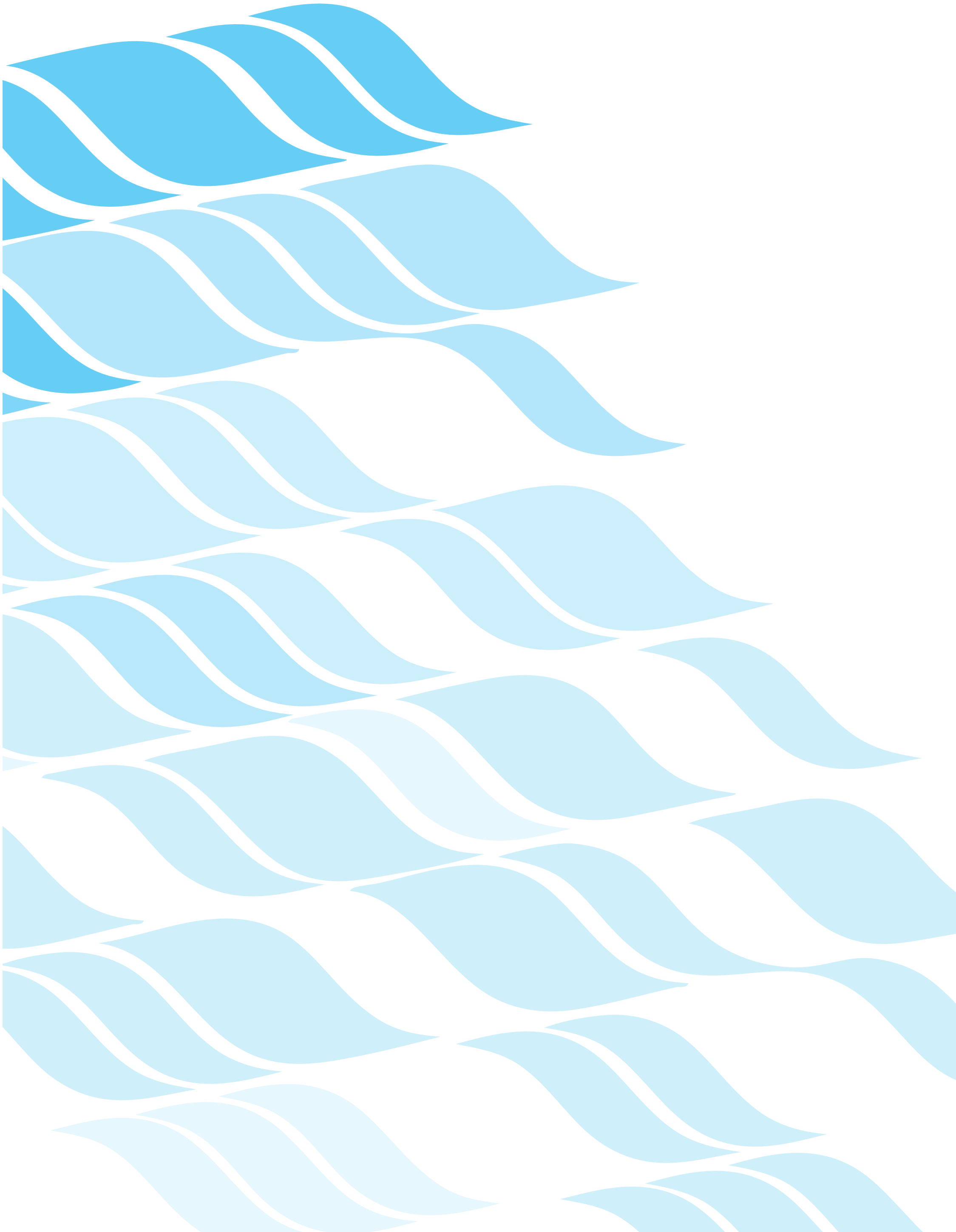
CHAPTER 10

GLADSTONE – FITZROY PIPELINE PROJECT

Environmental Impact Statement

Air Environment

Gladstone Area Water Board



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10.1 Introduction

Air quality studies are concerned with the presence or absence of airborne pollutants. This chapter outlines the baseline or existing air quality situation in the project area and assesses the potential changes to local air quality arising from the Gladstone-Fitzroy Pipeline project (the project).

The potential changes to air quality have been considered in relation to the standards set out in the *National Environment Protection (Ambient Air Quality) Measure* (referred to as the Air NEPM)[1]. Reference is also made to the Queensland Air Quality Goals as set out in the *Environmental Protection (Air) Policy 1997* (referred to as the EPP (Air))[2].

Greenhouse gases are considered separately to other pollutants.

This chapter considers the construction, operation and maintenance of the project and is divided into the air quality assessment and the greenhouse gas assessment. Issues considered include:

- Whether there is any impact from dust or emissions from construction machinery
- Whether gaseous emissions will occur from power sources at the Fitzroy River intake, water treatment plant (WTP) and pump stations and if so their impact
- Whether the water treatment process itself is likely to have any impact on air quality
- An assessment of the greenhouse gas emissions from construction and operation of the project.

[1] *National Environment Protection (Ambient Air Quality) Measure*, as amended, National Environment Protection Council, 7 July 2003

[2] *Environmental Protection (Air) Policy 1997*, *Environmental Protection Act 1994*, Queensland Government, reprinted as in force on 5 May 2006

10.2 Methodology

10.2.1 Approach to the air quality assessment

The air quality assessment of the proposed development comprises:

- A review of existing air quality in the area
- Site visit and onsite identification of sensitive receptors
- Assessment of the potential changes in air quality, including nuisance dust, arising from the construction and operation of the project
- Assessment of potential impacts of the operation of the WTP on sensitive receptors
- Formulation of mitigation measures, where appropriate, to minimise any adverse effects on air quality
- Identification of likely residual effects and assessment of significance of these effects, following application of any outlined mitigation measures.

The methodology for the greenhouse gas assessment is included in Section 10.2.2.

The existing air quality situation has been reviewed through data available from the Queensland Environmental Protection Agency (EPA). Data reviewed includes annual summary and trend reports for Queensland, air quality bulletins for Central Queensland and air quality monitoring data for the Gladstone area (see Section 10.5).

Construction impacts have been assessed through a qualitative assessment of potential sources of air pollutant emissions from construction activities and through the formulation of appropriate mitigation and control measures, which are also included in the Planning Environmental Management Plan (EMP) (see Chapter 20, Planning Environmental Management Plan). Guidance for such measures has been taken from the *Australian Pipeline Industry Association (APIA) Code of Environmental PrActice – Onshore Pipelines* (APIA 2005).[3]

Operational impacts on air quality associated with the Fitzroy River intake, WTP and pump stations, and maintenance of the pipeline have also been considered.

Any nuisance impacts from the WTP on nearby sensitive receptors have been assessed semi-quantitatively. The assessment considered the distance of sensitive receptors from the potential emission source (WTP) and the frequency with which emissions may be carried towards these sensitive receptors.

The significance of residual air quality effects has been assessed using the criteria presented in Table 10.1. These criteria have been applied to both the construction and operational effects.

[3] *Code of Environmental Practice – Onshore Pipelines*, The Australian Pipeline Industry Association Ltd., Revision 1 October 2005

Table 10.1 Air Quality (excluding greenhouse gases) Impact Significance Criteria

Significance	Air Emissions
Major adverse	These effects are likely to be important considerations at a regional or local scale and are also potential concerns to the project, depending upon the relative importance attached to the air quality during the decision-making process. Mitigation measures and detailed design for construction work are unlikely to remove all of the effects upon the affected communities or interest. Major detrimental effect on local air quality, in relation to short-term and long-term local air quality standards (*National Environment Protection (Ambient Air Quality) Measure* (Air NEPM) and Qld Air Quality Goals as set out in EPP (Air) 1997).
Moderate adverse	These effects, while important on a local scale, are not likely to be key decision-making issues. They represent issues where effects will be experienced, but mitigation measures and detailed design for construction work may ameliorate/enhance some of the consequences upon affected communities or interests. Some residual effects will still arise. Moderate detrimental effect on local air quality, in relation to short-term and long-term local air quality standards (Air NEPM and Qld Air Quality Goals).
Minor adverse	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in the detailed design for construction phase of the project and consideration of mitigation or compensation measures. Minor detrimental effect on local air quality, in relation to short-term and long-term local air quality standards (Air NEPM and Qld Air Quality Goals).
Not significant/negligible	No appreciable impact on local air quality with effects beneath levels of perception, within normal bounds of variation or within the margin of forecast error.
Slight beneficial	Slight beneficial effect on local air quality, in relation to short-term and long-term local air quality standards (Air NEPM and Qld Air Quality Goals).

Pollutants

The pollutants considered in the air quality assessment are:

- Nuisance dust
- Particles as PM_{10}
- Odour
- Oxides of nitrogen (NO_x)
- Carbon monoxide (CO).

Nuisance Dust

Dust is the generic term to describe particulate matter in the size range 1 to 75 µm in diameter. Dust nuisance is the result of the soiling of surfaces by excessive rates of dust deposition. There are currently no standards for the nuisance of dust in Queensland or in Australia, nor are formal dust deposition standards specified. This reflects the uncertainties in dust monitoring technology and the highly subjective relationship between deposition events, surface soiling and the perception of such events as a nuisance.

Nuisance dust is assessed qualitatively in relation to the impacts of dust generation from construction activities on the project.

The following project activities have the potential to cause nuisance dust:

- Excavation, drilling, trenching and other earthworks
- Removal of vegetation
- Cutting, grinding and sawing
- Use of unpaved haul roads, particularly in dry and/or windy conditions
- Transportation of uncovered loads on vehicles.

Particles as PM_{10}

Particles originate from a wide variety of sources, including natural sources such as bushfires, living vegetation, dust storms and sea spray. Particles are also generated through anthropogenic activities such as forestry and agricultural activities, motor vehicles, power plants and industry. Particulate matter can also be formed when gases such as nitrous oxides and sulfur dioxide, react in the atmosphere.

Particles of less than 10 µm (0.01 mm), referred to scientifically as PM_{10}, are considered a pollutant as they are easily inhaled into human lungs, potentially damaging health. The wide range of sources of particles means that their physical and chemical characteristics are also widely varied.

The impact of particles as PM_{10} is assessed here in terms of emissions from construction and maintenance-related vehicles, and from pump station operations (including those at the WTP).

Odour

Odour can originate from a wide variety of sources, including agriculture (especially animal husbandry), fires, natural biological processes, vegetation, watercourses and the marine environment, as well as from motor vehicles and other machinery, and from industry.

As odour must be perceived in order to be a nuisance, the impact of odour is assessed in relation to residential receptors surrounding the proposed WTP and pump stations.

Odour may be detected at surrounding sensitive receptors if:

1. Odours are released from the WTP or pump sites in sufficiently high concentrations
2. These odours are carried towards sensitive receptors (i.e. by wind)
3. There is insufficient dispersion to dilute the odours to a concentration that cannot be detected by the human nose.

Generally, water treatment, comprising treatment of water with chemicals and production of waste, should not be a significant source of offsite odour if properly managed. Likewise, pump stations are very unlikely to produce any significant offsite odour. Only if anaerobic conditions are permitted to develop in the water treatment processes or water storage is any significant, perceptible effect likely to be generated. Further, even if anaerobic conditions do develop, contrary to the design and intended operation of the WTP, the odour must be released (which will only occur where they are moved or otherwise disturbed), they must fail to be contained or controlled, and they must travel toward sensitive receptors without being diluted beyond perceptible levels.

There are a number of difficulties in assessing odour impacts. For example, the unpleasantness of any odour is highly subjective and the olfactory response decreases with concentration. The perceived intensity of a smell rapidly decreases after initial exposure in a phenomenon known as olfactory fatigue or self-adaptation. Another difficulty is the wide variation in the sensitivity of individuals, i.e. an odour that might be undetectable by one person might be considered to smell unbearably by another.

The significance and resulting impacts of odour emissions to the atmosphere depends on the type, concentration and level of the emissions, proximity of sensitive receptors to the emission source and prevailing meteorological conditions.

Oxides of Nitrogen (NO_x)

Oxides of nitrogen principally comprise nitric oxide (NO) and nitrogen dioxide (NO_2). Oxides of nitrogen (NO_x) may be formed from the oxidation of nitrogen in fuel during combustion processes or from the reaction of atmospheric nitrogen and oxygen at high temperatures. The majority of NO_x is emitted from combustion processes as NO (typically over 90 percent), that rapidly oxidises to NO_2 in ambient air. Health-related standards for NO_x (as outlined in Section 10.4.1 below) generally relate to NO_2.

Exposure to elevated levels of NO_2 can lead to respiratory problems, inflaming the lining of the lungs and airways. It can also exacerbate symptoms in people with pre-existing conditions such as asthma or heart disease.

NO_2 also contributes to the formation of photochemical smog, which can also impact human health.

The impact of oxides of nitrogen is assessed from construction and maintenance-related vehicle activity and any occurrence at the pump stations (including those at the WTP).

Carbon Monoxide (CO)

Carbon monoxide is created when carbon in fuels is not combusted fully. Globally, motor vehicles contribute a significant proportion of ambient carbon monoxide concentrations to the atmosphere.

Carbon monoxide is a pollutant Of Concern as it reduces the oxygen-carrying capacity of the blood, can aggravate pre-existing cardiovascular disease and in very high doses can be fatal. Typical ambient concentrations of carbon monoxide in Australia are not high enough to be hazardous to human health.

The impact of carbon monoxide is assessed, also from construction and maintenance-related vehicle activity and any occurrence at the pump stations (including those at the WTP).

10.2.2 Approach to the Greenhouse Gas Assessment

There is a significant body of evidence that suggests the increase of 'greenhouse' (heat-absorbing) gases in the atmosphere has resulted in a warming of the global climate during the previous century. Predictive work indicates that this warming will accelerate in the future due to continued anthropogenic (i.e. caused by humans) greenhouse gas emissions.

The greenhouse gas assessment of this project involves comparison of emissions from the existing activities in the project area (Baseline Scenario) to emissions from construction (Construction Scenario) and emissions from operations of the pipeline infrastructure (Operational Scenario).

For the Baseline Scenario, vegetation mapping was used to identify the different uses within the project area (the general 30 m right-of-way (ROW) that is to be cleared). The land uses applied to the Baseline Scenario included cattle grazing for areas with low levels of vegetation and no grazing activity in areas with medium to high levels of vegetation. Emissions associated with cattle grazing activities were calculated in accordance with the *Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2006: Agriculture* published by the Australian Greenhouse Office.

For the Construction Scenario, emissions were calculated from:

- Changes in vegetation cover - Vegetation cover was estimated from aerial photographs. It was assumed that all vegetation in the construction site was removed during construction
- Soil disturbance - It was assumed that 40 percent of the carbon stored in organic content of soil excavated for the pipeline and associated infrastructure would be released to the atmosphere
- Fuel consumption from onsite plant and equipment including earthmoving machines and trucks, small plant and equipment and onsite generators
- Fuel consumption from delivery of materials and movement of personnel to and from the site
- Electricity used for site sheds and commissioning of the pumping and control systems
- Embodied energy of materials used in the construction phase including steel, concrete, timber, asphalt, non ferrous metals, sand and gravel, road base, plastics and glass
- Waste generated by construction activities.

For the Operational Scenario, emissions were calculated from:

- Changes in vegetation cover including revegetation of construction areas that were cleared but not paved or built upon
- Soil disturbance and accumulation of soil carbon including the accumulation of organic carbon matter in the soil after revegetation
- Fuel consumption from onsite plant and equipment including fuel associated with vegetation management and other small plant and equipment used to maintain the pipeline and associated treatment plant
- Fuel consumption from delivery of materials and movement of personnel to and from the site, including removal of residue from WTP
- Electricity used for on-site equipment (primarily pumping)
- Embodied energy of materials consumed within the WTP, including treatment chemicals, paint, grease and oils, herbicides and pesticides
- Waste generated by operational activities.

The greenhouse gas assessment has used accounting methodologies consistent with those outlined within the Commonwealth Department of Climate Change's *National Greenhouse Accounts Factors* (January 2008). This method is consistent with assessment of greenhouse gas emissions in accordance with international requirements in the Kyoto Protocol.

In order to determine the significance of the greenhouse gas emissions associated with the construction and operation of the project, the significance criteria in Table 10.2 were developed. These criteria relate the greenhouse gas emissions from the project to the key global, national, state and sectoral greenhouse gas emissions.

Table 10.2 Greenhouse Gas Assessment Significance Criteria

Significance Criteria	Impact	Determinant
Major Adverse	Irreversible and severe impact in comparison to national emissions. Mitigation measures are unable to reduce impacts	Emissions exceed 5% of national greenhouse gas emissions
High Adverse	Emissions are significant in comparison to national emissions. Mitigation measures and detailed design for construction work are unlikely to remove all of the significant effects	Emissions exceed 5% of national greenhouse gas emissions
Moderate Adverse	Emissions are significant in comparison to state emissions. Some recovery is anticipated following completion of the works concerned. Mitigation measures anticipated to alleviate some impacts	Emissions exceed 5% of state greenhouse gas emissions
Minor adverse	Emissions are significant in comparison to State Industrial Process Sectoral emissions. Close to full recovery is anticipated following completion of the works concerned. Mitigation measures anticipated to alleviate close to all impacts	Emissions exceed 5% of state Industrial Process Sectoral greenhouse gas emissions
Negligible	Emissions are within the normal bounds of variation or within the margin of forecasting error for State Industrial Process Sectoral emissions. Significant mitigation strategies can be applied	Emissions are less than 5% of the State Industrial Process Sectoral greenhouse gas emissions
Beneficial	Project results in net reduction of emissions	

10.3 Assumptions and Limitations

10.3.1 Assumptions

The air quality assessments in this chapter are based on the following assumptions:

- It is assumed that, given the nature of the project, most air quality impacts will be relatively short-lived impacts associated with the construction phase of the project
- For the same reasons, it is not possible to precisely model the operational air quality impacts of maintenance of the pipeline and associated infrastructure
- Broad estimates on the types and approximate numbers of vehicles required in relation to the construction and operation of the project have been made. These have been used in the process of estimating the likely impact on the air environment from the project
- It is assumed that the intake, WTP and pump stations will all be powered by electricity provided by an external energy supplier
- The preferred location for the WTP is south of and approximately 2.5 km from the intake site
- It is assumed that there will be some drying of residue from the water treatment process and that if, contrary to design and intended operation, anaerobic conditions were to occur, some gases (e.g. hydrogen sulfide, H_2S) could be created
- It is assumed that the main chemicals to be used in the water treatment process will be normal water industry options (e.g. polyaluminium chloride, sodium hypochlorite or equivalents) and are not likely to cause odour. It is also assumed that the selection of treatment chemicals will not include dangerous or corrosive gases such as chlorine gas.

For the Greenhouse Accounting processes, there have also been a number of assumptions made in order to estimate the emissions associated with the project.

In the Baseline Scenario, it was assumed that all cleared areas within the ROW were growing native pasture grasses, which are not intensively maintained or subject to pasture improvement programs. The cattle grazing on the pastures were assumed to be Bos Indicus steers and it was assumed that 3.5 ha of land was available for each head of cattle.

In the Construction Scenario, assumptions were made on the quantity of materials used in the project. These assumptions are based upon the design as of March 2008. There may be some adjustments to materials quantities in the final design, however, the material estimation approach used has erred on the conservative side to avoid underestimation. Similarly, estimates for soil movement and vegetation removal are likely to be higher than the actual occurrences during construction to maintain a conservative estimation approach.

In the Operation Scenario, conservative estimates of chemical use and operating of plant and equipment may have overestimated the emissions profile of the project.

Throughout this assessment, emissions from the project have been calculated and reported in units of tonnes of carbon dioxide equivalent emissions (tCO_2-e). This is consistent with accounting methodologies used throughout Australia and is also consistent with international treaties such as the Kyoto Protocol. Where emissions factors are used to estimate emissions, the factors used were first sourced from the *Australian National Greenhouse Accounts Factors* (January 2008). If the factors needed were not available from that source, as was the case with many embodied energy factors for materials, national and internationals sources were used as required.

10.3.2 Limitations

The limitations associated with the air quality assessment include:

- Assessment of the construction phase is entirely qualitative as it is not possible to model these types of impacts effectively. Construction impacts are dependant on a great number of variables, including the number of plant required, operation methods of plant and maintenance and condition of plant amongst other factors
- Assessment of the operational phase is also entirely qualitative as it too depends on a great number of variables
- Air monitoring data does not exist for the entire route. It is assumed that where monitoring has not taken place pollutant levels can be reasonably expected to be well below Air NEPM standards
- Air quality monitoring has not been undertaken for the purposes of the project. A minimum of six to 12 months of monitoring would be required at numerous points along the 115 km route to provide relatively representative data of the area.

The limitations associated with the greenhouse gas assessment include:

- The greenhouse gas emissions estimations for this project are based upon preliminary design information available at the time of preparing this report. Operational activities are similarly based upon estimated quantities. The results of this analysis are intended to inform decisions about the environmental impact of the project in construction and operation and are not intended to be used to estimate operating costs or any other related issue
- It should be noted that this analysis has included greenhouse gas emissions from land use change, changes in vegetation, soil disturbance and embodied energy of materials. These are all sources of emissions that are not required to be calculated or reported under most existing voluntary and regulated greenhouse gas programs. These include the Greenhouse Challenge Plus program, the Energy Efficiency Opportunities program and the *National Greenhouse and Energy Reporting* Act *2007 (*NGER Act*)*. The analysis presented in this report is therefore likely to differ from data collected and reported under these programs in the future.

10.4 Relevant Legislation and Policy

10.4.1 Federal

National Climate Change Policy

The Australian Government has set a target to achieve an average of 108 percent of 1990 levels of greenhouse gas emissions by the period 2008 to 2012 (see Kyoto Protocol treaty; http://www.environment.gov.au/minister/wong/2008/pubs/mr20080311.pdf).

In 2008, the Government will set a long-term aspirational goal, over a minimum of 30 to 40 years, for reducing greenhouse gas emissions. It is anticipated that such an emissions goal will provide favourable conditions for low emissions technologies to advance.

National Greenhouse Strategy

The National Greenhouse Strategy provides an over-arching framework with three key goals:

- Reducing national greenhouse gas emissions
- Advancing knowledge and understanding of climate change and greenhouse gas issues
- Initiating climate change adaptation.

All States and Territories have individual implementation plans for applying actions as identified in the National Greenhouse Strategy (see Queensland Strategy).

National Greenhouse and Energy Reporting Act

The NGER Act establishes a single, national system for reporting greenhouse gas emissions, abatement actions, and energy consumption and production by corporations from 1 July 2008.

Data reported through the system will underpin the Australian Emissions Trading Scheme. The ability to monitor, report and verify businesses' emissions data will be essential for maintaining the environmental and financial integrity of the trading system.

Key features of the system are:

- A single online entry point for reporting based on the Online System for Comprehensive Activity Reporting (OSCAR)
- A standard data set and nationally consistent methodologies for reporting
- Public disclosure of company level greenhouse gas emissions and energy data
- Consistent and comparable data provided to government for policy making
- Secure data storage
- Reporting thresholds that avoid capturing small business.

It should be noted that the Greenhouse Gas emissions calculations carried out here include many emissions that are not reportable under the new NGER Act. Also, these calculations were carried out prior to the release of new NGER Act 2007 regulations, released on 24 June 2008.

Energy Efficiency Opportunities Act

The *Energy Efficiency Opportunities* Act *2006* took effect on 1 July 2006 (with an amendment in March 2007). It aims to improve the identification and evaluation of energy efficiency opportunities by large energy-using businesses and, as a result, to encourage implementation of cost effective energy efficiency opportunities.

In order to achieve its aim, the Act requires large energy using businesses to:

- Undertake an assessment of their energy efficiency opportunities to a minimum standard in order to improve the way in which opportunities are identified and evaluated
- Report publicly on the outcomes of that assessment in order to demonstrate to the community that those businesses are effectively managing their energy.

The Act outlines the broad requirements for large energy-using businesses, and allows for regulations to provide detailed requirements for assessment, reporting, verification and other elements of the program.

National Environment Protection Measures

NEPMs are broad framework-setting statutory instruments defined in the *National Environment Protection Council (Queensland)* Act *1994*. NEPMs outline agreed national objectives for protecting or managing particular aspects of the environment. There are two NEPMs relevant to this project, comprising:

- Ambient Air Quality NEPM
- National Pollutant Inventory NEPM.

Ambient Air Quality NEPM[1]

The Air NEPM sets out national air quality standards and goals for six different pollutants. These standards aim to ensure clean ambient air that allows for the adequate protection of human health.

The Air NEPM is a regulatory requirement similar to the environmental policies under the Queensland *Environmental Protection and Biodiversity* Act *1994*.

The pollutants Of Concern in the Air NEPM are:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO_2)
- Photochemical oxidants (as ozone) (O_3)
- Sulfur dioxide (SO_2)
- Lead (Pb)
- Particles as PM_{10} (particles of 10µm equivalent aerodynamic diameter or less).

This chapter addresses carbon monoxide, nitrogen oxide and particles as PM_{10}, as these are the main pollutants Of Concern from road vehicle emissions.

Some pollutants have standards expressed as annual average concentrations due to the chronic way in which they affect human health (i.e. effects occur after a period of prolonged exposure to elevated concentrations) and others have standards expressed as 24-hour, eight-hour, four-hour and one-hour average concentrations due to the acute way in which they affect health (i.e. after a relatively short period of exposure). Some pollutants have standards expressed in terms of both long-term and short-term concentrations (e.g. nitrogen dioxide and photochemical oxidants).

Particles as $PM_{2.5}$ (particles of 2.5µm equivalent aerodynamic diameter or less) have advisory standards and goals (shown in Table 10.4) as sufficient data needs to be gathered nationally to enable a review of the potential health impacts of $PM_{2.5}$ and the suitability of the proposed standards.

Table 10.3 and Table 10.4 set out these national air quality standards for the pollutants relevant to this chapter.

Table 10.3 Relevant Standards and Goal for Pollutants Other than Particles as $PM_{2.5}$

Pollutant	Averaging period	Maximum concentration	Goal within 10 years* Maximum allowable exceedences
Carbon monoxide	8 hours	9.0 ppm	1 day per year
Nitrogen dioxide	1 hour	0.12 ppm	1 day per year
	1 year	0.03 ppm	None
Particles as PM_{10}	1 day	50 µg/m^3	5 days per year

** From 7 July 2003*

Table 10.4 Advisory Reporting Standards and Goal for Particles as $PM_{2.5}$

Pollutant	Averaging period	Maximum concentration	Goal
Particles as $PM_{2.5}$	1 day	25 µg/m^3	Goal is to gather sufficient data nationally to facilitate a review of the Advisory Reporting Standards as part of the review of this measure which has commenced.
	1 year	8 µg/m^3	

Performance against these objectives is monitored where people are regularly present and might be exposed to air pollution. It is the responsibility of the Queensland EPA to carry out this monitoring.

National Pollutant Inventory (NPI) NEPM[4]

The National Environment Protection goals established by the NPI NEPM are to assist in the reduction of existing and potential impacts of emissions of pollutants. They are also in place to assist government, industry and the community in achieving the desired environmental outcomes of the NEPM by providing a basis for:

- The collection of a broad base of information on emissions of substances to air, land and water on the publicly available reporting list
- The dissemination of information collected to all sectors of the community in an accessible and transparent form.

The NEPM requires industrial facilities to report emissions of 90 different substances when emissions are deemed to be above threshold levels. Individual substance emissions are reported as total mass of pollutant emitted on an annual basis. The reported emissions from each facility are compared against the maximum emission of that substance from all of the facilities reported on the NPI, on a scale of 1 to 100 (from lowest to highest) – if the total emissions of a substance is 10 percent of the maximum reported to the NPI, the emission ranking would be 10; if the total emission is 95 percent of the maximum, the ranking would be 95. A score of 100 would mean that the facility in question is the highest facility emitter of that substance.

10.4.2 State

Environmental Nuisance Laws[5]

In 2000, the *Environmental Protection Regulation 1998* (Qld) (*EP Regulation)* was amended to include part 2A, Environmental Nuisance, which includes offences for release of dust from construction or clearing activities and provisions for serving nuisance abatement notices on parties creating nuisance dust.

Environmental Protection (Air) Policy 1997

The *Environmental Protection (Air) Policy* (EPP (Air)) sets out a schedule of maximum ambient pollutant concentrations for various substances. These substances include oxides of nitrogen (NO_x), particulates (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3) and lead (Pb).

Emissions of these pollutants are required to be controlled to ensure the standards are not breached. Discharges to atmosphere are administered through licence conditions for Environmentally Relevant Activities under the *EP Regulation*.

Emissions of pollutants not covered by this policy are covered by the Air NEPM.

From January 2007, however, air pollutant concentrations in central Queensland have been measured against the Air NEPM (see Table 10.3 and Table 10.4).

State Interest Planning Policy for Air Quality in Planning Schemes

The Queensland EPA's *State Interest Planning Policy for Air Quality in Planning Schemes* (Air Quality SIPP) outlines the EPA's interests in terms of air quality as a planning matter in Queensland. The Air Quality SIPP interprets existing EPA legislation, policies, strategies and plans in planning terms.

The key aim of the Air Quality SIPP is to "protect or enhance Queensland's air quality while allowing for ecologically sustainable development". The objectives of the Air Quality SIPP are to ensure that valuable features of the air environment are identified in planning schemes and to protect and enhance the air environment through the setting of objectives and assessment provisions in planning schemes.

Recommended Buffer Distances for Industrial Residual Air Emissions[6]

The Queensland EPA in the *Odour Impact Assessment from Developments Guideline*[7] adopts the Victorian EPA requirements on buffer distances.

The Victorian EPA document *Recommended Buffer Distance for Industrial Residual Air Emissions*, provides buffer distances for various industrial activity types from sensitive land uses, such as residential zones, schools and hospitals. The recommended buffer distances are presented as sufficient to "protect" sensitive land uses from emissions of dust, odour or other pollutants in an unintended or accidental emission scenario. Such an event may be caused by equipment failure, accidents or abnormal weather conditions, causing adverse impacts to sensitive land uses beyond project boundaries.

The Victorian EPA document does not provide any buffer distances for water treatment plants. Water treatment plants are rarely considered likely to be sources of emissions, as is the case in this project.

4 *National Environment Protection (National Pollutant Inventory) Measure*, as varied June 20 2000, National Environment Protection Council, June 2000

5 Part 2A Environmental Nuisance, *Environmental Protection Regulation 1998*, *Environmental Protection* Act *1994*, Reprint No 6B, Queensland Government, Reprinted as in force 1 July 2007

6 Recommended Buffer Distances for Industrial Residual Air Emissions, EPA Victoria, July 1990

7 Odour Impact Assessment from Developments Guideline, Queensland Government Environmental Protection Agency 2004

Rockhampton City Plan

The *Rockhampton City Plan* states that a Desired Environmental Outcome of the Plan is to minimise "air quality impacts that cause environmental harm or detrimentally effect residential amenity, by implementing measures to control emissions, whether they be air contaminants such as dust and particulate matter or odour emission, or the like, such that they do not extend beyond the boundaries of the site".

Fitzroy Shire Council Planning Scheme

One of the Desired Environmental Outcomes of the *Fitzroy Shire Council Planning Scheme* is that "air quality is maintained or enhanced while allowing for ecologically sustainable development".

Calliope Shire Council Planning Scheme

The *Calliope Shire Council Planning Scheme* states that development should not adversely affect the Shire's natural environment. This desired environmental outcome is to be achieved, amongst other means, via the protection, maintenance and enhancement of air resources for its "health and amenity implications and clean air for its greenhouse implications".

10.5 Baseline

10.5.1 Air Quality

This section defines the baseline air quality environment for the assessment and provides a review of:

- Existing air pollution sources in the area
- Local meteorological conditions
- Background monitoring data for the area
- Sensitive receptors that may potentially be impacted by the project.

Existing or baseline ambient air quality refers to the concentration of relevant substances that are already present in the environment. These substances come from various sources, such as industrial processes, commercial and domestic activities, traffic and natural sources. This section describes the existing ambient air quality situation between Fitzroy and Gladstone.

The following data sources have been reviewed in this assessment:

- Queensland EPA website
- Air Quality Bulletins for Central Queensland January 2006 to June 2007
- Ambient Air Quality Monitoring in Queensland: 2005 Annual Summary and Trend Report*
- Ambient Air Quality Monitoring in Queensland: 2004 Annual Summary and Trend Report
- Fine Particle Levels in Gladstone: Review of EPA Air Monitoring Data 2001 to 2006
- Queensland 2005 Air Monitoring Report
- Queensland 2004 Air Monitoring Report
- Queensland 2003 Air Monitoring Report
- Enertrade Central Queensland Gas Pipeline Environmental Impact Statement, October 2006
- National Pollutant Inventory website[8]
- Australian Greenhouse Office website[9]
- Bureau of Meteorology website[10].

10.5.1.1 Fitzroy to Bajool

Air Pollution Sources

Given the rural nature of the project area, the likely air pollutant sources between Fitzroy and Bajool are not significant. Ambient particulate contributions are likely to be most significant from agricultural activities, bushfires and managed vegetation-burning practices in the area. Dry conditions with little rain are also likely to cause an increase in ambient particulate levels, as dust is easily mobilised in dry conditions.

Desktop research has identified that Rockhampton is home to 15 industrial plants which report to the NPI. These include industries such as cement and magnesia production, which could contribute to particulate levels in the area. A search of the NPI for postcode 4700, Rockhampton, indicates that the top pollutant emission in Rockhampton from industrial sources is carbon monoxide (approximately 110,000 kg/year) primarily from the rail transport industry. This is followed by total emissions of chlorine of 29,000 kg/year from the water supply sewerage and drainage services and public order and safety services and 42,000 kg/year of total nitrogen from the water supply sewerage and drainage services.[11]

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* Note that the 2006 and 2007 Ambient Air Quality Monitoring Summary and Trend Reports were not available at the time of writing.

8 www.npi.gov.au

9 www.greenhouse.gov.au

10 www.bom.gov.au

11 http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2006;loc_type=postcode;loc_postcode=4700

For the 4702 postcode, which includes Alton Downs, Midgee and Gracemere, the NPI indicates that there are 29 facilities reporting emissions from 21 different industry types. From these facilities the top pollutants by emissions are recorded as being oxides of nitrogen (at 45 million kg/year), sulfur dioxide (at 36 million kg/year) and particulates (at 19 million kg/year). The main industrial emitters of these pollutants are the electricity production industry and coal mining and mineral product manufacturing.[12]

The NPI indicates that for the 4699 postcode, which includes Bajool, there is just one facility reporting to the Inventory and eight sources of emissions. Pollutants include total nitrogen (8,200 kg/year) and total phosphorus (4,000 kg/year) primarily from agricultural activities.[13]

Stanwell Power Station is approximately 22 km west of Rockhampton and 20 km west of the project boundary. This is a coal-fired power station and as such is likely to contribute to ambient particulate levels. Stanwell Power Station is also likely to be a significant contributor to greenhouse gas emissions in the area.

Aside from point emission sources, road traffic from the Bruce Highway (A1) is likely to contribute to ambient particulate concentrations, nitrogen dioxide, ground level ozone and carbon monoxide concentrations. Road traffic also contributes to greenhouse gas emissions in the area.

Local Climate

The rate at which pollutants disperse depends on prevailing meteorological conditions.

The Rockhampton to Gladstone region is classified as a subtropical climate zone, according to the Koppen climate classification system, characterised by a hot, humid summer and low winter rainfall. Median annual rainfall is in the range 650 to 1200 mm.[24]

Dispersion of atmospheric pollutants, nuisance dust and nuisance odour is particularly dependant upon wind direction and speed. Wind direction determines the broad transport of an emission and the general direction in which an emission is dispersed, and wind speed determines the initial dilution of pollutants. Dust nuisance impacts may be greatest during strong winds or turbulent conditions resulting in higher emissions of wind blown dust and increased distances that dust may be transported offsite. Gaseous nuisance, conversely, is often exacerbated during light wind conditions that result in poor dispersion.

[12] http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2006;loc_type=postcode;loc_postcode=4702

[13] http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2006;loc_type=postcode;loc_postcode=4699

The closest EPA wind monitoring station to the Fitzroy to Bajool section of the project area is at Rockhampton. The predominant wind directions in Rockhampton are from the southeast and east, at a frequency of around 35 to 40 percent of the time. Wind speeds are usually in the 10 to 20 km/h range.[14] Figure.10.1 and Figure.10.2 below show annual average wind roses for Rockhampton.

Air Quality Monitoring

At present no air quality monitoring is carried out in the Rockhampton area as the EPA considers that pollutant levels are reasonably expected to be below the relevant NEPM standards.[15]

PM_{10} monitoring was previously carried out in Parkhurst, northeast of Rockhampton, approximately 10 km east of the proposed intake site. Monitoring ceased at this site in October 2004 after a decision to discontinue the use of one-in-six day PM_{10} high volume air samplers across the entire monitoring network. There are no other EPA monitoring stations in this section of the project area.

Background Pollutant Concentrations

During monitoring at Parkhurst station in 2004 there were no recorded exceedences of the 24-hour average or annual average goals as set out in the EPP (Air). The maximum 24-hour average PM_{10} level recorded at Parkhurst in 2004 was 20.6 µg/m^3 and 95th percentile of 17.8 µg/m^3. This is well under the EPP (Air) 24-hour average goal of 150 µg/m^3. The annual recorded average for PM_{10} was 11.7 µg/m^3. This is also well below the EPP (Air) annual average PM_{10} goal of 50 µg/m^3.

This monitoring data is not entirely representative of the existing air environment surrounding the proposed pipeline route and sensitive receptors in the vicinity given the rural setting of the proposed intake site and the proposed pipeline. PM_{10} levels along the pipeline route are therefore likely to be lower than those recorded in Parkhurst.

In 2001 and 2002 dry and consequently dusty conditions were responsible for an increase in PM_{10} concentrations at Rockhampton.[16]

[14] http://www.bom.gov.au/cgi-bin/climate/cgi_bin_scripts/windrose_selector.cgi

[15] Queensland 2005 Air Monitoring Report, Environment technical report No. 60, Queensland Government Environmental Protection Agency, 29 June 2006

[16] Ambient Air Quality Monitoring in Queensland , 2004 annual summary and trend report, Queensland Government Environmental Protection Agency, 12 August 2005

Figure.10.1 Annual Average Wind Rose for Rockhampton (9am data)

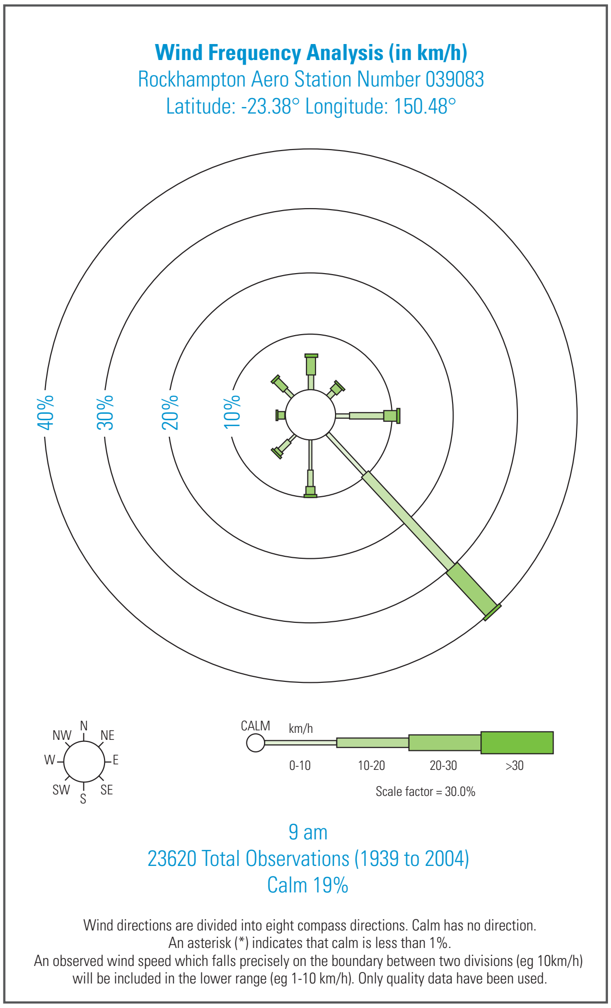
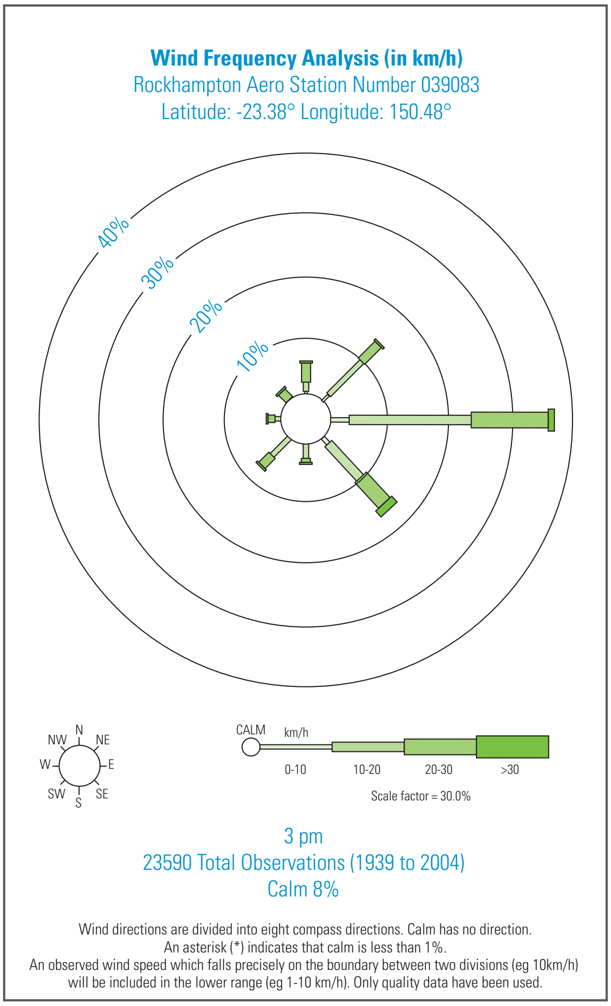


Figure.10.2 Annual average wind rose for Rockhampton (3pm data)



Sensitive Receptors

This chapter considers the impact of nuisance dust emissions. Large dust particles (more than 10 µm) can cause a nuisance within a construction site and outside the boundary of works by deposition on properties and cars. Smaller particles (less than or equal to 10 µm or PM_{10} size) are able to be carried further beyond the construction site boundary, causing not only nuisance by deposition, but potentially impacting the health of construction workers and people living and working in the vicinity.

This chapter also considers the impact of fugitive dust emissions from construction vehicles. Beyond 200 m, the contribution of vehicle emissions to local pollution levels is not significant[17].

Approximately 10 sensitive receptors located within 200 m of the proposed pipeline route have been identified in the section from Fitzroy to Bajool. All of these receptors are rural residential properties.

[17] UK Highways Agency 2007. Design Manual for Roads and Bridges, Environmental Assessment Techniques, Air Quality.

10.5.1.2 Bajool to Gladstone

Air Pollution Sources

As with the Fitzroy to Bajool section, the Bajool to Gladstone section is in a primarily rural setting meaning agricultural activities and bushfires and managed burning practices are likely to contribute significantly to ambient particulate concentrations in this area.

There are two facilities reporting to the National Pollutant Inventory at Marmor. These facilities are cement and lime manufacturing and the production and refining of sea salt, which produces negligible emissions to the atmosphere. The cement and lime manufacturing facility emits three key pollutants: oxides of nitrogen (32,000 kg/year), particulates (30,000 kg/year) and carbon monoxide (21,000 kg/year). These are considered low-level emissions for these types of pollutants on the NPI ranking of substance emissions in comparison with the maximum emissions of these substances from all facilities reported on the NPI.[18]

[18] http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2006;loc_type=postcode;loc_postcode=4699

The NPI indicates that the 4697 postcode (Raglan) has similar pollutant sources as the Bajool area, i.e. agricultural activities and pollutant types (total nitrogen and total phosphorus). Pollutant emissions are recorded as being much lower in the Raglan area with total nitrogen emissions estimated at being 25 kg/year and total phosphorus 12 kg/year.[19]

The Mt Larcom area (postcode area 4695) has just two facilities reporting to the NPI: a gas pipeline check meter station emitting negligible amounts of volatile organic compounds (VOCs); and a limestone mining and crushing facility emitting 340,000 kg/year of particulates, 24,000 kg/year of carbon monoxide and 16,000 kg/year of oxides of nitrogen.[20]

The Yarwun area (postcode area 4694) has six facilities reporting to the NPI. These facilities include gas pipeline and metering with negligible emissions of VOCs, inorganic industrial chemical manufacture (with emissions of oxides of nitrogen (160,000 kg/year) being the greatest pollutant emission from the facility), oil shale processing (with manganese and compounds (580 kg/year) being the main pollutant emitted), alumina refining and cement and lime manufacturing.[21]

The alumina refining facility has relatively low emissions of oxides of nitrogen (530,000 kg/year), carbon monoxide (110,000 kg/year), sulfur dioxide (400,000 kg/year) and particulates (98,000 kg/year). The alumina refinery also has what is considered by the NPI to be relatively high emissions of formaldehyde (170,000 kg/year) and medium-level emissions of chromium (VI) compounds (1,400 kg/year).

The cement and lime manufacturing facility contributes emissions of 3.3 million kg/year of oxides of nitrogen, 1.1 million kg/year of carbon monoxide and 87,000 kg/year of particulates to the airshed. These emissions are also considered relatively low in comparison with the maximum emissions of these substances from all facilities reported on the NPI.

Gladstone, which lies approximately 6 km to the southeast of the end of the project at Yarwun, houses 28 facilities which report to the NPI, most of which fall under the Basic Non-Ferrous Metal Manufacturing and Electricity Supply categories. The top three pollutants by volume emitted from these facilities include carbon monoxide (68 million kg/year), oxides of nitrogen (51 million kg/year) and sulfur dioxide (45 million kg/year). Emissions of particulates in the Gladstone area from the 28 facilities are around 1.9 million kg/year.[22]

Local Climate

See Section 10.5.1.2 above for a general description of the region's climate.

The EPA monitoring station in Gladstone is the closest station to the Bajool to Gladstone section of the study area. The predominant wind directions in Gladstone, as with Rockhampton, are also from the southeast (am) and east (pm), at a frequency of around 30 to 40 percent of the time. Wind speeds are slightly higher than those recorded in Rockhampton, usually being in the 20 to 30 km/h range.[23]

Annual average wind roses for Gladstone are shown in Figure 10.3 and Figure 10.4.

Air Quality Monitoring

The EPA carries out monitoring at three sites in the Gladstone region:

- South Gladstone
- Clinton
- Targinie.

Between June 2006 to June 2007, there were no recorded exceedences of the NEPM standards for the four key pollutants monitored (nitrogen dioxide, sulfur dioxide, ozone and particulates) across the three monitoring sites in the Gladstone area.

Background Pollutant Concentrations

An investigation carried out by the Queensland EPA in 2007[24] states that particles as PM_{10} in Gladstone have been experiencing an overall downward trend since 2001 and that industrial particulate emissions (both PM_{10} and $PM_{2.5}$) did not exceed air quality standards. It was reported that exceedences only occurred during events such as dust storms and bushfires.

The same report states that there is a direct correlation between higher levels of particles as PM_{10} and winds blowing from the direction of major industrial particle sources (within 2 km of the monitoring stations).

Table 10.5 provides monitored data for nitrogen dioxide, sulfur dioxide and particles for the South Gladstone, Clinton and Targinie monitoring sites.

19 http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2006;loc_type=postcode;loc_postcode=4697

20 http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2006;loc_type=postcode;loc_postcode=4695

21 http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2006;loc_type=postcode;loc_postcode=4694

22 http://www.npi.gov.au/cgi-bin/npireport.pl?proc=location_detail;instance=public;year=2006;loc_type=postcode;loc_postcode=4680

23 http://www.bom.gov.au/climate/averages/tables/cw_039326.shtml

24 Fine Particle Levels in Gladstone Review of EPA Monitoring Data 2001 – 2006, State of Queensland Environmental Protection Agency, 2007

Figure 10.3 Annual Average Wind Rose for Gladstone (9am data)

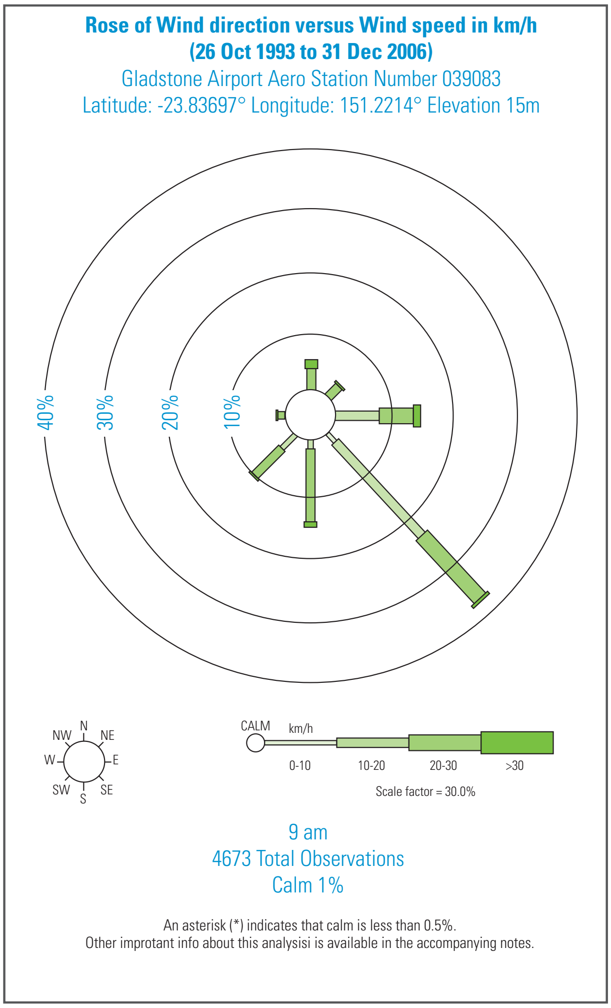


Figure 10.4 Annual Average Wind Rose for Gladstone (3pm data)

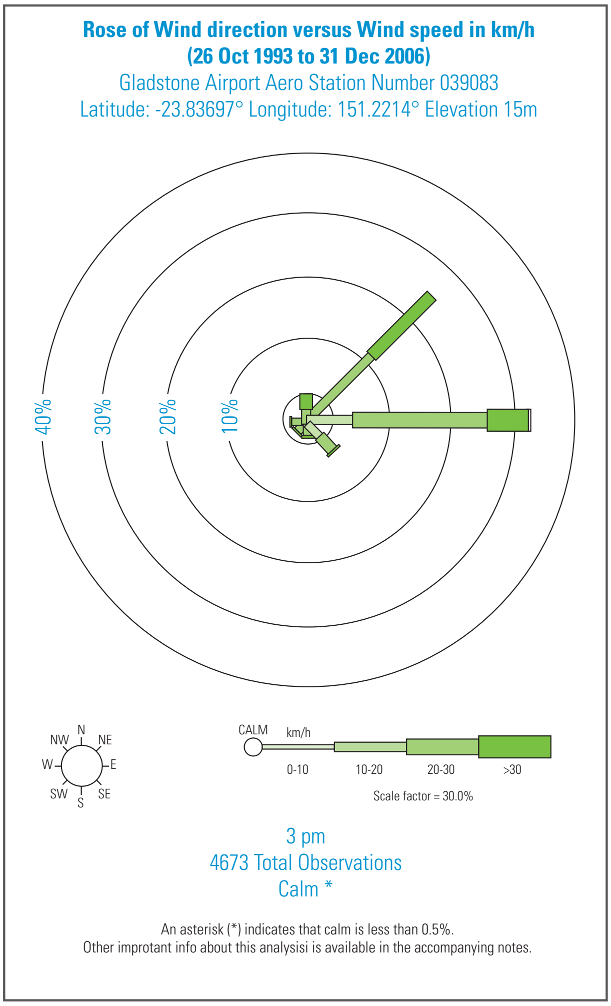


Table 10.5 Ambient Concentrations of Monitored Pollutants in Gladstone, June 2006–July 2007[25]

Site	NEPM standard	Annual average	Maximum 24-hour average	Maximum 1-hour average
Nitrogen Dioxide (ppm)				
South Gladstone	0.03 ppm (annual average) 0.12 ppm (1-hour average)	0.004	n/a	0.035
Clinton		0.004	n/a	0.038
Targinie		0.004	n/a	0.038
Sulfur Dioxide (ppm)				
South Gladstone	0.02 ppm (annual average) 0.08 ppm (24-hour average) 0.2 ppm (1-hour average)	0.003	0.021	0.075
Clinton		0.001	0.009	0.073
Targinie		0.002	0.009	0.045
Particles as PM_{10} (µg/m³)				
South Gladstone	50 µg/m³ (24-hour average) (not to be exceeded on more than 5 days per year)	16.6	54.6*	n/a
Clinton		15.6	53.0*	n/a
Targinie		14.4	78.6*	n/a

* *Did not occur for more than five days*

[27] Air Quality Bulletin Central Queensland, Queensland Government, July 2007

Sensitive Receptors

Approximately four sensitive receptors within 200 m of the edge of the ROW have been identified in the Bajool to Gladstone section. All of these are residential properties.

10.5.2 Greenhouse Gas Baseline Assessment

The desktop baseline assessment of greenhouse gas emissions from the existing activities in the project area using the methodology described in Section 10.2.2 has considered that the areas of the project area covered with light vegetation are currently used for cattle grazing. The baseline emissions for current land use activities were estimated to be 130 t CO_2-e per annum. These emissions are mainly from enteric fermentation of methane in cattle.

10.6 Impact Assessment

This section provides an assessment of the potential impacts to the air environment from the project. It provides an assessment of:

- Construction-phase impacts with regard to emissions from site vehicles and other associated traffic
- Construction-phase impacts in terms of nuisance dust
- Operational-phase impacts with regard to associated vehicle emissions
- Operational-phase impacts in terms of nuisance dust
- Operational-phase impacts in terms of odour
- Construction and operational phase greenhouse gas emissions.

10.6.1 Air Quality Impacts

Atmospheric emissions from construction activities will depend on a combination of the potential for emission (the type of activities), meteorological conditions and the effectiveness of control measures. In general terms, there are two sources of emissions that will need to be controlled to minimise the potential for adverse environmental effects:

- Exhaust emissions from site plant, equipment and vehicles
- Fugitive dust emissions from site activities.

The operation of vehicles and equipment powered by internal combustion engines results in the emissions of exhaust gases containing the pollutants NO_x, PM_{10}, VOCs and CO. The quantities emitted depend on factors such as engine type, service history, pattern of usage and composition of fuel. While the operation of site equipment, vehicles and machinery would result in emission to the atmosphere of unquantified levels of waste exhaust gases, such emissions are unlikely to be significant.

Atmospheric emissions from construction activities will depend on a combination of the potential for emission (the type of activities) and the effectiveness of control measures.

The traffic effect of construction of the project would be along existing public roads and the traffic routes employed by haulage vehicles, construction vehicles and personnel. The principal construction activities with transportation implications are:

- Delivery and movement of pipeline materials
- Delivery of heavy plant
- Trenching and backfilling activities
- Movement of heavy plant and equipment
- Movement of personnel to and from site
- Delivery of fuel to site
- Removal of cleared vegetation
- Removal of any contaminated soil
- Grading of access roads for the WTP, pump stations or storages
- Delivery of concrete (premix) for construction of the WTP, pump stations or storages
- Delivery of scaffolding, timber and other materials for construction of the WTP, pump stations or storages.

Entry to the construction site for labour and vehicles will be by dedicated access points only. Dust from construction traffic could have an impact on neighbouring or nearby occupiers if not properly controlled, but appropriate mitigation measures will be able to reduce these impacts (see Section 10.7).

Fugitive dust emissions from construction activities are likely to be variable and would depend on the type and extent of activity being carried out, soil conditions (soil type and moisture), road surface condition and weather conditions. Conditions, and therefore soils, tend to be drier in the winter months in Central Queensland and periods of dry weather combined with higher than average winds have the potential to generate the most dust. The construction activities that are the most significant potential sources of fugitive emissions are:

- Earth moving, due to the excavation, handling, storage and disposal of soil and sub-soil materials
- Clearing of vegetation
- Transport, unloading, storage and use of dry and dusty materials (such as cement powder and sand)
- Movement of heavy site vehicles on dry untreated or hard surfaced roads
- Movement of vehicles over surfaces contaminated by muddy or dusty materials brought off the site over public roads
- Delivery of concrete (premix) for construction
- Delivery of scaffolding, timber and other materials for construction of the WTP, pump stations or storages
- Delivery of pumps and other equipment
- Removal of rock in the pipeline trench or at key sites such as Aldoga (blasting would increase the likelihood of dust nuisance if it was required).

Fugitive dust arising from construction activities is generally of particle size greater than PM_{10} (the human-health based, respirable size). Fugitive dust relates to the amount of dust falling onto and soiling surfaces (or rate of dust deposition) and PM_{10} to the concentration of dust in suspension in the atmosphere.

Fugitive dust has a limited ability to remain airborne and readily drops from suspension as a deposit. Research undertaken for the United States Environmental Protection Agency (US EPA) concluded that large particulate matter (particles over 30μm in diameter), return to the surface quite rapidly. Under generally accepted average wind conditions (mean wind speed of 2 to 6 m/sec or approximately 7 to 21 km/h), these particles, which comprise around 95 percent of total dust emissions were found to return to the surface within 60 to 90 m of the emission source[26].

If not effectively controlled, fugitive dust emissions can lead to dust nuisance. Most of the dust emitting activities outlined above respond well to appropriate dust control. Adverse effects can be greatly reduced or eliminated through the application of such measures (see Section 10.7).

The sensitivity of different land uses and facilities to dust can be categorised from low to high. Examples are shown in Table 10.6.

[26] Cowheard et al.,1990. Control of Fugitive and Hazardous Dusts, Pollution Technology Review, Noyes Data Corporation.

Table 10.6 Examples of Dust Sensitive Land Uses

High sensitivity	Medium sensitivity	Low sensitivity
• Hospitals and clinics • Hi-tech industries • Painting and finishing • Food processing	• Schools • Residential areas • Food retailers • Greenhouses and nurseries • Horticultural land • Offices	• Farms • Light and heavy industry • Outdoor storage

In determining the significance of the construction effects on the air environment there are a number of factors to be considered. These can assist in determining the level of risk of exposure to pollutants associated with the proposed site construction activities. These are considered below.

Existing Environment

The project area is in a largely rural setting with a limited number of residential properties in close proximity (less than 200 m) to the project. The project is in close proximity to some sensitive habitats, as discussed in Section 10.6.2.

Scale of Construction Activity

Construction activity will be confined to the ROW and site boundaries for above ground infrastructure, including clearing of the ROW and trenching for the pipeline being carried out ahead of the laying of the pipe.

Construction activities will be of limited duration. The construction of the pipeline itself is anticipated to take around eight months to a year, including clearing and backfilling operations. The WTP is anticipated to have the longest construction time at around two years, with storages and pump stations likely to be over lesser periods but still greater than one year.

Potential for Fugitive Emissions

There is a significant possibility for fugitive emissions to be generated from the construction process due to the type of works carried out and the current dry conditions. These will be able to be controlled, as described in Section 10.7.

Potential for Construction Site Traffic Emissions

There will be emissions from construction vehicles during the construction phase however the number of vehicles involved in construction are not expected to have a significant impact on local air quality.

Potential for Off-road Plant Emissions

The project is not likely to generate a significant level of off-road plant emissions, as a result of pump stations, generators or other plant at the site.

Potential for Discharge of Toxic Fumes or Dangerous Substances

It is not anticipated that there will be any contaminants onsite with the potential to discharge toxic fumes or dangerous substances.

Ambient (Baseline) Air Pollution Levels

Air quality standards are currently met in the project area.

Prevailing meteorology

Dust nuisance can arise if there is a source of dust emissions and an exposure pathway to receptors. Nuisance is more likely to occur during high wind speed conditions (wind speeds of greater than 5 m/s or approximately 18 km/h) as dust from a stationary source is more likely to become airborne during strong winds with turbulence and remain airborne over greater distances with the potential to reach sensitive locations.

10.6.1.1 Fitzroy to Bajool

Construction Impacts

Sensitive Receptors

The dust sensitive land uses within the vicinity of the project between Fitzroy and Bajool are medium and low-sensitivity land uses:

- Residential properties
- Dry-land agricultural production and plantations
- Irrigated agriculture production and plantations
- Production from relatively natural environments (further classified as grazing)[27].

Approximately ten sensitive receptors were identified within 200 m of the ROW in this section of the study area.

For strong winds in the Rockhampton area, the prevailing wind direction is southeasterly based on 9am data (4 percent) to easterly, based on 3pm data (4 percent), meaning that the greatest air quality effects, including dust nuisance, will occur to the west/northwest of the project.

Receptors to the west/northwest of the project between Fitzroy and Bajool are therefore likely to be most affected. However these receptors are generally at distances greater than 100 m from the project works and are therefore likely to experience minimal nuisance from fugitive dust emissions.

The frequency of strong winds is presented in Figure 10.5 and Figure 10.6.

[27] As defined in Queensland Land Use categories 1999Australian Land Use and Management (ALUM) Classification,

Figure 10.5 Wind Rose with Wind Speeds Greater than 5 m/s for Rockhampton (9am data) (BoM 2007)[28]

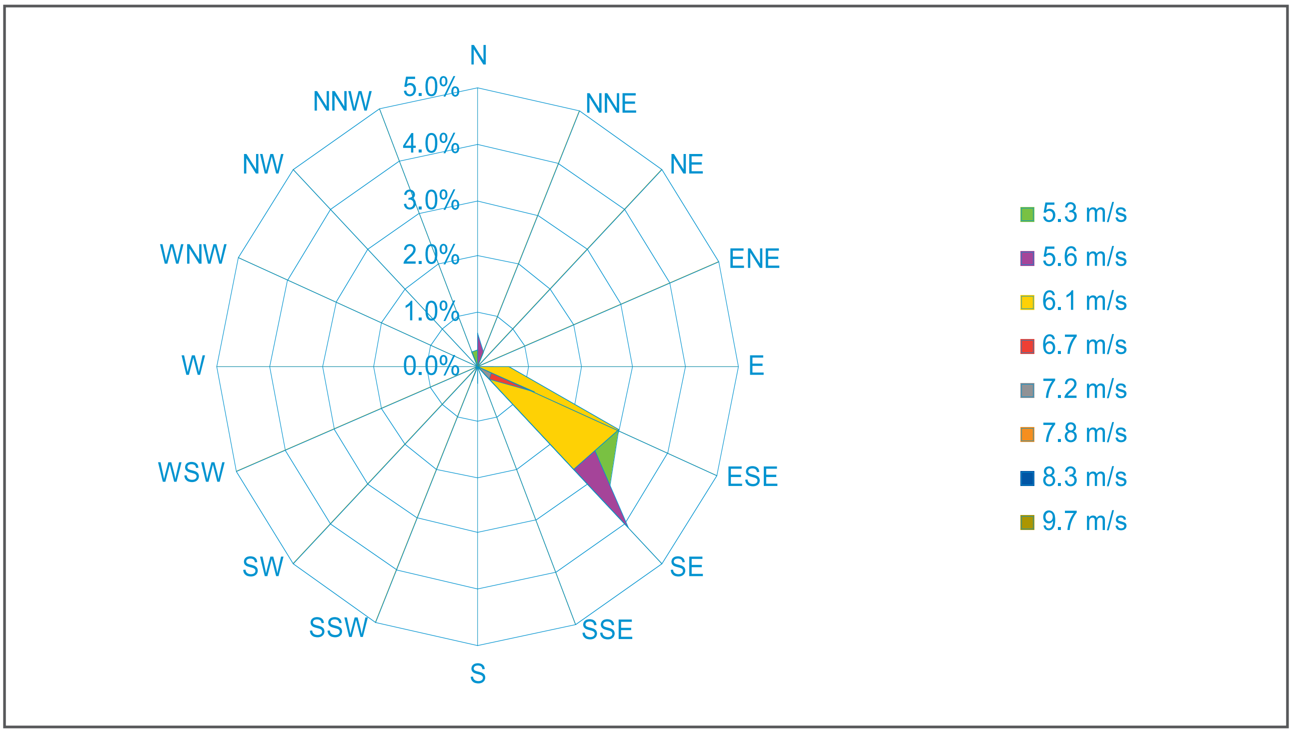
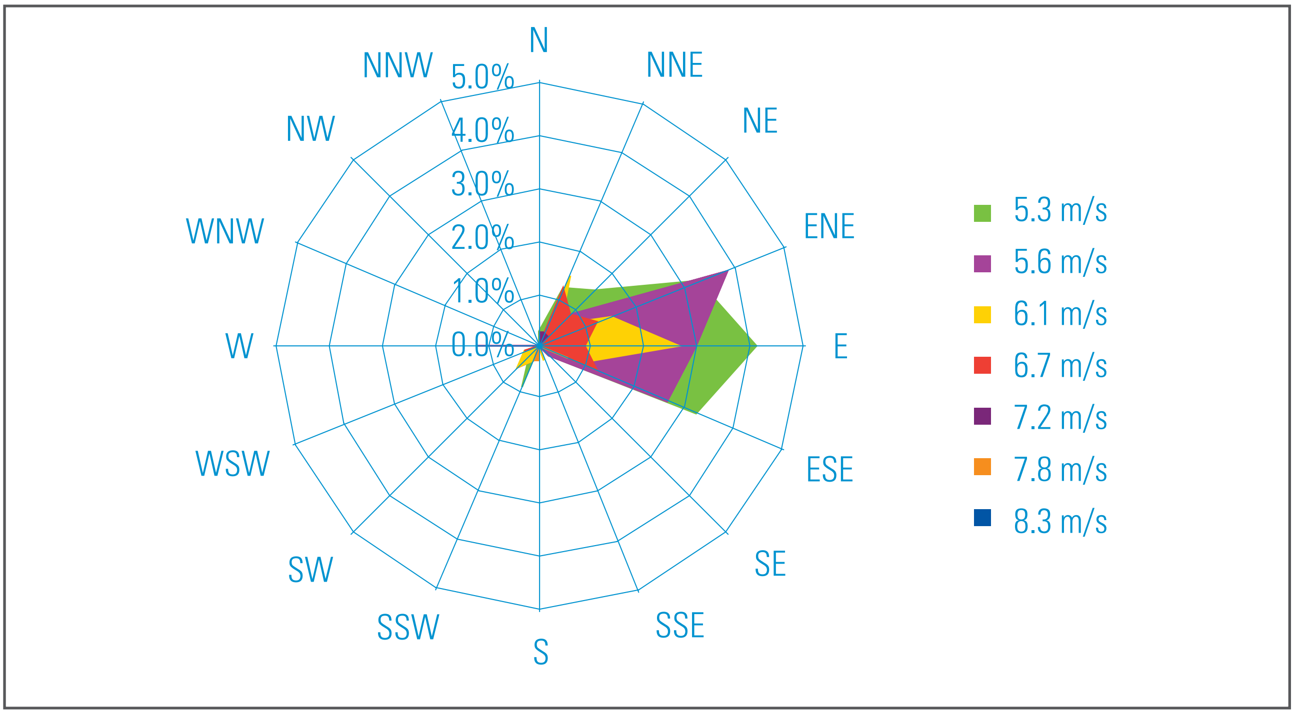


Figure 10.6 Wind Rose with Wind Speeds Greater than 5 m/s for Rockhampton (3pm data)[28]



[28] http://www.bom.gov.au/climate/dwo/IDCJDW4102.latest.shtml - data from November 2006 to November 2007

Flora and Fauna

Nuisance dust can also impact upon flora, fauna and their habitats. There are a number of sensitive habitats in the vicinity of the project area, such as:

- Wetlands, including habitat for Rare and Migratory species (discussed further in Chapter 6, Terrestrial Flora and Chapter 8, Aquatic Flora and Fauna)
- Locally significant habitat corridors (discussed further in Chapter 7, Terrestrial Fauna)
- The Fitzroy River, including preferred habitat for fish species of conservation and fisheries significance, potential habitat for Fitzroy River Turtle and Estuarine Crocodile (discussed further Chapter 8, Aquatic Flora and Fauna).

Operational Impacts

The main effects during the operational phase will be from vehicles travelling to, from and along the project for maintenance purposes, with respect to the pipeline and pump stations and for day-to-day operational purposes, with respect to the WTP. Vehicle movements will comprise employees, delivery and service vehicles. This includes truck movements for the transport of residue from the WTP.

The numbers of vehicles that are likely to be required for the operation and maintenance of the project have been approximated (see Chapter 13, Transport and Access Arrangements). However, given the number of vehicles and that the majority of roads traversed are sealed, the effects of these traffic movements on local air quality (with regard to gaseous emissions and entrainment of nuisance dust) are not likely to be significant.

In terms of emissions from operation of the WTP, pump stations and intake, these are all anticipated to be powered via overhead cables with no power production on site, therefore producing no direct emissions in the vicinity of the project. There are not anticipated to be any other significant gaseous pollutant emissions from the project.

Odour

The WTP is the only site with potential for this type of emission.

However, as detailed in Section 10.2.1.1, the conditions under which any potential problem could arise would be outside design and intended operational parameters.

Further, if the location of the WTP is to the south of the intake site, and given the prevailing direction of strong winds in the Rockhampton area, nuisance is likely to be minimal even in the rare circumstances in which it could occur. The nearest sensitive receptors are residential properties greater than 175 m from the WTP site and odour impacts are considered very unlikely.

10.6.1.2 Bajool to Gladstone

Construction Impacts

Sensitive Receptors

Dust sensitive properties in the vicinity of the project between Bajool and Gladstone are also medium and low-sensitivity land uses:

- Residential properties
- Production from relatively natural environments (further classified as grazing land
- Production from irrigated agriculture and plantation.

Approximately four sensitive receptors have been identified between 100 m and 200 m of the project in this section of the project area.

For strong winds in the Gladstone area, the prevailing wind direction is southeasterly based on 9am data (4 percent to northeasterly, based on 3pm data (6 percent), meaning that the greatest air quality effects, including dust nuisance, will occur to the northwest to southwest of the project works. All four receptors have potential to be in the path of strong prevailing winds carrying dust from construction activities on the project. However, the distances of these receptors from the project construction works indicates that nuisance dust is not likely to have a significant effect. Adverse effects from nuisance dust will be managed thorough appropriate mitigation measures.

The frequency of strong winds (wind speeds of greater than 5 m/s), which can increase the likelihood of nuisance dust occurring, is presented in Figure 10.7 and Figure 10.8

Figure 10.7 Wind Rose with Wind Speeds Greater than 5 m/s for Gladstone (9am data)[29]

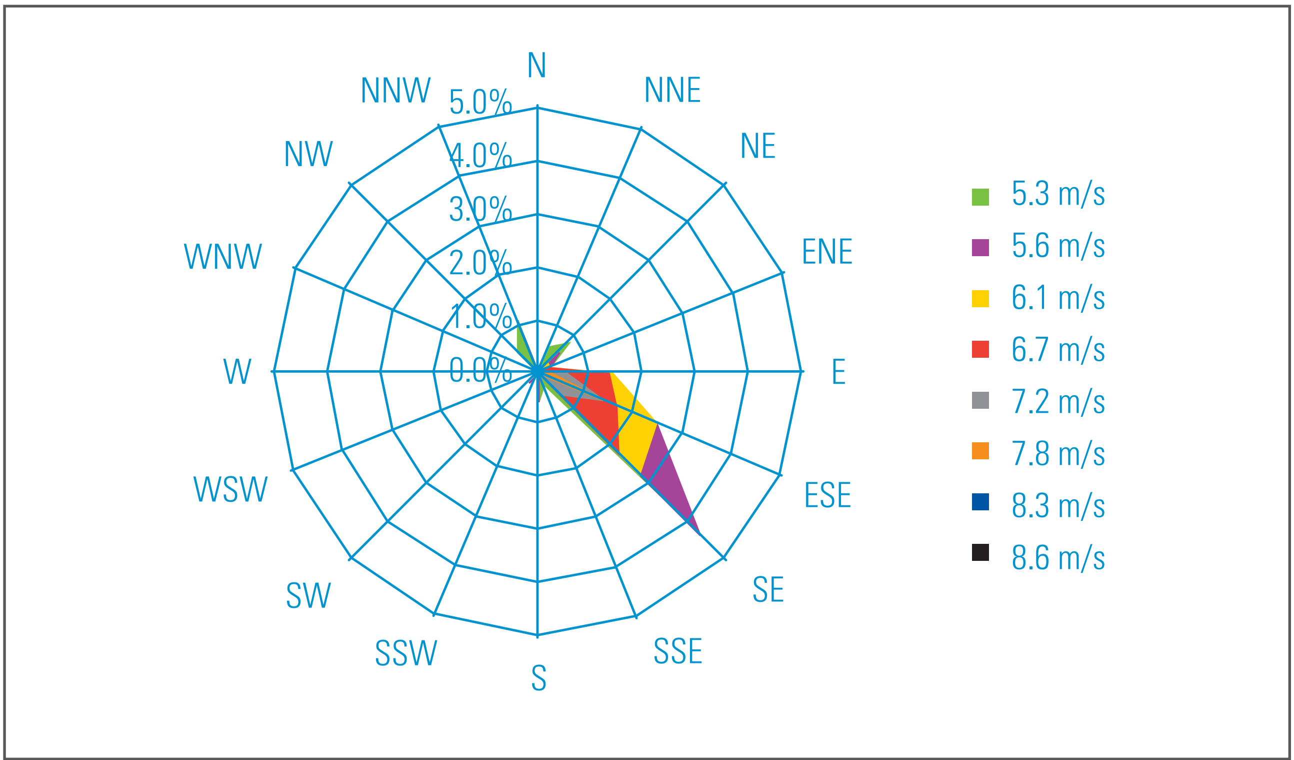
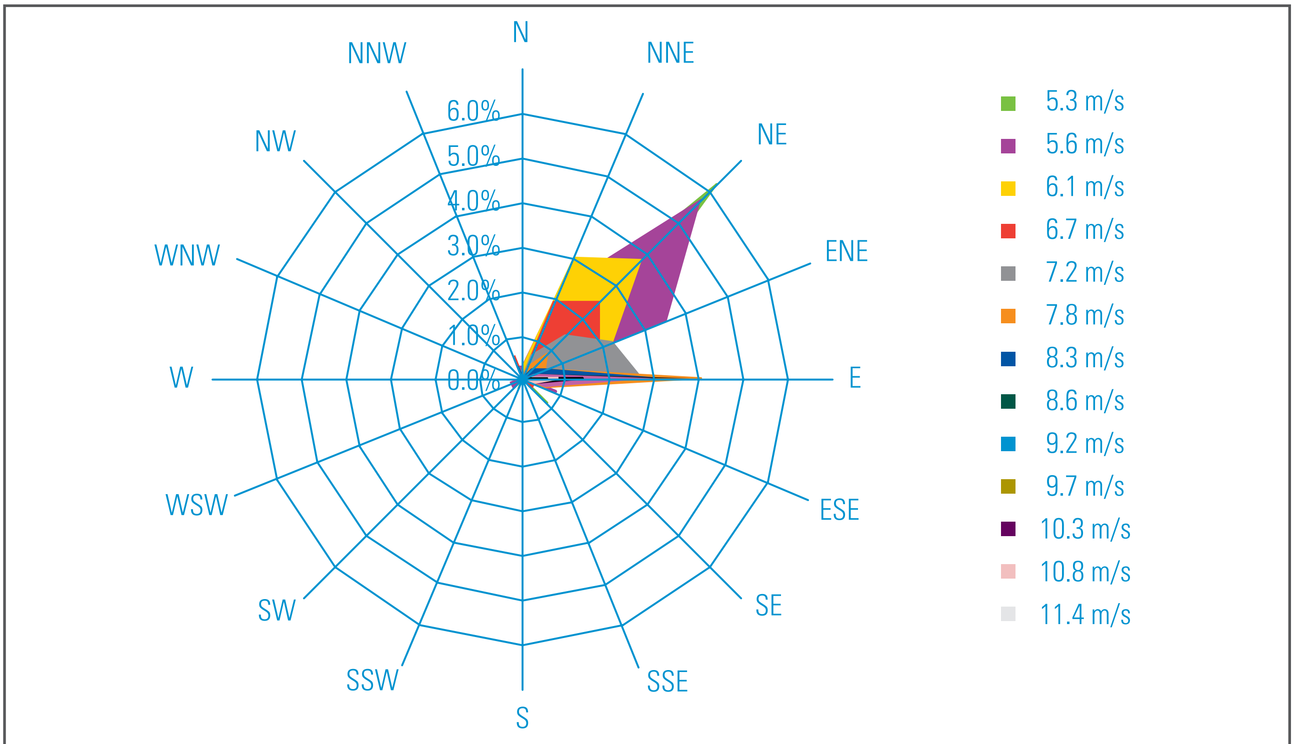


Figure 10.8 Wind Rose with Wind speeds Greater than 5 m/s for Gladstone (3pm data)[29]



[29] http://www.bom.gov.au/climate/dwo/200611/html/IDCJDW4048.200611.shtml - data from November 2006 to November 2007

Flora and Fauna

There are conservation and natural environment land uses around the southern end of the project in the Yarwun area, which may potentially be of high sensitivity to dust. Significant habitat areas are discussed further in Chapter 6, Terrestrial Flora; Chapter 7, Terrestrial Fauna; and Chapter 8, Aquatic Flora and Fauna.

Operational Impacts

This section of the project area would include the pipeline, Raglan Pump Station and Aldoga Reservoir. As with the Fitzroy to Bajool section, the main effects during the operational phase will be from vehicles travelling to, from and along the project for maintenance purposes, with respect to the pipeline and pump station.

Traffic numbers are not likely to be significant and effects of these traffic movements on local air quality (with regard to gaseous emissions and entrainment of nuisance dust) are not likely to be significant.

The pump stations are anticipated to be powered via overhead cables with no power production on site, therefore producing no direct emissions in the vicinity of the project. There are not anticipated to be any other significant gaseous pollutant emissions from the project in this section.

Odour

There are no odour emissions expected in this section of the project area.

10.6.2 Greenhouse Gas Assessment

Current national policy on greenhouse gas emissions suggests that emissions from Australia's activities must be reduced by a factor of 60 percent from 2000 levels by 2050 in order to avoid the impacts associated with global warming.

The Greenhouse Gas assessment for the project identified the following emissions profiles:

- Baseline Scenario – 130 t CO_2-e per annum
- Construction Scenario – 371,289 t CO_2-e over the two year construction period
- Operation Scenario – 4,273 t CO_2-e per annum.

These emissions are compared to global, national, state and sectoral emissions in order to determine the impact. Table 10.6 summarises the relevant emissions profiles for this assessment.

Table 10.6 Relevant Emission Profiles

Emissions Source	Mt CO_2-e per annum
Global emissions (total)	37,273
Australian Emissions (total)	559.1
Industrial Processes - National	29.5
Queensland State Emissions (total)	157
Industrial Processes - Queensland	5.6
Project Construction Emissions	0.1856
Project Operational Emissions	0.0043

Source: Australian Greenhouse Office, Department of the Environment and Water Resources, March 2007, National Greenhouse Inventory 2005.

Comparing the project construction emissions to the total Industrial Process sector emissions for Queensland indicates that this project will result in an increase in emissions of approximately 3.3 percent for each of the two years the project is under construction. This assumes that all emissions associated with the construction of the project, including the embodied energy of the materials used in the project can be accounted to the Queensland Industrial Processes sector. Using the significance criteria established in Table 10.2, this level of emissions is considered to be within the normal bounds of variation for this sector.

When the project is in operation, the project emissions will result in an increase in emissions of approximately 0.077 percent per annum for the Queensland industrial processes sector. This increase is less than the margin of error expected in the calculation of the Queensland Industrial Processes sector emissions.

10.7 Mitigation

10.7.1 Construction Phase Mitigation Measures

Prior to commencement of construction activities, the contractor will prepare a Construction EMP. This is to ensure the potential for adverse environmental effects on local receptors is avoided. The Construction EMP is expected to include the following air quality/dust nuisance mitigation measures (which are also included in Chapter 20, Planning Environmental Management Plan):

- Planning to prevent dust emissions where possible, in the first instance, rather than applying dust suppression methods
- Identifying appropriate water sources for dust suppression purposes. Water used should not lead to soil contamination (e.g. saline groundwater or contaminated waste water). Where water resources are scarce, dust stabilisers could be used
- Damping down of site haul roads during prolonged dry periods
- Regular cleaning of hard-surfaced site entrance roads
- Ensuring that dusty materials are stored and handled appropriately (e.g. wind shielding or complete enclosure, storage away from site boundaries, restricting drop heights of materials, using watersprays where practicable to reduce dust emissions)
- Ensuring that dusty materials are transported appropriately (e.g. sheeting of vehicles carrying spoil and other dusty materials – 'covered loads')
- Confining vehicles to designated haul routes within the site
- Ensuring surfaces of haul roads are of an appropriate material to minimise dust
- Restricting vehicle speeds on haul roads and other unsurfaced areas of the site
- Hoarding and gates to prevent dust breakout
- Appropriate dust site monitoring within the site management practices to inform site management of the success of dust control measures used
- If all available dust suppression methods fail to adequately prevent or suppress nuisance dust resulting in unacceptable impacts, construction activities may need to cease until conditions generating dust have subsided.

These measures, which are in line with the *APIA Code of Practice*, would enable construction activities to be controlled to reduce as far as possible the potential environmental impacts, thus limiting residual impacts.

No specific measures related to mitigating greenhouse gases have been included here due to the relatively low contribution of the project to these emissions during construction.

10.7.2 Operational Phase Mitigation Measures

Given that only relatively small effects on local air quality are anticipated from the operational traffic associated with the project, and that the effect of the project itself on local air quality is negligible, no mitigation measures are proposed with respect to operational traffic.

As stated in the assumptions, the final design will ensure that there are no significant operational risks associated with dangerous or corrosive chemicals, by avoiding the need for them (e.g. chlorine gas).

As standard practice, design will provide for buffers, controls, screening and other measures, which will mitigate any operational impact on air quality. Buffers likely to be in place will usually serve multiple purposes, mitigating any noise, visual or other impacts also.

No specific measures related to mitigating greenhouse gases have been included here due to the very low contribution of the project to these emissions during operation. However, it should be noted that GAWB is currently investigating options to offset its corporate greenhouse gas emissions (or carbon footprint). Options under consideration include the purchase of offsets, the use of GAWB land for carbon sequestration or the use of alternative (i.e. non-carbon) fuel sources (e.g. solar and wind) in its operations.

10.8 Residual Impact

10.8.1 Construction Residual Impact

With the implementation of suitable mitigation measures, the construction of the proposed development is considered to have a low environmental risk with regard to air quality. In terms of the significance criteria outlined in Table 10.1, this equates to a **minor adverse** to **negligible** effect.

In order to determine the significance of the greenhouse gas emissions associated with the construction and operation of the project, the significance criteria in Table 10.2 (in Section 10.2.2) were developed. These criteria relate the greenhouse gas emissions from the project to the key global, national, state and sectoral greenhouse gas emissions. The residual greenhouse gas impact during the construction phase of the project has been assessed as **negligible** in terms of the greenhouse gas significance criteria in Table 10.2.

10.8.2 Operational Residual Impact

Given that vehicle numbers associated with the project's operation and that background pollutant concentrations are well below the relevant standards it is anticipated that operation of the project in terms of vehicle movements is likely to equate to a **negligible** effect.

The operation of the project in terms of direct emissions is likely to equate to a **negligible** effect on local air quality.

The residual greenhouse gas impact during the operational phase of the project has been assessed as **negligible** in terms of the greenhouse gas significance criteria in Table 10.2.

10.9 Cumulative and Interactive Impacts

There is potential for cumulative effects, in both construction and operation, if other development projects are carried out in the vicinity of and in conjunction with the project.

It is known that there may be other pipeline projects implemented within the same corridor (the Stanwell – Gladstone Infrastructure Corridor (SGIC)) as this project. The purpose of the SGIC is to reduce the potential cumulative effects of multiple projects in the region by lessening the disruption caused by investigation and construction on individual landowners, surrounding communities and the environment that would otherwise occur if access to multiple pipeline routes was sought on a project-by-project basis.

However there is the potential for some cumulative effects during construction and operation. Operationally, potential cumulative effects may arise from vehicle movements in the corridor although this is not likely to be significant (depending on the numbers of vehicle movements anticipated during operation). Cumulative effects during construction may occur if this project and others in the vicinity were to be run concurrently with vehicles using the same access roads. However, this could be adequately controlled to avoid significant adverse effects, (see Section 10.7).

10.10 Summary and Conclusions

The construction effects of the project on local air quality will primarily be events where dust causes a nuisance during the limited period of the construction activities. These will be controlled through mitigation measures contained within a Construction EMP, ensuring that any adverse effects of the construction of the project on local air quality are minimised or avoided. Measures are also included in the planning EMP in Chapter 20, Planning Environmental Management Plan.

The air quality impacts once the project becomes operational – in relation to associated vehicle movements and direct emissions from the project itself – are likely to be negligible. As such, no mitigation measures in relation to the operation are proposed.

The impact associated with greenhouse gas emissions during construction and operation has also been assessed as negligible and no mitigation measures are proposed for this aspect.

Table 10.7 provides a summary of the air quality impact arising from the project.

Table 10.7 Summary of Air Quality Impact

EIS Area: Air Environment Feature/Activity	Current Value + Substitutable Y:N	Description of Impact		
		Description in Words	Mitigation	Residual Impact Using Significance Criteria
Local air quality	Good local air quality, within NEPM standards. Not substitutable.	Dust nuisance from construction activities.	Planning to avoid creation of dust. Dust suppression methods contained within EMP.	Negligible, T, ST
Greenhouse gases	Global warming. Not substitutable.	Greenhouse gas emissions from project activities.	None proposed.	Negligible

KEY:
Significance Criteria: Major, High, Moderate, Minor, Negligible
+ve = positive; –ve = negative impacts
D = direct; I = indirect
C = cumulative; P = permanent; T = temporary
ST = short-term; MT = medium-term; LT = long-term

Relative duration of environmental effects
Temporary: Up to one year
Short-term: From one to seven years
Medium-term: From seven to 20 years
Long-term: From 20 to 50 years
Permanent: Period in excess of 50 years

10.11 Glossary

VOCs = Volatile Organic Compounds

NO_x = Nitrous Oxides

PM_{10} = particulate matter of size 10µm or less

Particulate = see PM_{10}

Particles as PM_{10} = see PM_{10}

Particles = see PM_{10}

CO = carbon monoxide

Nuisance dust = particulate matter in the size range 1 to 75 µm in diameter. Dust nuisance is the result of the perception of the soiling of surfaces by excessive rates of dust deposition

Fugitive dust = dust arising from construction activities generally of particle size greater than PM_{10} (the human-health based, respirable size). Fugitive dust relates to the amount of dust falling onto and soiling surfaces (or rate of dust deposition) and the latter to the concentration of dust in suspension in the atmosphere.