Gas Transmission Pipeline Environmental Values and Management of Impacts

7.2 Climate

7.2.1 Introduction

This section discusses local climate characteristics, seasonal conditions and potential extreme climatic events including cyclones, flooding, drought and bushfires within the gas transmission pipeline corridor. Non climate associated hazards and risks are described in Section 10.

7.2.2 Existing Environmental Values

The climate for the gas transmission pipeline corridor ranges from an inland sub-tropical climate along the western section (within the CSG fields), with cold winters and hot summers; to the wet-dry regime characterised by high summer rainfall and dry winter conditions at the eastern extent on Curtis Island. The climate of the CSG fields and LNG facility study areas is described in detail within Sections 6.2 and 8.2 respectively.

This section considers the climate for the central area of the gas transmission pipeline corridor and utilises meteorological data collected at Biloela (a site operated by the Department of Primary Industries and Fisheries (DPIF)), and Thangool Airport and Baralaba Post Office (operated by the Bureau of Meteorology (BOM)). These sites are located approximately half way along the 435 km gas transmission pipeline corridor as shown in Figure 7.2.1, and indicate the local climatic conditions within this area of the pipeline corridor.

7.2.2.1 Temperature

Mean maximum temperatures range from 21.9 °C in July at Biloela DPIF to 34.4 °C in January at Baralaba Post Office. Mean minimum temperatures range from 5.2 °C in July at Biloela DPIF to 21.4 °C in January at Baralaba Post Office. This data is shown in Figure 7.2.2.

7.2.2.2 Rainfall and Evaporation

The sites at Biloela DPIF, Thangool Airport and Baralaba Post Office report similar annual rainfall statistics, averaging 661 mm, 683 mm and 709 mm respectively, as shown in Figure 7.2.3. The summer months (December to February) report the highest average monthly rainfalls (approximately 100 mm per month). Rainfall in the winter months (April to September) averages approximately 20 to 40 mm per month.

Evaporation records are only available for Biloela DPIF and Thangool Airport (Figure 7.2.4). Evaporation is highest from November through to February, with a mean daily potential evaporation rate of approximately 7 mm (approximately 210 mm per month). The winter months of June and July exhibit daily evaporation rates of approximately 3 mm (approximately 90 mm per month).

April and September are generally the driest months, as rainfall is low (with an average rate of about 40 mm and 20 mm respectively), and evaporation demand is reasonably high (averaging about 5 mm for April and 5.5 mm for September).

7.2.2.3 Relative Humidity

The monthly average relative humidity data (at 9 am and 3 pm) recorded at each of the sites within the gas transmission pipeline corridor is shown in Figure 7.2.5. Relative humidity is higher at 9 am, ranging from 50 % to 75% on average, and lower at 3 pm, ranging from 27% to 47%. This is primarily due to the low temperature in the morning and high temperature in the afternoon as the water holding capacity of the air increases with temperature. At most of the sites, relative humidity is higher in winter than in summer, with September and October (spring) reporting the lowest relative humidity levels. Of the three sites Thangool has the lowest relative humidity, with Baralaba slightly more humid than Biloela.



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Figure 7.2.2 Mean Monthly Maximum and Minimum Temperature at Sites Adjacent to the Gas Transmission Pipeline



Figure 7.2.3 Mean Monthly Rainfall at Sites Adjacent to the Gas Transmission Pipeline







Figure 7.2.5 Mean Monthly Relative Humidity (%) at 9 am and 3 pm at Sites Adjacent to the Gas Transmission Pipeline

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7.2.2.4 Wind

Figure 7.2.6 presents the monthly average wind speed at 9 am and 3 pm for Thangool and Baralaba monitoring locations (Biloela has not been included as complete data is not available for the same time period). For both sites, monthly average wind speed ranges from 1.6 m/s to 3.1 m/s, with a site average of 2.7 m/s for Thangool, and 2.2 m/s for Baralaba.

These stations do not record the wind direction at 9 am and 3 pm. Since the pipeline has no regular release points, no air quality modelling was undertaken for the pipeline (see Section 7.8) and therefore no site-specific wind data were modelled for the area. Typical wind directions will change along the pipeline route, according to large-scale synoptic weather conditions as well as local effects of terrain. The main wind direction does not affect the management of the pipeline construction, operation or decommissioning aside from normal considerations of dust management to avoid impacts at nearby receptor locations.



Figure 7.2.6 Mean Monthly Wind Speed (M/S) at 9 am and 3 pm at Sites Adjacent to the Gas Transmission Pipeline

7.2.2.5 Atmospheric Stability and Mixing Height

Atmospheric stability and mixing height are parameters that impact the atmosphere's ability to dilute air pollution. Because of the nature of the gas transmission pipeline, which is a linear infrastructure over 435 km in length from the Santos CSG fields near Roma to the GLNG facility on Curtis Island and the fact that mid-line compression has not been included in the proposed project, air quality impacts from the gas transmission pipeline are expected to be minor. Hence the exercise of conducting meteorological modelling to extract information on atmospheric stability and mixing height is not necessary. Sections 6.2 and 8.2 provide information on the atmospheric stability and mixing height for the CSG fields and LNG facility respectively.

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7.2.2.6 Extremes of Climate

Extremes of climate include droughts, floods and cyclones. The gas transmission pipeline corridor experiences drought and flood conditions close to major rivers, and has the potential to experience cyclones and storm surge within the Gladstone area. The Environment Management Plan (EMP) will address the effects extremes of climate may have on pipeline construction. Each of these potential extremes of climate and their relevance to the pipeline corridor is described below.

Drought

Drought affected areas are declared by the Commonwealth Department of Agriculture, Fisheries and Forestry as areas of "Exceptional Circumstances" (EC). EC comprise weather conditions based on historical records that are rare, severe and prolonged occurring only once in every 20 - 25 years (DAFF, 2009) which includes exceptionally high temperatures, low rainfall and low soil moisture (Hennessey et al., 2008).

EC declared areas cover the majority of the gas transmission pipeline corridor and include the EC districts of Duaringa-Bauhinia, a declared area which includes a smaller proportion of the Fairview CSG fields, and the Burnett district extending between Biloela and Calliope near Gladstone. The extent of drought declared land within the pipeline corridor is shown as part of the entire GLNG Project area in Figure 7.2.7.

Floods

The major rivers along the gas transmission pipeline corridor include the Calliope River and the Brown and Dawson Rivers, which form part of the Fitzroy River Catchment. Other minor tributaries include the Bell, Kroombit, Banana, Kianga, Callide, Mimosa, Conciliation, Zamia, Clematis, Spring, Arcadia and Baffle Creeks.

A summary of the two major river catchments is provided below with further detail provided in Section 6.5.

Calliope River Catchment

The Calliope River flows eastward from the Calliope Range for approximately 100 kilometres, entering Port Curtis just to the north of Gladstone (DNRW, 2007). The gas transmission pipeline traverses the Calliope river catchment as the pipeline tracks into Gladstone and onto Curtis Island. The catchment is bounded by the Calliope Range to the west and the Mt Larcom Range to the north. Tributaries of the Calliope River are generally ephemeral and rely on episodic rainfall, with major flows occurring with large wet season rainfall events (Connell Wagner, 2004).

Fitzroy River Catchment

The Dawson and Brown Rivers discharge into the Fitzroy River, which enters marine waters near Rockhampton. The Dawson River catchment extends upstream and westwards from Taroom, encompassing the townships of Injune and Wandoan. The catchment contains extensive but largely ephemeral or intermittent stream networks.

The Arcadia Valley, Denison, Comet Ridge and Mahalo CSG field areas are located within the Comet-Brown sub-catchment, extending from the Carnarvon Ranges north to Emerald. Major flooding requires a large scale rainfall situation over the vast Fitzroy River catchment. The following can be used as a rough guide to the likelihood of flooding in the catchment:



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Flood potential within the Fitzroy catchment generally corresponds with rainfall events in excess of 200 mm (48 hours), with potentially significant moderate to major flooding likely to occur, particularly in the middle to lower reaches of the Dawson River catchment downstream of Taroom (BOM, 2008b). The Fitzroy River at Rockhampton has a long and well documented history of flooding, with flood records dating back to 1859. The highest recorded flood occurred in January 1918 and reached 10.11 m (Rockhampton gauge). The most recent flood event for the Fitzroy River was in 2008 and caused flooding within Emerald. The second largest flood on record registered 15.36 m on the Emerald gauge (BOM, 2008).

Bushfires

The climatic factors which exert most influence over conditions conducive to the generation of bushfires are temperature, winds and humidity (BOM, 2009). A combination of high temperature, high winds and low humidity increases fire danger, particularly in spring. In the period between winter and summer, the fuel is very dry from the lack of rainfall during the winter months, and the temperatures increase.

While the gas transmission pipeline will be buried to a sufficient depth to withstand impacts of bushfires, there are facilities associated with the pipeline which will be above ground (refer to Section 3.7.2.2 for further details). The exact location of these facilities has not yet been determined within the pipeline corridor; however the corridor traverses the following local government areas (LGAs): Roma Regional Council, Central Highlands Regional Council, Banana Shire Council, Dalby Regional Council and Gladstone Regional Council. The Rural Fire Service and Queensland Fire and Rescue Service (RFS, 2009) modelled the bushfire risk in these LGAs based on factors of slope, aspect and vegetation, and have developed risk maps for use in planning. Bushfire risks for the gas transmission pipeline were assessed against these RFS maps for its entire length. The pipeline corridor commences within the Fairview CSG field which lies within extensive areas of medium to high bushfire risk before entering the Arcadia valley, which is predominantly of low bushfire risk. As the pipeline tracks to the north east towards Gladstone, the bushfire risk is predominantly low with small areas of medium bushfire risk until the pipeline reaches Biloela. As the pipeline extends from Biloela to Gladstone the pipeline passes through mostly low and medium bushfire risk areas. The pipeline corridor in relation to assessed bushfire risk is depicted in Figures 7.2.8 to 7.2.10.

Bushfire management strategies include the provision of water supply for fire fighting, especially near project buildings, as well as creating an asset protection zone of at least 20 m to minimise fuel load, especially in medium to high risk bushfire hazard areas.

7.2.3 Potential Impacts and Mitigation Measures

The climatic conditions including rainfall patterns vary considerably over the length of the gas transmission pipeline corridor. Generally the entire region is prone to periodic high intensity rainfall events which may give rise to locally severe surface sheet, rill and gully erosion, particularly in areas that have been cleared and prepared for pipeline construction. The impact of erosion along the pipeline right-of-way (ROW) will vary considerably over the entire length of the pipeline, depending on the soil type, the general surface slope and form and the topographic position in the landscape with respect to the potential for surface water run-on and runoff. Erosion potential and management strategies to minimise sediment loss from disturbed areas along and adjacent to the gas transmission pipeline easement is addressed in Section 7.3 of this EIS and in Appendix L2.

Natural hazards are not considered a major risk for the gas transmission pipeline corridor. However, both flood and drought events may become an issue at some point during the expected life of the gas transmission pipeline. These issues are considered further in Section 7.5. Additionally, an emergency management plan (which will address all foreseeable site specific risks such as fire and flooding including appropriate contact details of emergency services agencies) will be incorporated into the project EMP. The risk of natural hazards is considered as part of the business risk management process, with appropriate controls and monitoring under an emergency management plan being a fundamental part of the risk management (refer Section 10). The impact of sea level rise at the eastern end of the gas transmission pipeline corridor is discussed in Section 8.7.







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