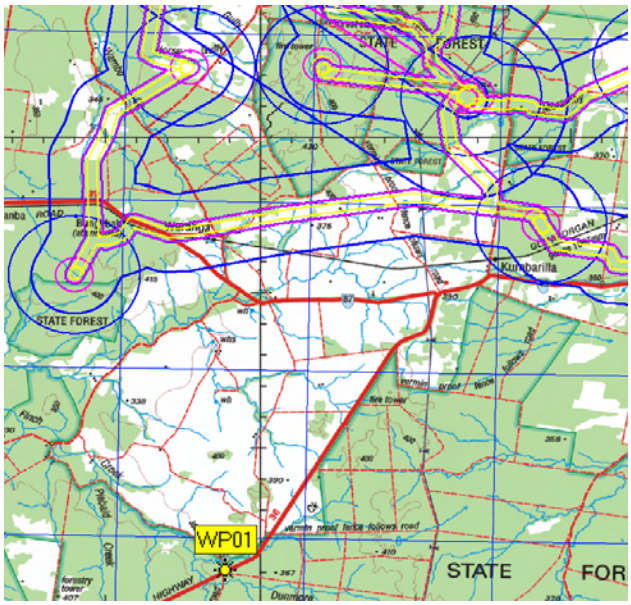
Viewpoints along Highways are important as the larger number of viewers mean that these are locations from which the Upstream Components will potentially be seen by the greatest number of people. For this reason the majority of viewpoints are located in and around the southern tenements where major roads are more common.

8.1.1 *Viewpoint 01– Moonie Highway #1*

Viewpoint 01 is located on the Moonie Highway. The Moonie Highway runs between St George, approximately 230 km to the south-west and Dalby which is approximately 62 km to the north-east.

The Moonie Highway is one of the few major roads that run through the southern portion of the land tenements.

The Braemar State Forest is located on both sides of the Moonie Highway and therefore this viewpoint is located within "Landscape Unit 3 – Forested areas".



VP01 (GPS 56J 275814.9, 6958031.6)

"Landscape Unit 3 – Forested areas". has a medium to high sensitivity to visual change and in this location adjacent to the Highway the landscape sensitivity would be rated as **high**.. *Figure 8.2* shows the view looking north east along the Moonie Highway.

Figure 8.2 North- east along the Moonie Highway

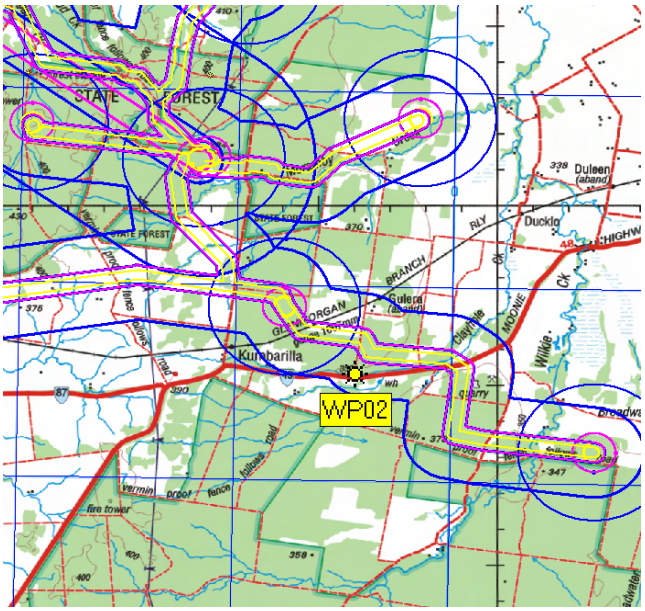
The Moonie Highway is a single lane two-way sealed road within a wide road reserve. The vegetation found within the Braemar State Forest restricts views across the countryside. Views into the forest itself are restricted to approximately 15-20 m.

8.1.2 *Viewpoint 02 – Moonie Highway #2*

Viewpoint 02 is located on the Moonie Highway near its intersection with Gulera Road

The Moonie Highway runs between St. George, 230 km to the south-west, and Dalby, which is 62 km to the north-east.

The most visible landscape unit at this location is "Landscape Unit 3 – Forested areas". The Braemar State Forest is located on both sides of the Moonie Highway at this location.



VP02 (GPS 56J 370320, 572948)

The proposed gas pipeline that connects to the south eastern edge of the land tenements crosses the highway at this location. *Figure 8.3* shows the view looking east from this location along the Moonie Highway

Figure 8.3 Moonie Highway looking east

The Moonie Highway is a single lane, two-way sealed road within a wide road reserve. The vegetation found within the Braemar State Forest at this location confines views to the Moonie Highway Road reserve. Views sideways into the forest are restricted to approximately 15 - 20 m.

Figure 8.4 shows the view looking south-east from the Moonie Highway along the proposed Collection Header pipeline. The proposed pipeline will cross the Moonie Highway close to the farm entrance seen in the centre of *Figure 8.4*.

Figure 8.4 View looking south- east from the Moonie Highway

The vegetation found within the Moonie Highway Road reserve and on private lots restricts views to within the road reserve.

The proposed Collection Header pipeline will cross the Moonie Highway at this location. The pipeline easement may be noticeable throughout construction due to the presence of construction activity and equipment. However due to the presence of existing infrastructure and roads; the proposed pipeline would be barely distinguishable in this landscape. Because the pipeline will cross at right angles to the highway, when travelling at approximately 100 km per hour there will be limited viewing opportunity of the pipeline easement.

The existing vegetation located on both sides of the Moonie Highway will restrict the visibility of the pipeline to a short distance when travelling along the highway.

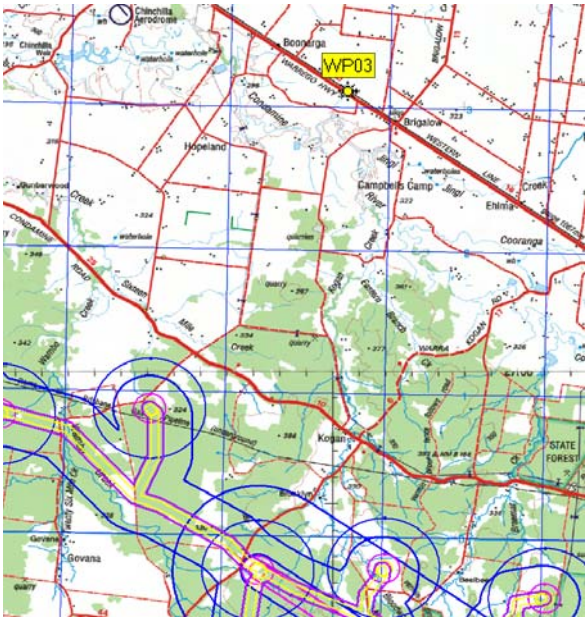
8.1.3 *Viewpoint 03 – Warrego Highway #1*

Viewpoint 03 is located on the Warrego Highway. The Warrego Highway is a two-way sealed road and runs between Dalby to the south-east and Chinchilla 16 km to the north-west.

The Western Line Railway parallels the northern side of the highway in this location.

"Landscape Unit 1 - Flat Farmland" is the most visible landscape unit at this location.

Figure 8.5 shows the view looking south from this location.



VP03 (GPS 56J 277374.6, 7031107.0)

Figure 8.5 View looking south from the Warrego Highway

The Condamine River is also approximately 1.0 km to the south and is behind the stand of trees seen on the horizon of *Figure 8.5*.

Figure 8.6 shows the view looking north-west along the Warrego Highway in the direction of the township of Chinchilla which is 15 km from this location. The Western Railway Line runs along the northern side of the highway in this location and can also been seen in the background of this figure. There are overhead powerlines on both sides of the highway at this location which can be seen in *Figure 8.6*.

Figure 8.6 View looking west along the Warrego Highway

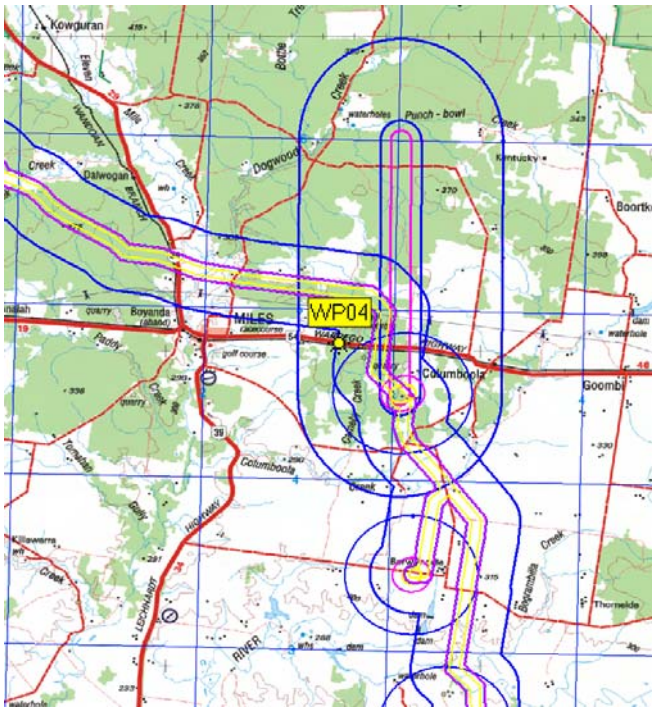
The Warrego Highway has a wide road easement at this location, set within a flat landscape that contains vegetation within both the road reserves and adjoining paddocks. Views to the surrounding landscape from the highway often include infrastructure such as overhead powerlines, railway lines, roads, farm buildings and equipment as well as fence lines.

8.1.4 *Viewpoint 04 – Warrego Highway #2*

Viewpoint 04 is located on the Warrego Highway, approximately 6.5 km east of the township of Miles within "Landscape Unit 3 – Forested areas" which would have a high sensitivity rating due to the high number of viewers.

Viewpoint 04 is where the a pipeline is proposed to cross the Warrego Highway. This pipeline connects the gas fields to the proposed LNG Plant on Curtis Island.

Figure 8.7 shows the view looking south-west from this location where the proposed export pipeline will cross the Warrego Highway.



VP04 (GPS 56J 227123.1, 7047978.7)

Figure 8.7 View looking South-West from the Warrego Highway

Figure 8.7 shows that the landscape to the south of this location is predominantly flat and contains established vegetation. This vegetation restricts views from the highway.

Figure 8.8 shows the view looking north-west from this same location on the Warrego Highway.

Figure 8.8 View looking North-West from the Warrego Highway

Even though there are potentially high viewer numbers and the surrounding landscape has a high sensitivity rating, the vegetation found in the road reserves will limit visibility of the proposed pipeline easement.

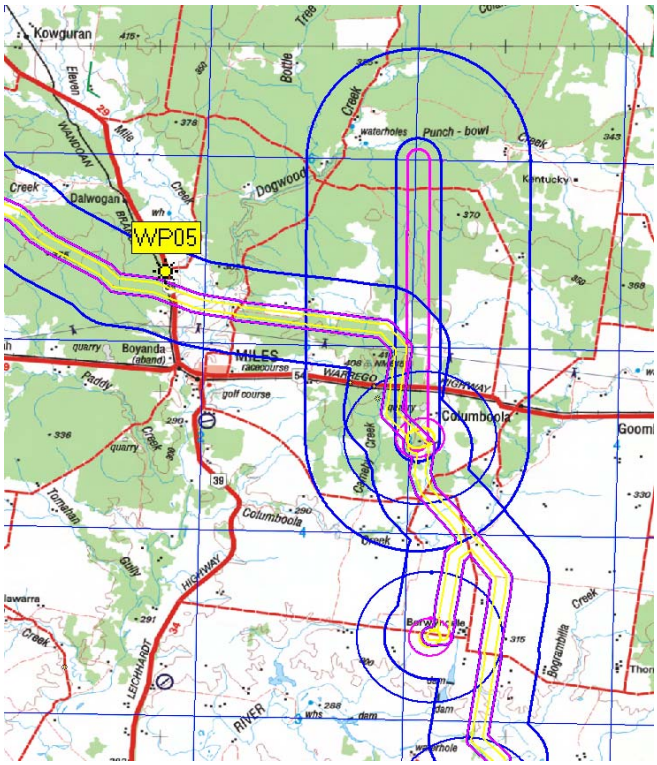
The Previous viewpoints have also demonstrated that, once the pipeline easement is rehabilitated, the pipeline easement will be visually similar a farm access track that are not uncommon in the surrounding landscape.

8.1.5 *Viewpoint 05 - Leichardt Highway #1*

Viewpoint 05 is located at the intersection of the Leichardt Highway and Myall Park Drive approximately 5.0 km north of the township of Miles.

The Highway runs through "Landscape Unit 3 – Forested areas" which would have a high sensitivity rating due to the high number of viewers.

This viewpoint is near the location where the proposed Collection Header pipeline crosses the Leichardt Highway.



VP05 (GPS 56J 218124.5, 7053745.6)

Figure 8.9 shows the view looking north along the Leichardt Highway.

Figure 8.9 View looking north along the Leichardt Highway

There are extensive areas of vegetation located on either side of the road. This vegetation confines views to the road reserve and limits views to the surrounding landscape.

Figure 8.10 shows the view looking east along Myall Park Road which is a local un-made road which runs off the Leichardt Highway.

Figure 8.10 View looking east along Myall Park Road

Myall Park Road runs in a wide road reserve and is typical of the roads that run off the Leichardt Highway. A curve in the road limits long views down the road reserve.

Because the pipeline will also cross at right angles to the highway, there will be limited viewing opportunities along the pipeline easement, however the treatment of Mayall Park Road with a curve or a dogleg limits long views and could be a design response at this Highway crossing.

8.1.6 *Viewpoint 06 - Leichardt Highway #2*

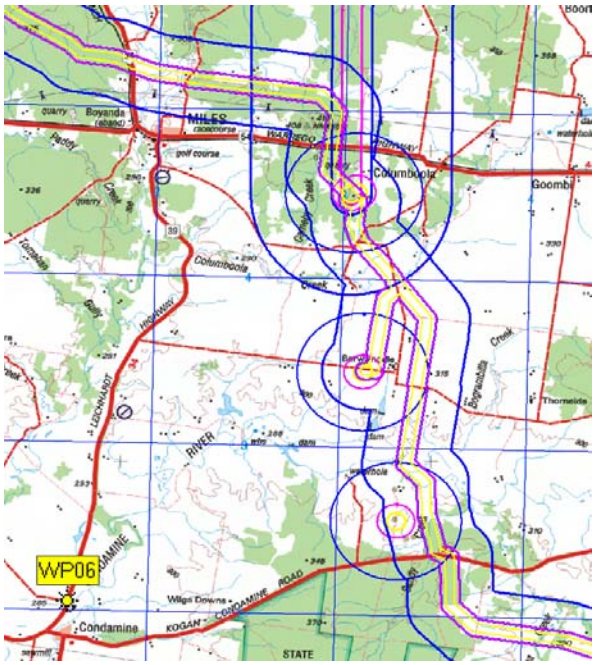
Viewpoint 06 is located at the intersection of the Leichardt Highway and Henry Road, approximately 2 km north of the township of Condamine.

The Leichardt Highway is a two-way sealed Road that runs in a north- south direction.

Henry Road is a no-through road that truncates approximately 5.0 km to the north-west of this location.

Landscape Unit 1 - Flat Farmland is the most visible landscape unit at this location.

Figure 8.11 shows the view looking north along the Leichardt highway from this location.



VP06 (GPS 56J 215767.2, 7020503.4)

The Leichardt Highway comprises a wide road reserve at this location containing many trees and shrubs of varying stages of maturity, as seen in *Figure 8.11*. Existing infrastructure such as the power lines visible in this Figure, are also common.

The roadside vegetation does assist in filtering views from the Leichardt Highway to the surrounding landscape.

Figure 8.11 View looking north along the Leichardt Highway

However as the surrounding landscape is predominantly flat and has been cleared for farming there will be unimpeded views across the landscape to the Upstream Components. However these views can change dramatically as a viewer moved away from the Leichardt Highway on the various local roads..

Figure 8.12 shows the view looking west along Henry Road. Henry Road is also a wide road, and is used for local access only and terminates approximately 5.0km west of this location.

However there are also extensive areas of vegetation of varying stages of maturity found in the road reserve of Henry Road.

Figure 8.12 View looking west along Henry Road

The potential visual impacts on these local roads is discussed in greater detail in the next section, however it is important to acknowledge that the views into the landscape may differ radically once a viewer leaves the main highways.

8.1.7 Summary assessment of views from Highways

The landscapes along the Highways which run through the viewshed have sometimes been extensively cleared for agricultural practices. Being highly modified already, this landscape has low sensitivity to further visual change. Views from this location also take in roads, fence lines and associated rural infrastructure including sheds, silos, machinery and equipment.

However in many instances the Highways are already lined with mature bands of vegetation. Basing an assessment on aerial photographs shows that between 35 – 50% of the highway edges are well vegetated.

In these areas the vegetation will easily screen views of the infrastructure as can be seen in the screening of the Condamine Power Station from locations along the Warrego Highway (Refer *Figure 3.15*) and therefore the visual impact of project infrastructure would be Low – **Negligible**. If infrastructure was visible from the highway then given the number of viewers the visual impact would be assessed as **Medium**. Well heads are reasonably smaller pieces of infrastructure and their visual impact would be less, and the visual impact of well heads would be assessed as **Low**.

The visual impact of easements seen from the Highways would differ in the extent to which they appeared as another local road. As discussed in Viewpoint 5 and Viewpoint 6, local roads such as Myall Park Road and Henry Road are common occurrences along the Highways. If the proposed easement is of a similar width to local roads, say between 15-30 m in width, then the visual impact would be **Low** as these would appear similar to many other roads that cross or intersect with the Highway and which have involved clearing of vegetation. However if the easement width is in excess of 30 m, then this will create a large and unusual visual corridor across the Highway and the visual impact would be assessed as **Medium** to **High.**

Future landscaping associated with the proposed upstream components may add vegetation to this view and could enhance views from the Highway.

Impact during construction

During construction, the appearance of construction equipment will be obviously short term and transient. For this reason the visual impact of construction when viewed from the Highways is considered **Negligible**.

Table 8-1 Summary Assessment of views from Highways

Visual Change	Assessment	Rating
Project infrastructure	Where vegetation permits views	Medium
	Where vegetation screens views	Low - Negligible
Well Heads	Where vegetation permits views	Low
	Where vegetation screens views	Negligible
Easements	15 - 30 m	Low
	> 30 m	Medium – High (depending upon linear extent of view)
During construction	Visible from the roads	Low – medium

Measures to reduce visual impact from highways

Some design measures can reduce the level of visual impact from Highways. These include:

- Reduce clearing, especially at right angles to the Highway; and where it is necessary for a wide easement (> 50 m) to cross the Highway limit long lengths of clearance by locating a dogleg at either side of the Highway to limit long views along the cleared easement.
- Site infrastructure behind existing vegetation or where there is limited existing vegetation, plan for landscape buffers to be established between the easement and the Highway. Straight access roads from the Highway to the infrastructure should be avoided and the use of curved access roads or roads which contain a dog leg or which are orientated towards an area which does not contain visible infrastructure can also reduce the visual impact.

8.2 VIEWPOINTS FROM LOCATIONS ALONG ROADS AND TRACKS

These roads are used by the local community to move through the viewshed. As such they afford many views to the Upstream Components and an analysis of the potential visual impact on these is important in understanding the potential visual impact on local communities.

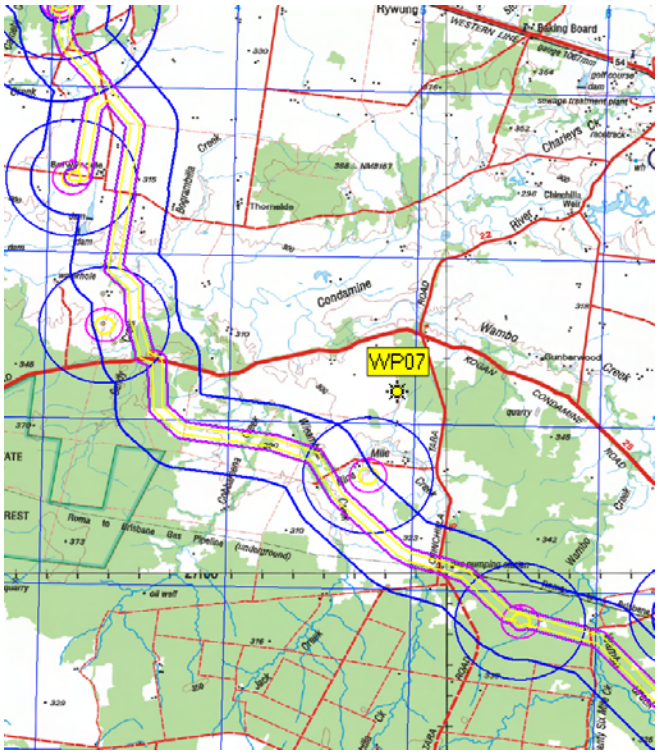
8.2.1 *Viewpoint 07 – Noel Robinson Road*

Viewpoint 07 is located on Noel Robinson Road, south of the Kogan-Condamine Road .and is an un-made road.

The most visible landscape unit at this location is "Landscape Unit 1 –Flat Farmland".

There are several existing Well Heads located in the landscape to the west of this Viewpoint.

Figure 8.13 shows the view looking south through west.



VP07 (GPS 56J 249107.7, 7021913.1)

Figure 8.13 View looking west from Noel Robinson Road

There are existing Well Heads within this landscape shown in *Figure 8.13*. The nearest Well Head can only be seen clearly in a photograph taken with a telephoto lens. In *Figure 8.14* this well head is just visible although it is only 750 m west of this viewpoint and, even in a photograph taken with a telephoto lens, the well head is difficult to discern at this distance.

Figure 8.14 The well head at a distance of 750 m (taken with a telephoto lens)

Figure 8.14 shows that even assessing the impact using a telephoto lens, the existing well head and associated infrastructure is barely discernable in the landscape. This is also across a cleared paddock with no intervening vegetation or landscape screening. Two hundred metres is the closest a well head will be located to a residential property. At this distance the visual impact would be **low**.

These small structures are almost indiscernible in a rural landscape. They have the appearance of a small rural farming structure and their visual impact would be assessed as **negligible**.

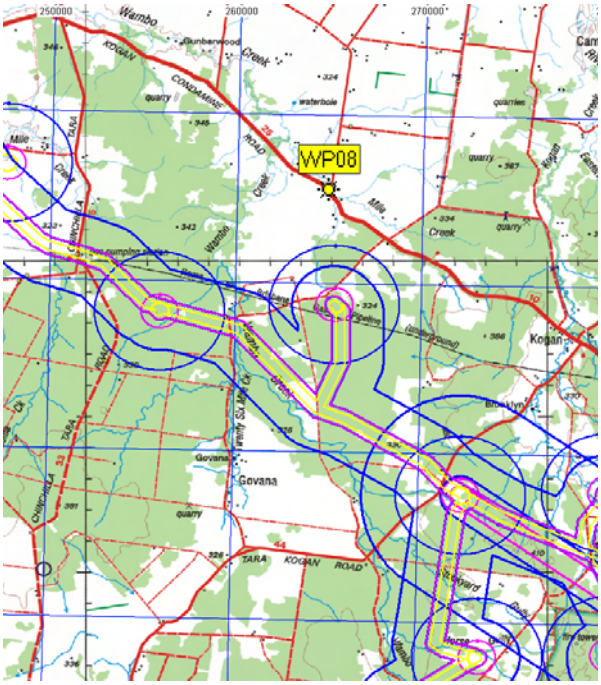
8.2.2 *Viewpoint 08 – Condamine – Chinchilla Kogan Road*

Viewpoint 08 is located at the intersection of the Condamine – Kogan and Chinchilla Road which runs in a north west south east direction. Chinchilla Road is a smaller road heading north.

The most visible landscape unit at this location is "Landscape Unit 3 – Forest areas".

Figure 8.15 shows the view looking east along the Condamine - Kogan Road.

Figure 8.16 shows the view looking north along the Chinchilla Road from the intersection with Condamine – Kogan Road.



VP 08 (GPS 56J 264931.0, 7015494.3)

Figure 8.15 View looking south-east along Condamine - Kogan Road from the Chinchilla Road Intersection

When travelling along this section of the Condamine – Kogan Road, views to the surrounding landscape are confined by the existing roadside vegetation.

This existing vegetation seen in *Figure 8.15* confines most views to the Condamine – Kogan Road when travelling south-east or north-west.

Figure 8.16 View looking north along Chinchilla Road

This existing vegetation seen in *Figure 8.16* also restricts views from Chinchilla Road into the surrounding landscape.

When travelling on these local roads through "Landscape Unit 3 – Forested areas", these Figures demonstrate that views to the Upstream Components will be limited. .

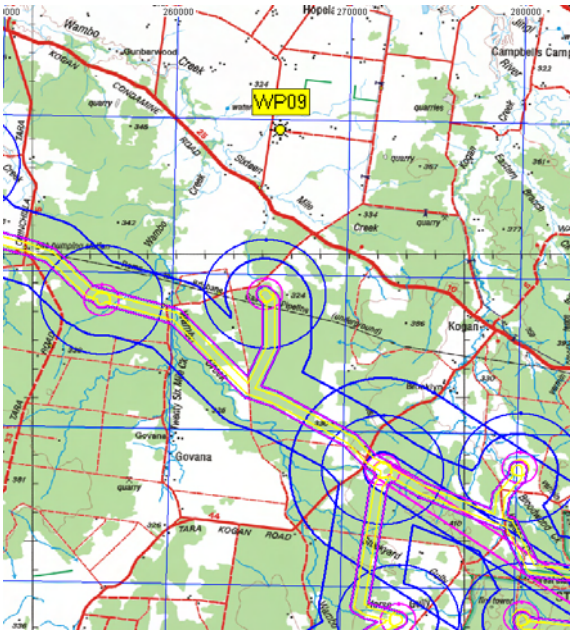
The proposed Project infrastructure will be set back from the road way. Therefore the existing vegetation that is found in the road reserve and the surrounding landscape will filter or limit views to the proposed Project infrastructure.

8.2.3 *Viewpoint 09– Kummerow Road*

Viewpoint 09 is located on Kummerow Road which is a local un-made road that runs in an east - west direction through "Landscape Unit 1 - Flat farmland". Roadside vegetation is common along these local roads.

This viewpoint was selected where a break in the roadside vegetation allowed a view to the existing power station. The LINC Energy Power Station is located approximately 1.2 km to the north-east

Figure 8.17 shows the view looking north-east from this location towards the LINC Energy Power Station.



VP09 (GPS 56J 370320, 572948)

Figure 8.17 View looking north-east from Kummerow Road

Even across cleared farmland the power station is a small element in the landscape when viewed from a location 1.2 km away. As well there are many windbreaks, hedgerows and roadside vegetation that limit views to the power station Kummerow Road. This is illustrated in *Figure 8.17*. Well heads and the infrastructure proposed as part of the Upstream components will be smaller than this power station and it is clear that this landscape has the capacity to absorb infrastructure.

If pipelines where required to be constructed within or adjacent to the road way, then visual impact will be reduced if the pipeline runs through gaps in the existing vegetation and minimises additional vegetation removal.

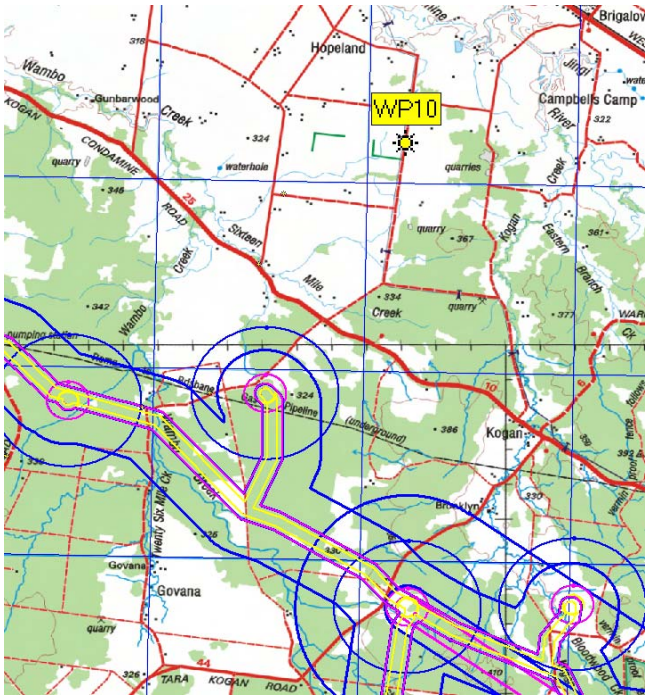
Well heads in this area, will be relatively inconspicuous elements, even without additional landscape screening.

8.2.4 *Viewpoint 10– 16 Mile Hall Road*

Viewpoint 10 is located on 16 Mile Hall Road which is a local un-made road that runs in a north-south direction through "Landscape Unit 1 - Flat farmland".

The landscape surrounding this Viewpoint is predominantly cleared,. However although the LINC Power Station is located to the south west within this landscape, it is inconspicuous and difficult to discern from this location.

Figure 8.18 shows the view looking south-west from this viewpoint.



VP10 (GPS 56J 271785.9, 7022110.2)

Figure 8.18 View looking south-west from 16 Mile Hall Road

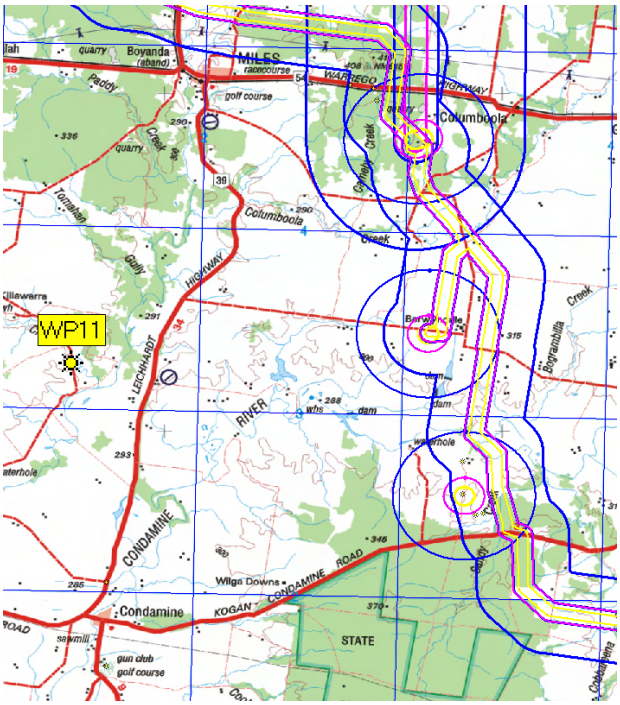
Wind breaks and hedgerows are common along property boundaries and fence lines and verges. This vegetation contributes to limiting views to the surrounding landscape from other locations along 16 Mile Hall Road.

Well heads and pipeline corridors will be inconspicuous. Other infrastructure will also be a small element, difficult to discern, in this landscape.

8.2.5 *Viewpoint 11 – Kentara Road*

Viewpoint 11 is located on Kentara Road. Kentara Road is a local gravel un-made track which runs through "Landscape Unit 1 - Flat farmland", but which contains considerable vegetation, that is not limited to hedgerows and along roadsides.

Figure 8.19 shows the view looking south along Kentara Road.



VP11 (GPS 56J 213754.6, 7032478.1)

Figure 8.19 View looking south along Kentara Road

The area has been partially cleared, however it does contain many areas of existing mature vegetation or regrowth as seen in *Figure 8.19*.

Well heads and other infrastructure proposed as part of the Upstream Components will be easily absorbed by this landscape. The visual impact of long cleared corridors that may be created along easements will be minimised if they run parallel to the road and avoid long runs at right angles to the road alignment. .

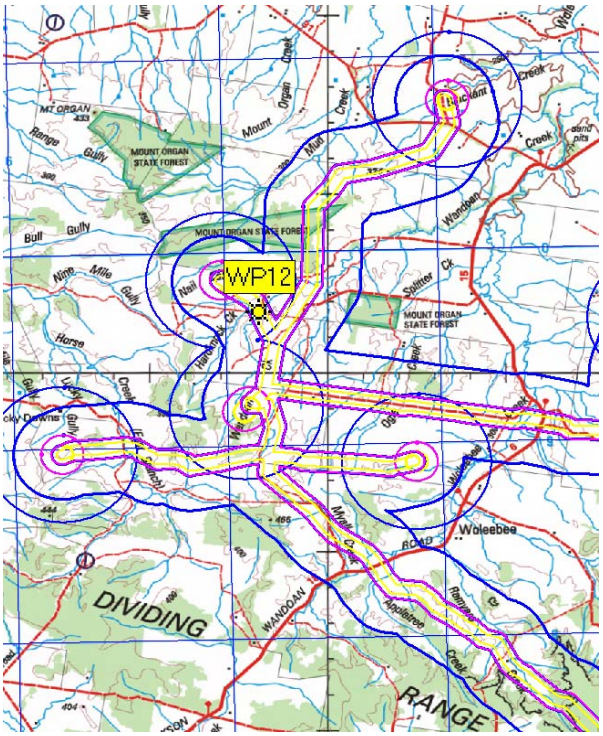
8.2.6 *Viewpoint 12 - Un-named Road*

Viewpoint 12 is located on an un-named road. This viewpoint is located within the most north–western land tenement associated with the Project.

This viewpoint is near the Great Dividing Range and is one of the few locations in which "Landscape Unit 2 – Hilly Farmland" is visible.

The topography is more varied that that which has been described in the previous Viewpoints.

Roadside vegetation and additional scattered vegetation within the farmland areas is also common.



VP12 (GPS 55J 771605.8, 7096888.8)

Figure 8.20 shows the view looking east across the low ridges.

Figure 8.20 View looking east

The distinction between the "Landscape Unit 2 – Hilly Farmland" and "Landscape Unit 1 - Flat farmland" is not obvious. Looking west from this location the road runs through "Landscape Unit 1 - Flat farmland". *Figure 8.21* shows the view looking west.

Figure 8.21 View looking west from an un-named Road

Although the landscape to the west appears flat it is undulating and contains much vegetation within road reserves, paddocks and along fence lines and property boundaries. This vegetation assists to limit views to the surrounding landscape, as seen in *Figure 8.21*.

8.2.7 Summary assessment of views from roads and tracks

The landscapes along the roads and tracks which run through the viewshed have sometimes been extensively cleared for agricultural practices. Being highly modified already, this landscape has low sensitivity to further visual change. Views from this location also take in power plants, roads, fence lines and associated rural infrastructure including sheds, silos, machinery and equipment.

Viewer numbers for these roads are also less than those using the Highways which were discussed previously.

However in many instances the local roads are already lined with mature bands of vegetation. In these areas the vegetation will easily screen views of the infrastructure as can be seen in the screening of the LINC Power Station from locations along 16 Mile Hall Road (Refer *Figure 8.18*) and therefore the visual impact of project infrastructure would be **Low – Negligible**. If infrastructure was visible from these roads, then given the low number of viewers the visual impact would be assessed as **Low**. Well heads are reasonably smaller pieces of infrastructure and their visual impact would be less, and the visual impact of well heads would be assessed as **Low - Negligible**.

The visual impact of easements seen from these roads would be **Low – Negligible** as the proposed easement would either be similar to those created for existing roads, or, if larger, similar to the many clearings evident in this landscape.

Where wider easements are required and these need to cross forested areas then the visual impact will be higher. However as these roads have fewer visitor numbers that the Highways discussed in the previous section the visual impact would be assessed as **medium** in the worst case scenario of a wide easement (>30 m) crossing a local road and continuing in a straight alignment for a considerable distance on both sides of the road.

Impact during construction

During construction, the appearance of construction equipment will be obviously short term and transient. For this reason the visual impact of construction when viewed from the surrounding road network is considered **Negligible**.

Even though drill rigs are sometimes described as being lit up "like a Christmas tree", they are still a transient operation with a negligible visual impact when the duration of their operation is taken into account.

Table 8-2 Summary Assessment of views from local roads

Visual Change	Assessment	Rating
Project infrastructure including WTP and powerlines	Where vegetation permits views	Low
	Where vegetation screens views	Low - Negligible
Well Heads	Where vegetation permits views	Low
	Where vegetation screens views	Negligible
Easements	Vegetated and un-vegetated areas	Low - Negligible

Measures to reduce visual impact from roads and tracks

Some design measures can reduce the level of visual impact from Highways. These include:

- Reduce clearing and limit long visible lengths of clearance.
- Site infrastructure behind existing vegetation or where there is limited existing vegetation, plan for landscape buffers to be established around the infrastructure.

8.3 VIEWPOINTS FROM LOCATIONS WITHIN FORESTED AREAS

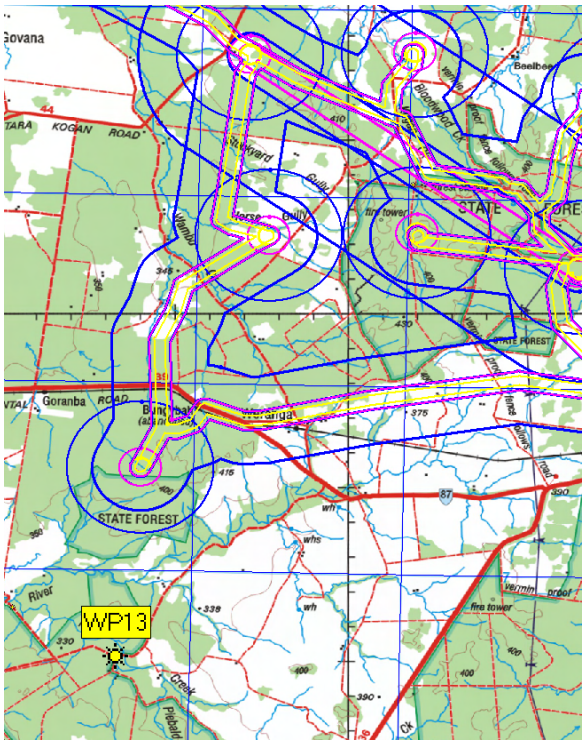
The potential for views to impact on forested areas are important as it is these locations that viewpoints have potentially the greatest sensitivity as visitors to forested areas except these to appear undisturbed.

8.3.1 *Viewpoint 13 - Marmadua State Forest #1*

Viewpoint 13 is located at an entry to the Marmadua State Forest which is within "Landscape Unit 3 – Forested areas".

"Landscape Unit 3 – Forested areas". has a medium to high sensitivity to visual change.

Figure 8.22 shows the view looking south towards the entrance to the Marmadua State Forest.



VP13 (GPS 56J 370320, 572948)

Figure 8.22 Marmadua State Forest entrance looking south

A pipeline easement and well heads may be located within 1 km of this location. This viewpoint is located within an area of state forest which restricts views to the proposed easement.

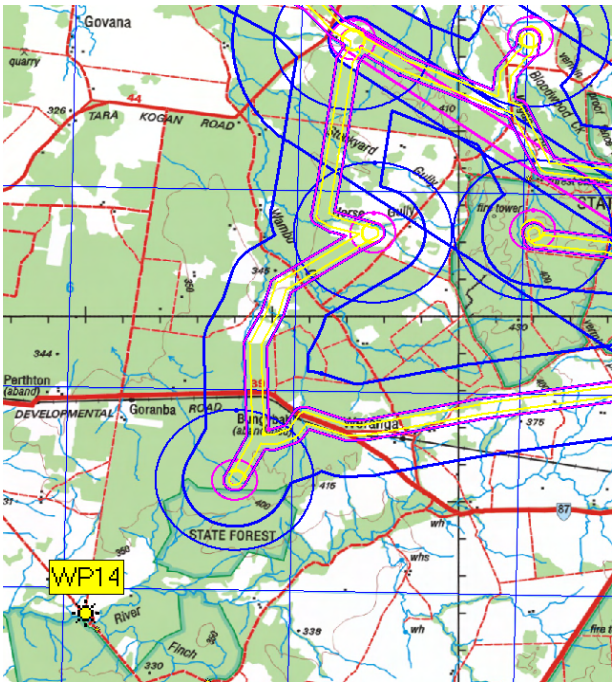
The major impact at this viewpoint will be associated with vegetation removal, either around a particular piece of infrastructure or along an easement that crosses this access road.

8.3.2 *Viewpoint 14 – Marmadua State Forest #2*

Viewpoint 14 is located on an un-named road on the south western edge of one of the land tenements on the western edge of the Marmadua State Forest.

"Landscape Unit 1 - Flat Farmland" and "Landscape Unit 3 – Forest areas" are both visible.

"Landscape Unit 3 – Forested areas". would have a medium sensitivity to visual change, and "Landscape Unit 1 - Flat Farmland" has a low sensitivity to change.



VP14 (GPS 56J 261058.1, 6968692.5)

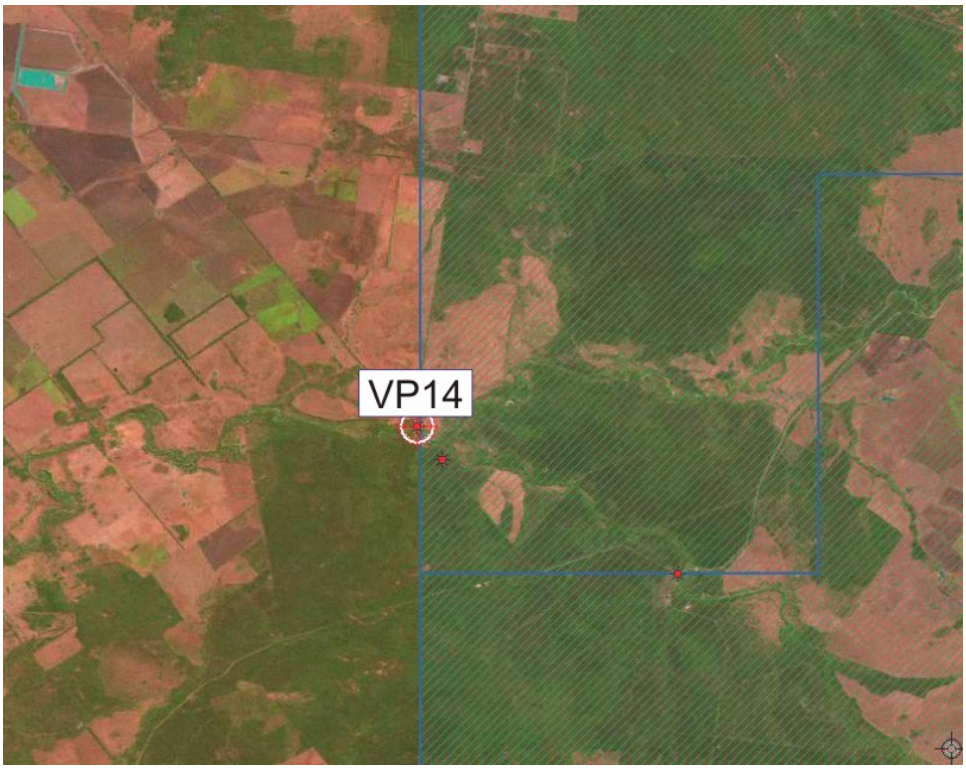


Figure 8.23 Satellite image

Figure 8.23 is a Satellite image of this location. The existing vegetation, which is mostly within the Marmadua State Forest are the areas of green, whilst the cleared farmland immediately to the north and to the west is a light ochre colour.

Figure 8.24 and *Figure 8.25* shows the view looking east and west towards the forest and the open farmland.

Figure 8.24 View looking north over cleared farmland to the Marmadua State Forest

Figure 8.25 View looking east to the Marmadua State Forest

Views to the east are restricted to approximately 10-15 m into the forest.

If clearing is minimised and infrastructure is separated from this viewing locations by existing vegetation, then the visual impact will be negligible.

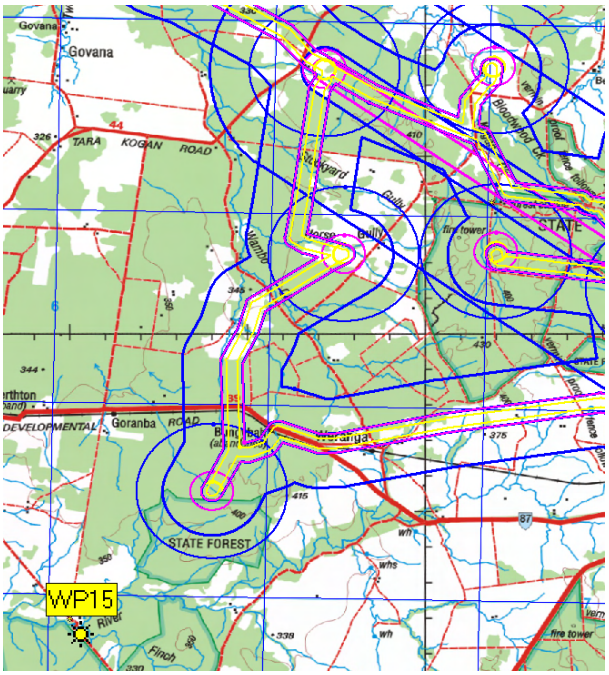
Where pipeline corridors are proposed these should optimally either be within cleared farmland areas or follow existing roadways where vegetation has already been removed.

8.3.3 *Viewpoint 15 - Marmadua State Forest #3*

Viewpoint 15 is located on an un-named road in the Marmadua State Forest which runs roughly north- west to south- east. This location is also near the western edge of the viewshed.

The most visible landscape unit at this location is Landscape Unit 3 – Forest which would have a medium level of sensitivity.

The vegetation found within the Marmadua State at this viewpoint is dense and immediately adjacent to the access track, as seen in Figure 8.26. This existing vegetation limits views to any proposed infrastructure that is not immediately adjacent to the access road.



VP15 (GPS 56J 370320, 572948)

Figure 8.26 State Forest Un-named Road looking south east along Road

This existing vegetation confines views to the roadway and limits views into the forest to approximately 5 – 10 m. This area also has low visitor numbers.

Visual change in this landscape unit will be noticeable where vegetation removal occurs near to the access track or where vegetation removal allows long views through the forest.

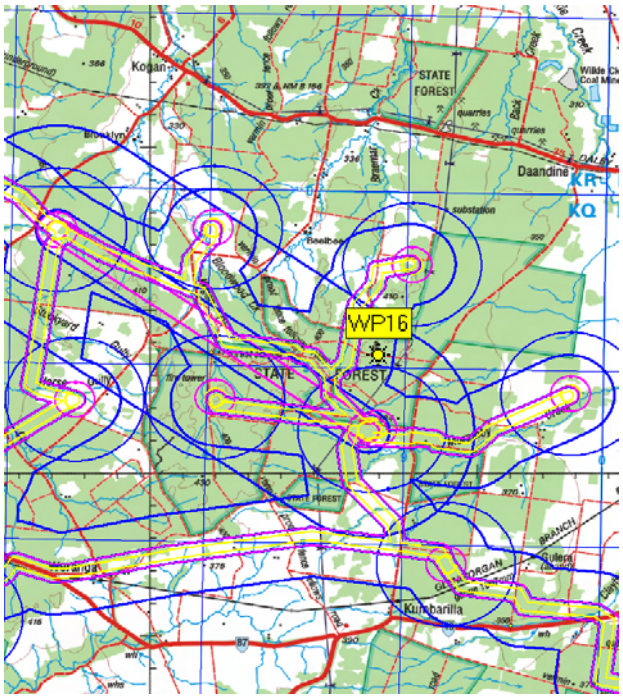
8.3.4 *Viewpoint 16 – Braemar State Forest #1*

.Viewpoint 16 is located on an un-named Road or track in the Braemar State Forest.

The most visible landscape unit at this location is "Landscape Unit 3 – Forested areas" which would have a medium level of sensitivity.

The road is unsealed and crosses the undulating topography.

Figure 8.27 shows the view looking south-east along the road.



VP16 (GPS 56J 288639.8, 6990731.4)

Figure 8.27 View looking east along the un-named track

The vegetation found within the Braemar State Forest at this location is dense and close to the roadway which limits views into the forest to approximately 5 – 10 m. There are also few viewers.

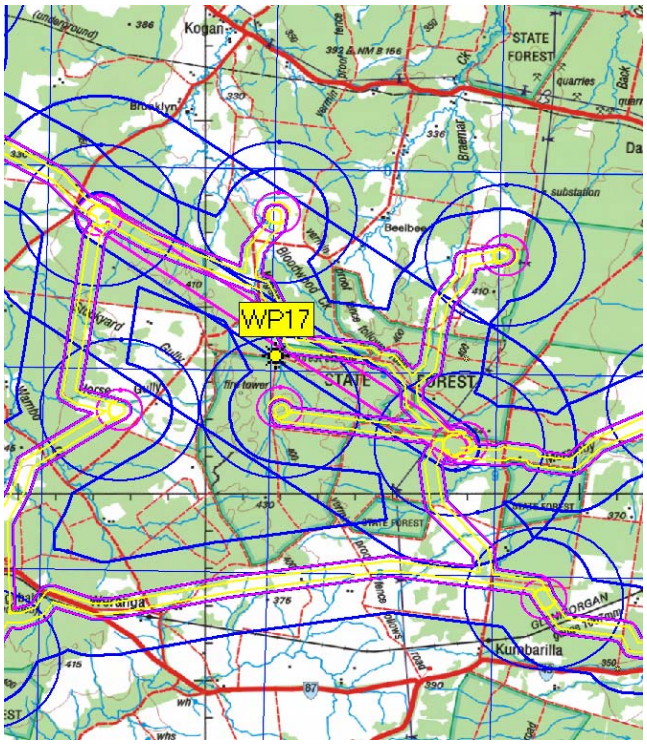
Visual change in this landscape unit will be noticeable where vegetation removal occurs near to the access track or where vegetation removal allows long views into the forest.

8.3.5 *Viewpoint 17– Braemar State Forest #2*

Viewpoint 17 is located in the Braemar State Forest. Ruins of the former Forest Homestead are located to the east.

The most visible landscape unit at this location is "Landscape Unit 3 – Forested areas". Cleared farmland is located to the northwest of this location, however this farmland is surrounded by dense scrub

The proposed Collection Header pipeline will run in a north-south direction past this viewpoint.



VP17 (GPS 56J 280254.6, 6990716.4)

Figure 8.28 is an aerial photograph showing the viewpoint location, and the proposed collection header pipeline (blue line) may run through this landscape. *Figure 8.28* shows the former Forest Homestead site in the clearing to the east of this viewpoint and numerous access tracks that are similar to the proposed pipeline easement. Cleared farmland becomes the dominant landscape character to the north and north west where the easement for the header pipeline would be indistinguishable from the existing pasture.

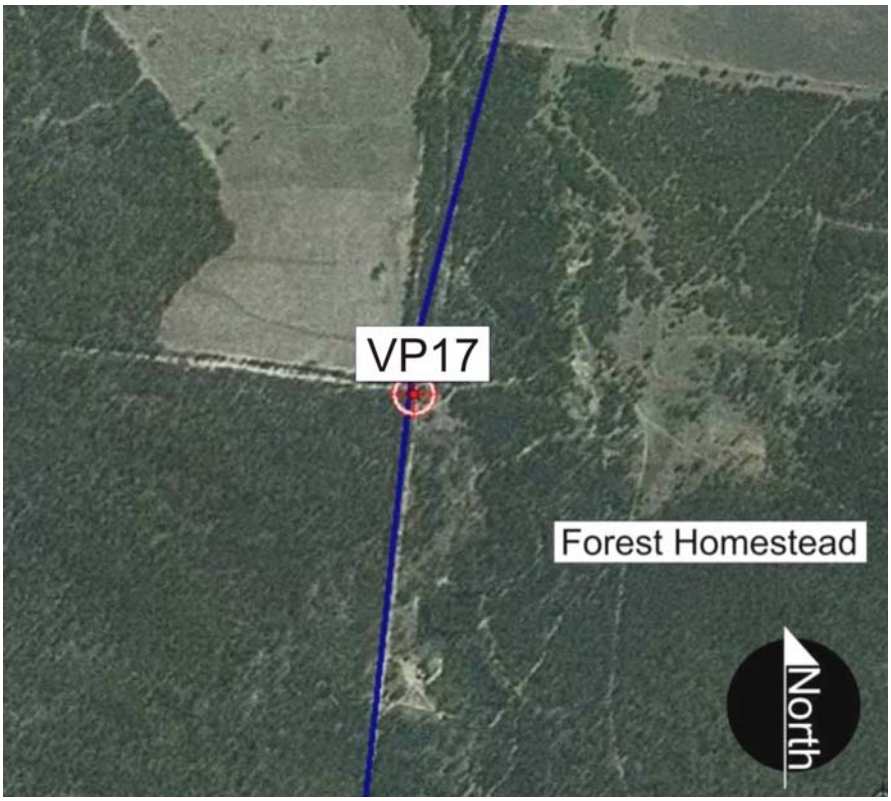


Figure 8.28 Aerial Photograph

Figure 8.29 shows the view looking south along the existing access track and proposed Collection Header pipeline alignment. The existing vegetation to the south is dense although existing access tracks appear similar to the proposed easement.

Figure 8.29 View looking south along access track

Figure 8.29 shows the view looking north west towards the area of cleared farmland. In these pasture areas the pipeline easement, after rehabilitation, will have a negligible visual impact.

Figure 8.30 View looking north - west

The proposed Collection Header pipeline will follow the existing access track to the south of this location and continue to the north through an area of fragmented vegetation as seen in *Figure 8.30.*

The proposed pipeline easement will require vegetation clearing along the existing access track to the south as well as to the north of this location. Even though this landscape unit has a medium to high sensitivity to change, there are few visitors to this area and the vegetation is already extensively cleared and fragmented by existing paths and tracks. For these reasons, it is considered this change would result in a low visual impact.

If well heads were to be located in either the vegetated areas or within the pasture areas to the north and west than the visual impact would be negligible as these would be small elements in this landscape, difficult to discern unless close to the viewpoint.

8.3.6 *Summary assessment of views from within forested areas*

The forested areas within the viewshed are on flat land and have dense vegetation. This means that there are no high points or lookouts to view out over the surrounding landscape. These forested areas also contain many tracks and cleared pathways. Existing easements for existing infrastructure also cross these forested areas.

A viewer in the forest has very limited visibility. Long distance and foreground views are usually screened unless the view is along a roadway or existing easement.

Even taller infrastructure will be easily screened by existing vegetation if sited appropriately to utilise this vegetation and limit the frequency of "gun-barrel" views along cleared access tracks to new infrastructure. Simple site design options such as curves or doglegs in the access tracks to infrastructure will limit long views and either reduce the visual impact or in most cases allow proposed infrastructure to be completely hidden from view.

If clearing is minimised and infrastructure is separated from this viewing locations by existing vegetation, then the visual impact from these viewpoints will be **low - negligible**.

Easements will also be ssen as part of the network of tracks and clearings through these forested areas. When the easements are less that 30 m in width their visual impact, given this visual similarity to existing tracks and few viewers, will be **low** to **negligible**. Where the easements are wider and visually more apparent the visual impact would still be **low** as there are few viewers.

Table 8-3 Summary Assessment of views from within forested areas

Visual Change	Assessment	Rating
Project infrastructure Including WTP's and powerlines	Where vegetation permits views	Low - Negligible
	Where vegetation screens views	Low - Negligible
Well Heads	Where vegetation permits views	Low
	Where vegetation screens views	Negligible
Easements	Vegetated and un-vegetated areas	<30 m Low – Negligible <30 m Low

Measures to reduce visual impact from forested areas

- Reduce clearing; and
- Site infrastructure behind existing vegetation.

Where clearance between an access route through the forest and a piece of infrastructure such as a well head is unavoidable, then the site design for the well head should enable landscaping to be established between the well head and the access route.

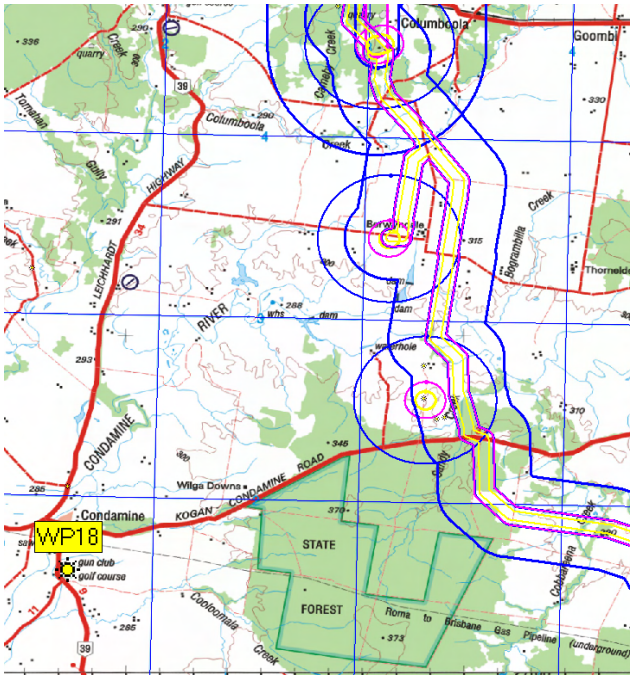
8.4 VIEWPOINTS FROM VISITOR / COMMUNITY CENTRES

Places of public assembly such as community or visitor centres can also be important and although these locations are limited within the viewshed, the impact on the Condamine Sporting and Recreation Centre is assessed.

8.4.1 *Viewpoint 18 - Condamine Sporting and Recreation centre*

Viewpoint 18 is located at the entrance to the Condamine Sporting Club which includes a Golf Course, a Gun Club, a Tennis Club, Lawn Bowls and facilities associated with the Camp Draft – Rodeo Grounds.

The Condamine Sporting Club The Condamine Sporting Club is a recreational hub for the township of Condamine and the surrounding district, and is therefore likely to attract medium to high visitor numbers.



VP18 (GPS 56J 215871.9, 7015876.2)

Figure 8.31 shows the entrance to the Condamine Sporting Club, looking east from the Leichardt highway. The entrance is located on the eastern side of the Leichardt Highway, approximately 2.3 km south of the township of Condamine.

Figure 8.31 Condamine Sporting Club Entrance.

Figure 8.31 shows the entrance to the Condamine Sporting Club and the existing vegetation located within the Leichardt Highway road reserve as well as the Administration building and club house.

Figure 8.32 shows a view looking west towards the Condamine Sporting Club administration building. This building also serves as the Club House for the lawn Bowles and Tennis Club.

Figure 8.32 View looking west towards the Condamine Sporting Club tennis courts, Club house and Bowling Greens

Figure 8.33 shows the view looking south-east over the golf course from the internal access road of the Condamine Sporting Club.

Figure 8.33 View looking south-east over the golf course from the Condamine Sporting Club

Figure 8.33 also shows the existing vegetation which runs around the golf course also screens views to the surrounding landscape.

8.4.2 Summary assessment of views from the Condamine Community Centre

Because of the extent of modification to the landscape of the sporting club and the and limited viewing opportunities beyond the site, the visual impact to this location as a result of the Project would be assessed as **Low - Negligible**.

Table 8-4 Summary Assessment

Visual Change	Assessment	Rating
Project infrastructure Including WTP's and powerlines	Where vegetation screens views	Low - Negligible
Well Heads	Where vegetation screens views	Negligible
Easements	Vegetated and un-vegetated areas	Low - Negligible

8.5 SUMMARY OF THE OVERALL VISUAL IMPACT FROM PUBLICY ACCESSIBLE VIEWPOINTS

The landscape within the viewshed is relatively flat, with little topographical variation. The main environmental value that generates varying landscape units is the extent of vegetation cover.

Cleared flat farmland has far less vegetation that forested areas, yet even this landscape unit does have hedgerows and other remnant and planted areas. It is this mosaic of vegetation that reduces the visual impact of infrastructure, whether from highways, roads or forested areas.

Following construction, the disturbed areas that are located in areas of cleared farmland will have pasture/grasses re-established. Viewers may be able to discern a slight change in colour however such a change would only be a negligible impact at worst. The landscape rehabilitation methods outlined in the project description are considered to the adequate to mitigate the majority of the likely visual impacts that can be expected through the development of the project.

8.5.1 *Infrastructure*

The capability of this landscape to absorb infrastructure is demonstrated by the degree to which existing infrastructure is screened. Existing infrastructure that is much larger than any proposed as part of these Upstream Components includes power stations, however similar infrastructure such as well heads are also evident in the area.

These existing examples clearly showed that the smaller structures such as the proposed well heads and flaring events can be screened from view, especially in vegetated areas. Even when located in cleared landscapes, they are of such a scale that they cease to be visible elements within the landscape beyond a distance of greater than 500 m.

Even large structures such as the Condamine power station are visually absorbed into the surrounding landscape through intervening landscape treatments.

8.5.2 *Well heads*

The project outline prepared by the project proponents has indicated that the proposed Well Heads will not be located within 750 m of existing residential dwellings. At this distance the Well Heads and associated infrastructure will be barely noticeable features in the landscape.

Although both power stations and well heads already are constructed within the viewshed, these remain relatively inconspicuous and the preceding assessment has shown that the visual

impact from the proposed infrastructure will except for a few limited instances be **Low – Negligible.**

8.5.3 Easements

The main concern that derives from the preceding analysis has been the construction of easements. This visual impact will be more pronounced where easements are near Highways and main roads

Where a pipeline runs parallel to the roads, once the route is rehabilitated the easement has the appearance of a widened road reserve and creates little visual impact.

Furthermore, when a pipeline crosses a road, generally at right angles, the visual impact in a vegetated or forest landscape is restricted to a view along an easement, which is not dissimilar to view along minor roads or access tracks. Therefore the visual impact in forested areas is low – negligible and in cleared areas the pipeline becomes indistinguishable against the existing pasture and the visual impact becomes nil.

Narrow easements may look like access tracks and therefore have a lower level of visual impact, but wider easements, especially those that are greater than 50 m in width, can appear as broad corridors which can cut through the existing vegetation.

Where wider easements are necessary there are two ways of reducing their impact:

- Locate wider easements across cleared farmland where they will remain inconspicuous, especially after landscape remediation has occurred; and
- Avoid long straight lengths at right angles to a viewpoint such as across a road.

8.5.4 Visual impact of the powerlines and associated infrastructure

There are many transmission lines already found within the project area. For this reason, transmission lines are already an accepted part of the landscape and the transmission towers associated with the Upstream Components will be on poles, not lattice towers. Such poles are easily able to re absorbed in the landscape, unlike lattice towers which can be identified at a considerable distance. Even the taller poles proposed for the 132kV lines at a distance appear to be normal power lines, which to most viewers are such a part of the rural landscape that they do not draw a viewer's attention and become a background element in the overall view.

This has been supported by views expressed in previous powerline studies, where during community consultation an overwhelming preference was shown for powerlines on poles rather than lattice towers. Lattice towers remained unsightly even at a considerable distance, while the pole structures became a minor alteration to the landscape.

The main visual impact of a transmission line will be where vegetation is removed to construct the transmission line easement. Vegetation removal paralleling a Highway or major road should be avoided to minimise visual impact.

8.5.5 Impact during construction

During construction, the appearance of construction equipment will be obviously short term and transient. For this reason the visual impact of construction when viewed from the Highways, the local road network and from forested areas is considered **negligible**.

9 ASSESSMENT OF POTENTIAL IMPACTS FROM RESIDENTIAL PROPERTIES

Following the discussion of the anticipated visual impacts on viewpoints that are publicly accessible, this section analyses the potential visual impact from residential properties. There are between 1500-2000 residential properties within the tenement area.

The assessment of the visual impact of the proposed upstream components on residential properties is based on the following assumptions:

- An occupant of a residential dwelling will have a high degree of sensitivity to the change in their surrounding landscape.
- Viewer numbers for residential properties are not applicable.
- Residents may be able to see the upstream components as they move around their property however in cases where there are multiple viewing locations, the most sensitive location is the one which is most used (i.e. a patio or outside entertainment areas) or is most visually impacted (i.e. a view form second storey window).
- Landscaping may mitigate the visual impact at many residential locations, where landscaping immediately adjacent to the viewer is effective in screening or filtering views to the upstream components. In some instances landscaping may be inappropriate as it may screen a view or reduce solar access. The appropriateness of landscape mitigation can only be assessed on a case by case basis.

Given the area potentially impacted by the upstream components there would be a number of residential properties within the various viewsheds. Many of these residential properties will lie in forested areas or will have forested areas between the residence and a particular upstream component, thereby screening or filtering views to the component. Many other properties will have gardens surround the house which will also screen or filter views.

However the following assessment assumes that the living areas are orientated towards the closest or most visually apparent piece of infrastructure and that there is **no** vegetation screening or filtering views from the residential location.

However an assessment can be made on a worst case scenario, based solely on distance parameters. These zones of visual influence were discussed in *Chapter 5 – Viewshed* and the viewsheds and zones of visual influence for the various upstream components are repeated below.

9.1 VISUAL IMPACT OF THE INFRASTRUCTURE ON RESIDENTIAL PROPERTIES

Given a 30 m high structure in the landscape, the viewshed could extend out to a distance of 3.5 km. A high level of visual impact could occur within 340 m and a medium level could occur between 340 m and 680 m. For infrastructure within the project the viewshed has been calculated conservatively and the Zones of Visual Influence for residential properties within the viewshed would be as follows:

- 0 – 0.5 km **high** level of visual impact;
- 0.5 –1 km **medium** level of visual impact;
- 1 – 3.5 km **low** level of visual impact; and
- > 3.5 km visually **insignificant**.

9.1.1 *Potential visual impact on residential properties of the highest infrastructure*

Therefore a conservative assessment of the visual impact on a residential property can be assessed using these distance calculations. If 20 m – 30 m high infrastructure are located at least 1 km from the nearest residential property, the impact would be **low**.

9.1.2 *Potential visual impact on residential properties of other lower infrastructure*

It must be stressed that this is a very conservative assumption and for elements such as the well heads and FCS's which are less than 5 m high and therefore the viewshed and the zones of visual influence would be less. For a 5m high object the viewshed would only extend to approximately 500 m, with the zone of **high** visual impact extending only to 30 m, and **medium** level of visual impact being between 30-60 m. Between 60 – 500 m the visual impact of a 5 m high piece of infrastructure would be **low**.

As well heads are at least 200 m from residential properties their visual impact where completely exposed would be **low**.

9.2 *VISUAL IMPACT OF THE TRANSMISSION LINES ON RESIDENTIAL PROPERTIES*

The maximum height of the 132 kV transmission poles is likely to be 41 m, however the viewshed calculations will be based on a height of 50 m. The viewshed and associated zones of visual influence for a transmission tower of this height are:

- 0 – 0.6 km **high** level of visual impact;
- 0.6 – 1.2 km **medium** level of visual impact;
- 1.2 – 6 km **low** level of visual impact; and
- > 6 km visually **insignificant**.

From this calculation it is apparent that if the 132 kV transmission lines are at least 1.2 km from the nearest residential property, their impact will be **low**.

The 33 kV transmission line would be lower in height, and basing the calculations on a height of 20 m, the viewshed and the associated zones of visual influence for a 33 kV line would be:

- 0 – 0.25 km **high** level of visual impact;
- 0.25 –0.5 km **medium** level of visual impact;
- 0.5 – 2.3 km **low** level of visual impact; and
- > 2.3 km visually **insignificant**.

From this calculation it is apparent that if the 33 kV transmission lines are at least 0.5 km from the nearest residential property, their impact will be **low**, however those residential properties with direct views to a 33 kV transmission line which is less than 500 m from a 33 kV line and less than 1.2 km from a 132 kV line will have a medium level of visual impact.

However landscape mitigation would be very effective in reducing or eliminating such visual impact. This is discussed later in this Chapter.

9.3 *VISUAL IMPACT OF THE EASEMENTS ON RESIDENTIAL PROPERTIES*

For the pipeline easement there are no direct visual impacts of the pipeline components as these are underground. However the construction of easements to contain the below ground infrastructure may involve the clearance of vegetation. Where this occurs, there can be a visual impact as these corridors of cleared vegetation can be defined by straight lines of vegetation on either side.

Given a cleared easement defined by 20 m high vegetation, the viewshed would extend out to a distance of 2.3 km. For such a viewshed the Zones of Visual Influence within the viewshed would be as follows:

- 0 – 0.25 km **high** level of visual impact;
- 0.25 – 0.5 km **medium** level of visual impact;
- 0.5 – 2.3 km **low** level of visual impact; and
- > 2.3 km visually **insignificant**.

An assessment of the visual impact of easements on the view from residential properties is more difficult than would be suggested by these calculations. If the easement is running through cleared farmland or through scattered vegetation where the impact of clearing is not obvious, then the visual impact would be **low** or **negligible**, irrespective of the separation distance between the easement and the residence. However if an obvious corridor is created in what appears to be a intact area of forest then these calculations could be applied and would suggest that if this clearance was more than 0.5 km from the residential property, then the visual impact would be **low**.

9.4 LANDSCAPE MITIGATION

It may be difficult or impossible to provide landscape mitigation for the views of easements or infrastructure from publicly accessible viewpoints. However this is not the case for residential locations.

Landscaping is a mitigation option for residential properties with views to visually dominant infrastructure. Planting may be designed to either screen the upstream infrastructure from view, or significantly reduce the visual dominance of infrastructure through filtering.

Landscape mitigation measures should be determined on a case by case basis in consultation with landholders to minimise adverse impacts where those impacts were assessed as **high** when based on the preceding zones of visual influence for the particular piece of infrastructure under consideration.

10 ASSESSMENT OF THE IMPACTS OF NIGHT TIME LIGHTING

This section responds to the night time lighting impacts as outlined in the *Terms of Reference* for the Project. The *Terms of Reference* are orientated towards the effects of lighting on Gladstone Harbour, however the lighting proposed as part of the Upstream Components and the potential impact of on viewers within the viewshed will be discussed in the following Chapter.

10.1 EXISTING LIGHT SOURCES

Existing light sources are evident within the project viewshed; although many areas have few light sources. The main areas that contain existing lighting are around the existing towns of Condamine, Miles, Chinchilla and Tara, as well as at farm houses and buildings and at existing infrastructure such as the Condamine Power Station.

Other, non permanent light sources include head and tail lights of vehicles travelling along the surrounding roads as well as trains and agricultural machinery that may operate at night.

10.2 PROJECT LIGHTING

Light sources for the Project include both permanent and intermittent sources and of light.

10.2.1 *Lighting at infrastructure locations*

Permanent light sources that have been identified with the project are limited to access lights to the control rooms within the Field Compressor Stations and Central Processing Plants. Additional lighting of these areas may be required from time to time for routine maintenance or emergency shut downs.

Intermittent lighting will include flaring of Well Heads, Field Compressor Stations and the Central Processing Plants. Each of these structures is to be located in relatively isolated locations where there are few viewers.

10.2.2 *Lighting during construction*

Intense lighting will be required consistently during the construction period for the Field Compressor Stations and Central Processing Plants. Construction lighting for the proposed Well Heads will include vehicle and drill rig lights as well as safety and work area lighting. Construction lighting will have a much greater impact than operational lighting and flaring as it will be more concentrated and an obvious change in the Landscape. This lighting will also be in relatively remote areas and will be temporary only.

The night time lighting impacts of Well Heads is considered to be low. This is due to the relative isolation of well heads, lack of permanent light sources and intermittent light sources limited to flaring.

The night time lighting impacts of Water Treatment Plants, Field Compressor Stations and Central Processing Plants is also considered to be low, even though these are the largest of the proposed structures and contain permanent sources of light. This is because the permanent lighting to these structures is limited to control room access lights that will not be dissimilar to lighting found at a farm house or shed. In additional to this, the Field Compressor Stations and Central Processing Plants will also be located in relatively isolated locations.

10.2.3 *Flaring*

Flares will be located at every CPP, FCS and wellhead. Flaring events may last between several minutes to three, other than pilot well flaring. The worst case scenario for flaring events will be up to five wells in one area, which may last up to three days. Shorter frequency flaring events may occur approximately twice a year for duration of approximately five minutes up to two hours.

Pilot well flaring may occur at approximately 300 wells over the entire gas field (470,000 ha) for up to six months per well. Pilot wells will typically be at least a kilometre apart.

Occasionally flaring will continue for three days and therefore will also occur at night, however it will be a relatively unusual occurrence that is also transitory and non-permanent.

Viewers may find the flares that occasionally occur to be a positive attribute in the landscape. Their unusual appearance can be an attractive element. However some viewers may find these unattractive and a reminder of the presence of this infrastructure near their dwelling or along a road on which they regularly travel.

However, at worst it is not considered that these short term events will create anything but a low level of visual impact.

10.3 *LIGHTING RECOMMENDATIONS*

The *Terms of Reference* seek a description of appropriate or available measures that may reduce the visual impact of lighting in the landscape.

10.3.1 *Construction lighting*

The preceding analysis has shown that the major visual impact caused by the project lighting will be during construction. This will be even more apparent in areas that currently contain few light sources.

There are no measures that can be implemented to mitigate this stage of the works. Visual mitigation measures in this time relate more to construction management practices, rather than landscaping options.

Where construction works are undertaken in heavily vegetated areas such as state forests, the effects of construction may be more noticeable as these areas have few existing light sources apart from the infrequent vehicle travelling down access roads at night. .

10.3.2 *Lighting post construction*

The greatest potential impact is on neighbouring properties to the Project where previously the views were to a night time landscape which had no artificial lighting.

The project description shows that most facilities will only have a small light adjacent to a switch that is used to control emergency / maintenance lighting. This larger and more visible form of lighting will only be visible in emergencies, and similar to the impact of construction, will be temporary and transient. Therefore the visual impact will be Low.

It is recommended that such a lighting solution, be utilised for all infrastructure that does not require 24 hour access and lighting for health and safety reasons.

11 CONCLUSION

In summary, this landscape and visual impact assessment demonstrates that the Project will have a generally low to negligible level of visual impact on the area within the viewshed. This conclusion is supported by:

The existing landscape

The Project is located in a flat landscape in which many areas have been extensively modified since European habitation. However large areas of remnant vegetation as well as vegetation in hedgerows, along property boundaries and road reserves and scattered vegetation within otherwise cleared paddocks, have clearly demonstrated that vegetation can easily screen infrastructure that is much larger than any proposed within the Upstream Components.

Visual impact to the surrounding road network

There is minimal visibility from major roads. The Moonie, Warrego and Leichardt Highway are the major roads within the region. Although there will be views from these two highways the overall impact is expected to be low due to the predominately low landscape sensitivity and limited viewing opportunities afforded by topography and vegetation.

Where Pipelines cross roads and highways at right angles, their visibility is also limited to only a very short section of the journey.

There will be a visual impact on viewers using the minor roads within the locality. Visibility from these minor roads, which have far fewer users than the highways and main roads, is sometimes restricted by roadside vegetation. It is considered that the visual impact will be low to negligible from these locations partly as the viewer numbers are low, but also because this rural landscape can absorb further change.

Visual impact from the forests and reserves

The majority of the areas located within forests and reserves are well covered by existing vegetation. This vegetation is dense and limits view to the immediate vicinity. Access to these forests is via an existing road network that cuts through the existing vegetation.

The recommendations both within this LVIA and the Flora and Fauna report seek to limit construction in these areas near to previously modified/cleared areas such as the existing access tracks. If this is achieved, views to the proposed infrastructure will be limited by the existing vegetation. Therefore the only visual impact will be in locations where there is existing visual change. Therefore the visual impact will be limited and is considered as having a low level of visual impact.

Visual impact to towns

Condamine is the only township within the Viewshed. No infrastructure is proposed in the vicinity of the township of Condamine.

Landscape Mitigation

Existing examples of large scale infrastructure have demonstrated that even the larger above ground structures can be visually accommodated into the surrounding landscape.

The analysis has also shown that where there are sensitive locations, landscape mitigation measures such as planting or retention of vegetation will assist to reduce or remove visual impacts.

Impacts of night time lighting

Although the Upstream Components are located in relatively remote locations there are some existing light sources within the viewshed including towns, and from vehicles using the the road and rail network as well as lighting associated with existing infrastructure.

There permanent light sources of the project are limited to control room access only. This lighting will be similar to existing lights found around existing farm houses and sheds already found in the landscape.

Because of the relatively remote location of the project components, there are few receptors of the intermittent lighting that may be associated with flaring of Well Heads, Field Compressor Stations and Central Processing Plants.

Annex A

Parameters of Human Vision

Appendix A PARAMETERS OF HUMAN VISION

The visual impact of a development can be quantified by reference to the degree of influence on a person's field of vision. The diagrams on the following pages illustrate the typical parameters of human vision. These provide a basis for assessing and interpreting the impact of a development by comparing the extent to which the development would intrude into the central field of vision (both horizontally and vertically).

Horizontal Field of View

Whilst the entire field of view may be greater than 180^{O}, The central field of view is between 50^{O} to 60^{O}. Within this angle, both eyes observe an object simultaneously. This creates a central field of greater clarity than that possible by each eye separately.

This central field of vision is termed the 'binocular field' and within this field images are sharp, depth perception occurs and colour discrimination is possible.

These physical parameters are illustrated in the figure opposite.

The visual impact of a development will vary according to the proportion in which a development impacts on the central field of vision. Developments, which take up less that 5% of the central binocular field, are usually insignificant in most landscapes (5% of 50^{O} = 2.5^{O}).

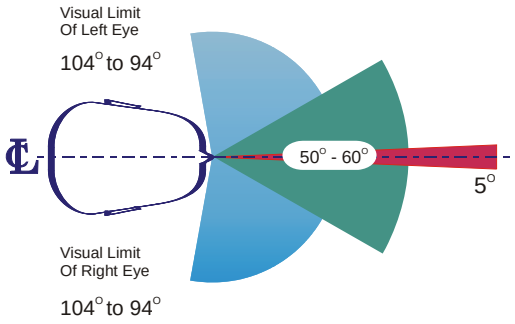


Figure A.1 Horizontal Field Of View

Vertical Field of View

A similar analysis can be undertaken based upon the vertical line of sight for human vision.

The typical line of sight is considered to be horizontal or 0^{O}. A person's natural or normal line of sight is normally a 10^{O} cone of view below the horizontal and, if sitting, approximately 15^{O}.

Objects, which take up 5% of this cone of view (5% of 10^{O} = 0.5^{O}) would only take up a small proportion of the vertical field of view, and are only visible when one focuses on them directly. However, they are not dominant, nor do they create a significant change to the existing environment when such short objects are placed within a disturbed or man-modified landscape.

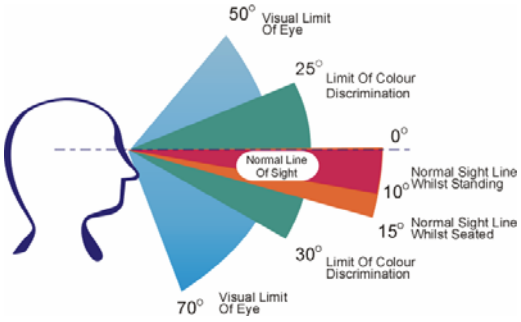


Figure A.2 Vertical Field Of View

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