CHAPTER 10

Air Quality

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10 Air Quality

10.1 Introduction

SLR Consulting Australia Pty Ltd (SLR) have prepared an Air Quality Impact Assessment (AQIA) for the Project. The AQIA has been prepared to provide an assessment of potential impacts on air quality from emissions of dust, odour and other air pollutants associated with the construction phase of the Project. The AQIA is provided in Appendix J and summarised in this chapter.

10.2 Legislative Framework and Air Quality Guidelines

The *Environmental Protection Act 1994* (EP Act) and the *Environmental Protection (Air) Policy 2008* (EPP (Air)) provides for the management and regulation of commercial and industrial air emissions that could adversely impact on sensitive receivers. There is a general environmental duty to prevent and minimise environmental harm under section 319 of the EP Act. The EP Act specifically states:

> *A person must not carry out an activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm (the general environment duty).*

Queensland air quality objectives are published in Schedule 1 of the EPP (Air) to protect environmental values listed in the EPP (Air). 'Human health and well-being' is an environmental value applicable to this Project. The air quality goals for particulate matter on human health and well-being are shown in Table 10-1.

Table 10-1: EPP (Air) Ambient Air Quality objectives for particulate matter

INDICATOR	ENVIRONMENTAL VALUE	AIR QUALITY OBJECTIVES ($\mu g/m^3$ at 0°C)	AVERAGING PERIOD	ALLOWABLE EXCEEDANCES
PM_{10}	Health and well-being	50	24 hours	5 days/year
$PM_{2.5}$	Health and well-being	25	24 hours	-
		8	Annual	-
TSP	Health and well-being	90	Annual	-

PM – particulate matter
TSP – total suspended particulate

10.2.1 National Environment Protection Measure for Ambient Air

The objective of the National Environment Protection (Ambient Air Quality) Measure (NEPC, 2016) (NEPM (Ambient Air) is to provide a representative measure of regional air quality, rather than for the standards to be used as project-specific targets. The NEPM (Ambient Air) is not considered strictly applicable to construction projects. However, given the expected duration of the construction works and the location of receivers near the Project area, it is considered appropriate to adopt these goals as part of the environmental performance criteria for the Project.

The air quality goals currently prescribed in the NEPM (Ambient Air) for particulate matter are shown in Table 10-2 below. There is no criterion specified in the NEPM (Ambient Air) for deposited dust.

Table 10-2: NEPM (Ambient Air) 2016 Ambient Air Quality Standards for Particulate Matter

INDICATOR	MAXIMUM CONCENTRATION STANDARD (µg/m^3 at 0°C)	AVERAGING PERIOD	MAXIMUM ALLOWABLE EXCEEDANCES
PM_{10}	50	24 hours	None
	25	Annual	None
$PM_{2.5}$	25	24 hours	None
	8	Annual	None

10.2.2 Relevant Guidelines

The Department of Environment and Science (DES) guidelines, *Application Requirements for Activities with Impacts to Air* (DES 2017) outlines the information required to support an environmental authority application for activities with impacts to air. The report provided in Appendix J addresses the information requirements which is summarised in this chapter.

In accordance with the *Odour Impact assessment from Developments* guidelines (DES 2013), new developments or modifications to existing facilities that may give rise to noxious or offensive odours need to determine the sensitivity of the receiving environment and applicable management measures. As the potential strength and extent of odour emissions from the Project cannot be quantified, an odour dispersion modelling study wasn't undertaken. Odour impact assessment criteria is also not useful in assessing or managing odour impacts from the Project. However, mitigation measures to minimise the potential for odour nuisance impacts have been identified and are discussed in section 10.6.

There are no national air quality guideline values that can be used to assess the impact of dust on the receiving environment. However, criteria have been derived from subjective observations and investigation of dust levels and nuisance effects. A dust deposition limit of 120 milligrams per square metre per day (mg/m^2/day), averaged over one month, when monitored in accordance with '*AS3580.10.1 Methods for sampling and analysis of ambient air – Determination of Particulates – Deposited Matter – Gravimetric method of 1991*', is frequently used in Queensland for nuisance impacts in residential areas.

The United Kingdom Institute of Air Quality Management (IAQM) developed guidance to provide a qualitative risk assessment method to identify the level of dust control anticipated to be required for the Project to minimise the risk of adverse health or nuisance impacts for surrounding residents. The *IAQM Guidance on the Assessment of Dust from Demolition and Construction* (IAQM 2014) has been used to undertake a risk assessment of the project (refer to section 10.5).

10.3 Methodology

The potential air quality impacts associated with the Project have been assessed by:

- Identifying nearby sensitive receptors and land-use
- Characterising the existing background air quality, focussing on concentrations of suspended particulate matter and dust deposition rates, based on the surrounding land use and publicly available data for similar sites in Australia
- Characterising the meteorological and climatic features of the site with the potential to impact on the generation and dispersion of air emissions during the construction works
- Undertaking a qualitative assessment of potential health and nuisance impacts associated with fugitive dust emissions from the construction activities
- Undertaking a qualitative assessment of potential off-site odour impacts due to the exposure of vegetation when the water level within Lake Macdonald is lowered
- Recommending mitigation measures, based on the level of risk, to mitigate off-site impacts, including recommendations for a construction phase air quality monitoring program, if appropriate.

10.4 Existing Environment

10.4.1 Receiving Environment

The topography surrounding the Project is relatively flat with a semi-rural residential area directly to the west, consisting of small-lot rural residential properties located along Lake Macdonald Drive (refer to Figure 10-1). Other potentially-affected residential receptors include residences near Collwood Road and residences adjacent to Lake Macdonald. Tewantin National Park is also considered a sensitive receptor due to potential impacts on vegetation associated with elevated levels of dust deposition.

FIGURE 10-1: SENSITIVE RECEPTORS

Six Mile Creek Dam Safety Upgrade Project

PROJECT NO: 30041832

CREATED BY / DATE: BM14706, 30/11/2018

VERSION: DRAFT A

PAGE SIZE: A4

0 100 200
Metres

N

SOURCES:
1. Localities, Roads, LGA, Waterways, Waterbody, Protected Areas © QLD Spatial Catalogue, State of Queensland (Department of Natural Resources, Mines and Energy) 2018
2. Basemap © Nearmap, 2018

seqwater
WATER FOR LIFE

LEGEND

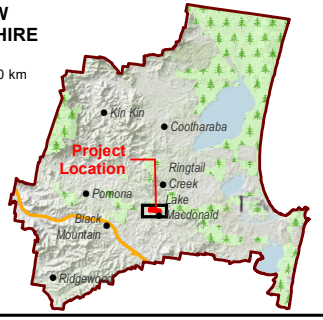
- Sensitive Receptors
- Six Mile Creek and Upper Tributary
- Watercourse
- Local Governmental Area
- Project Area
- Lake Macdonald

Protected Areas

- National Parks

OVERVIEW
NOOSA SHIRE

0 5 10 km



Path: R:\PROJECTS\30031970\MXD\IAS_ReportMaps\P30031970_Figure10_1_SensitiveReceptors.mxd

10.4.2 Climatic Conditions

Wind speed and wind direction, rainfall, temperature and relative humidity data are available from the Tewantin RSL Park Bureau of Meteorology (BoM) weather station (40908) for the period 1995 to 2018.

The annual wind rose for the period January 2013 to February 2018 indicates the predominant wind directions in the area are from the south, with a low frequency of winds from the east. From the recorded long-term wind patterns and assuming the same wind conditions will be experienced at Lake Macdonald, it can be concluded that the Project area is likely to be subjected to winds from south and southwest. Winds from the east, which would blow emissions from the construction works towards the nearest residences, occur approximately 20% – 30% of the time, with these winds generally being in the range of 3-8 m/s.

The average annual rainfall between 1996 and 2018 was 1,569 mm. Higher monthly rainfall rates occur in the summer, peaking in February. The average maximum temperatures in the region approach 30°C during summer and falls to an average maximum temperature of about 21°C during winter. Average minimum temperatures range from 22°C in summer to 11°C in winter. The humidity levels are relatively consistent throughout the year, and generally higher in the morning compared to the afternoon, particularly during winter.

10.4.3 Existing Air Quality

The existing air quality at the Project site is expected to be good given the undeveloped nature and low population density of the surrounding area. There would be minimal emissions from vehicle, with the Bruce Highway located around 4.8 km to the southwest. No significant industrial or commercial emissions sources have been identified in the surrounding area.

There is no site-specific air quality monitoring data available for the Project area, however the DES operates an ambient air quality monitoring station at the Mountain Creek Primary School, approximately 36 km to the southeast on the Sunshine Coast. No exceedances of the NEPM (Ambient Air) standard for 24-hour average PM_{10} concentrations of 50 µg/m^3 were measured by this monitoring station over the last three years. The annual average PM_{10} concentrations measured were also below the NEPM (Ambient Air) standard for annual average PM_{10} concentrations of 25 µg/m^3, at 13.8, 15.9 and 17.4 µg/m^3 in 2015, 2016 and 2017, respectively.

The Mountain Creek air quality monitoring station is in a more urbanised environment than Lake Macdonald with PM_{10} concentrations likely to be lower in the Project area. The average of the station's last three years' annual average background PM_{10} concentrations of 15.7 µg/m^3 has been used as a conservative estimate in the assessment (refer to Appendix J for further information).

10.5 Impact Assessment

The most significant emissions to air associated with the proposed Project activities will be emissions of particulate matter from the excavation, handling and transport of soil and rock materials, as well as from wind erosion of disturbed soils. The potential impacts of emissions of particulate matter on air quality include the following:

- Penetration into the respiratory system resulting in potential adverse health impacts such as increased mortality from cardiovascular and respiratory diseases, chronic obstructive pulmonary disease and hearth disease, and reduced lung capacity in asthmatic children
- Dust settling on surfaces and possessions, affecting visibility and contaminating tank water supplies
- Dust blanketing leaf surfaces and adversely affecting vegetation.

Impacts resulting from dust, combustion products and odour are discussed in sections 10.5.1 to 10.5.3.

10.5.1 Fugitive Dust

A qualitative risk assessment of the Project, using the *IAQM Guidance on the Assessment of Dust from Demolition and Construction* (IAQM 2014), was undertaken and is detailed in Appendix J. This method has been used to identify the level of dust control anticipated to be required for the Project to minimise the risk of adverse health or nuisance impacts for surrounding residents.

The risk assessment identified:

- The sensitivity of the surrounding area is classified as 'low' for health effects and 'medium' for dust soiling
- The dust emission magnitudes for the various construction phase activities (demolition, earthworks, construction and track out) are all classified as 'large'

- If dust mitigation measures are not implemented, there is:
  - A 'high' risk of adverse dust soiling impacts occurring at off-site receptor locations from demolition activities
  - A 'medium' risk of dust soiling impacts from earthworks, construction and track out
  - A 'medium' risk of adverse health impacts occurring at off-site receptor locations from demolition activities
  - A 'low' risk of dust soiling impacts from earthworks, construction and track out.

Given the proximity of the active stockpiling areas, laydown areas, haul roads and temporary concrete batching plant to Tewantin National Park, localised impacts on vegetation could potentially occur during peak activity periods if adequate mitigation measures are not implemented. However, localised impacts of dust from the construction works on vegetation along the site boundary would be temporary.

Additionally, water should be readily available for dust suppression. As such, residual impacts associated with fugitive dust emissions are expected to be able to be reduced to acceptable levels with the implementation of the mitigation measures provided in section 10.6.

10.5.2 Combustion Products

The proposed construction activities will give rise to emissions of products of fuel combustion from mobile equipment including excavators, dozers and haul trucks, as well as the generator(s) used to power the dewatering pumps. These emissions include sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), volatile organic compounds (VOCs) and fine particulate matter. Emissions from the trucks and other mobile plant will occur over a relatively large area and will vary spatially and temporally during the course of the works. However, the proposed 1,200 kVA diesel generator(s) used to power dewatering pumps will be located in a fixed location. The emissions from the generator exhaust will be emitted as a static, fixed point source so it is recommended that it be located at least 100 m from the nearest sensitive receptor.

Volatile Organic Compounds (VOCs) from diesel-powered trucks and generators are emitted in relatively low concentrations and would not have potential to give rise to off-site air quality impacts during this Project. As such, they have not been considered further.

10.5.3 Odour

Odour generation is anticipated during the lowering of the dam and immediately after lowering due to the exposure of normally inundated soil and aquatic vegetation. It is estimated that the six-month period following lake lowering (June - December 2019, subject to change) would be the peak period of potential odour generation. However, the potential odours will be temporary in nature, of organic origin and would be associated with the necessary upgrade works to ensure the safety of the dam. As lake bed sediments dry out, aquatic plants decay and desiccate, and grasses become established on the beds, it can be expected that odours will reduce. Additionally, it is anticipated there would be a higher level of tolerance of the odours by surrounding residents compared to (for example) a permanent and/or industrial-type odour source. Mitigation measures provided in section 10.6 would minimise odour impacts.

10.6 Impact Mitigation and Management

Recommended mitigation measures to minimise impacts associated with air emissions from the Project are provided below in Table 10-3.

In addition to the mitigation measures described in Table 10-3, an air quality monitoring program for dust is recommended. This would include continuous monitoring of suspended particulate concentrations, along with wind speed and wind direction to provide real-time data on dust levels. The requirements for the recommended monitoring program are provided in section 8 of Appendix J. The results of the monitoring should be reported to Seqwater on a monthly basis. Any non-compliances should be identified and details provided regarding the cause and extent of the problem and the remedial action taken.

Table 10-3: Air quality mitigation measures for the Project

IMPACT AREA	MITIGATION MEASURE	CONSTRUCTION STAGE
Communications	Develop and implement a stakeholder communications plan that includes community engagement before work commences on site.	Pre-construction
	Display the name and contact details of person(s) accountable for air quality and dust issues, and/or the available online platforms for providing feedback/complaints, on the site boundary.	Pre-construction
Site management	Record all dust, odour and other air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	Construction
	Make the complaints log available to the regulatory authorities upon request.	Construction
	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation. Records must be kept in a log book or a suitable records management system.	Construction
	Carry out daily site inspections to monitor compliance with the dust management plan, record inspection results, and make an inspection log available to the regulatory authorities upon request.	Construction
	Undertake weekly off-site visual inspections to monitor dust. Record inspection results and make the log available to the regulatory authorities upon request. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of site boundary.	Construction
	Ensure relevant personnel are provided with adequate environmental awareness and training covering air quality management and monitoring.	Pre-construction and construction
Odour	Ensure a high level of communication with local residents regarding the potential for odours to be generated as a result of lowering the water level within Lake Macdonald.	Dewatering
	Recovery of fish from the reservoir will minimise potential for odours relating to decomposition of dead fish.	Dewatering
	Monitor, and if required, promote vegetation growth on the exposed banks to encourage drying out of the sediments /mud and promote aerobic conditions that may minimise offensive odour generation.	Dewatering
Site preparation and layout	Erect solid screens or barriers around potentially dusty activities/stockpiles or the site boundary that are at least as high as any stockpiles on site.	Construction
	Keep the size of cleared areas to a minimum to limit exposed areas available for dust emissions by wind erosion.	Construction
	Retain existing vegetation, where practical, between construction activities and sensitive receivers to reduce particulate concentrations and dust deposition rates at receivers.	Construction
	Install barriers alongside site haul roads to deter driving off nominated access roads	Construction
General construction activities	Keep site fencing, barriers and scaffolding clean using wet methods.	Construction
	Avoid site runoff of water or mud. Remove silt and other materials from around any erosion control structures following any significant rain event (>10mm) to ensure deposits do not become a dust source.	Construction
	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	Construction
	Fence stockpiles (e.g. 3-sided enclosures where practicable) to prevent wind erosion.	Construction
	Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems	Construction
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	Construction

IMPACT AREA	MITIGATION MEASURE	CONSTRUCTION STAGE
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation at all times, using non-potable water where possible and appropriate.	Construction
	Use water sprays to control dust from unsealed traffic areas on site, particularly during periods of unfavourable wind conditions (winds greater than 5 m/s) and with particular focus on haul roads located near residents.	Construction
	Review the need to cease or relocate dust producing activities during strong wind conditions.	Construction
	Any fuel storage and handling areas are to be located as far as practicable away from sensitive receptor locations. Fuel/chemical storage areas are to be appropriately bunded and spill kits are to be strategically located to ensure timely clean-up should accidental spills/leaks occur.	Construction
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	Construction
	Ensure bagged supplies of fine powder materials are sealed after use and stored appropriately to prevent dust.	Construction
	Ensure emissions controls are installed on the Concrete Batch Plant (i.e. electrostatic precipitator (ESP) to be installed on the hopper vent) to minimise particulate emissions, and ensure that they are operated effectively at all times.	Construction
	Maintain and operate plant and equipment at the project site in a proper and efficient condition/manner.	Construction
Demolition	Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as the water can be directed to where it is needed. In addition, high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground.	Construction
Earthworks	Use water sprays to control dust from earthworks activities, particularly during periods of unfavourable wind conditions (winds greater than 5 m/s).	Construction
	Minimise drop heights from loading shovels and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	Construction
Track out	Implement regular watering along unsealed section of Collwood Road (eastern site access) when in use for heavy vehicle movements.	Construction
	Use water-assisted dust sweeper(s) on the sealed access and local roads, to remove, as necessary, any material tracked out of the site.	Construction
	Avoid dry sweeping of large areas	Construction
	Cover haul truck loads when travelling on public roads; the load must be lower than the sides of the truck and the truck is to be free of loose mud and dirt before entering public roads.	Construction
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site) where reasonably practicable.	Construction
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, as far as the site size and layout permits.	Construction
	Hydro-mulch, mulch, hydro-seed or stabilisation spray should be applied to batters adjacent to haul roads to stabilise these areas and minimise wind-blown dust.	Construction
Combustion emissions	Prepare an implement a traffic management plan to manage the sustainable delivery of goods and materials and to minimise queueing along local roads adjacent to residential properties.	Pre-construction
	Ensure all vehicles switch off engines where idling time on-site is likely to exceed two minutes.	Construction
	Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.	Construction

IMPACT AREA	MITIGATION MEASURE	CONSTRUCTION STAGE
	For the diesel powered generator required for the dewatering pumps, locate the unit as far from sensitive receptors as possible and ensure the exhaust emissions are discharged away from areas where workers or members of the public would be exposed to the plume.	Construction

10.7 Summary

SLR prepared an AQIA for the Project and is provided in Appendix J. The AQIA provides an assessment of potential impacts on air quality from emissions of dust, odour and other air pollutants associated with the construction phase of the Project in accordance with the EP Act, EPP (Air), NEPM (Ambient Air) and other relevant guidelines. The topography surrounding the Project is relatively flat with a semi-rural residential area directly to the west, consisting of small-lot rural residential properties located along Lake Macdonald Drive. Other potentially-affected residential receptors include residences near Collwood Road and residences adjacent to the lake. Tewantin National Park is also considered a sensitive receptor.

The Project area is likely to be subjected to winds from south and southwest. Winds from the east, which would blow emissions from the construction works towards the nearest residences, occur approximately 20% – 30% of the time, with these winds generally being in the range of 3-8 m/s. The existing air quality at the Project site is expected to be good given the undeveloped nature and low population density of the surrounding area. No significant industrial or commercial emissions sources have been identified in the surrounding area.

There is no site-specific air quality monitoring data available for the Project area, however the DES operates an ambient air quality monitoring station at the Mountain Creek Primary School, approximately 36 km to the southeast on the Sunshine Coast. The Mountain Creek air quality monitoring station is in a more urbanised environment than Lake Macdonald with PM_{10} concentrations likely to be lower in the Project area.

The most significant emissions to air associated with the proposed Project activities will be emissions of particulate matter from the excavation, handling and transport of soil and rocks, as well as from wind erosion of disturbed soils. The potential impacts of emissions of particulate matter on air quality include health impacts, dust settling on surfaces and possessions and dust settling on vegetation. However, the mitigation measures proposed in section 10.6 would minimise adverse impacts to air quality.