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Section 14

Air Quality

14 Air Quality

14.1 Introduction

This section outlines the potential air emissions from the Project and related impacts as supporting evidence for conclusions relating to impacts on matters of NES. Additional details are included in Section 9 of the Queensland EIS (RTA 2011) and the Queensland SEIS (RTA 2012) prepared for the Queensland Government.

14.2 Ambient Air Quality

The Project area is situated in a mostly undeveloped and remote part of Cape York. To the north of the Project area are the townships of Weipa and Napranum and to the south is the township of Aurukun. The Project area is vegetated and does not currently contain significant particulate (dust) sources except for smoke when bushfires occur. Potential sources of particulate emissions surrounding the Project area primarily comprise:

- unsealed roads;
- bushfires;
- existing mining and processing operations at East Weipa and Andoom; and,
- cattle stations.

Given its remote location and the lack of significant particulate emission sources, the existing dust levels within the Project area are relatively low. The estimated average background level of dust deposition in the Western Cape region is 50mg/m^2/day over 30 days (RTA 2011, Section 9). The Queensland guideline for maximum dust deposition in residential areas is 120mg/m^2/day (30 days).

14.3 Relevant Impacts

14.3.1 Emission Sources

During construction of the Project, dust emissions would result from clearing activities and the burning of cleared vegetation. In addition there would be heavy vehicle movements on unpaved roads. These emissions would generally be localised and of relatively short duration.

During Project operations, the main sources of dust would be the progressive clearing of areas to be mined, topsoil stripping and rehabilitation, bauxite extraction and hauling by dump trucks, beneficiation, stockpiling and shiploading.

Minor amounts of particulates, SO_2 and NO_2 would be emitted by the diesel-fired power station and vehicles.

14.3.2 Potential Effects on Vegetation

Vegetated areas and habitats adjacent to active construction and operational zones may become affected by dust generated by earthworks, vehicle movements along roads, and the extraction and hauling of bauxite.

Excessive dust deposition on the leaves of plants could suppress plant growth due to a decrease in light available for photosynthesis, an increase in leaf temperature due to changed surface optical properties, and interference with the diffusion of gases into and out of leaves (Prajapati 2012). Dust

deposition impacts on vegetated surfaces depend on the size distribution of these particles and, to a lesser extent, on their chemistry.

These impacts can lead to changes in populations of flora species more sensitive to dust deposition, and consequently change ecosystem function and habitat (Bazzaz 1996).

There are currently no dust criteria relating to agriculture or native flora and fauna. However, research into the effects of dust on vegetation provides some indication of the relevance and severity of the impacts. Doley and Rossato (2010) established that a dust load (considering dusts which are chemically inert and do not markedly alter substrate pH) greater than 500mg/m²/day could adversely impact plant growth. This research also found that rain events greater than 10mm may completely remove the plant dust load. Based on rainfall data in Weipa (BOM site number 027042) for the years 1914 to 2012, on average there has been approximately 47 days per year where daily rainfall has been 10mm or greater (BOM 2012). Therefore, any deposited dust would be removed every wet season and is unlikely build up again until the following dry season. On average, monthly rainfall is 10mm or greater for eight months of the year. Therefore, dust related impacts on vegetation would be negligible.

Similarly, a species-specific experiment by Wijayratne *et al.* (2009) on the rare plant *Astralagus jaegerianus* (Fabaceae) (habitat for this particular flora species is not found within the Project area) determined that growth was not adversely affected by dust deposition of 395mg/m²/day.

The Queensland *Environmental Protection (Air) Policy 2008* (EPP(Air)) sets air quality objectives for the protection of the biodiversity of ecosystems of 7.5ppb (annual average) for SO_2 and 16ppb (annual average) for NO_2.

14.3.2.1 Modelled Impacts

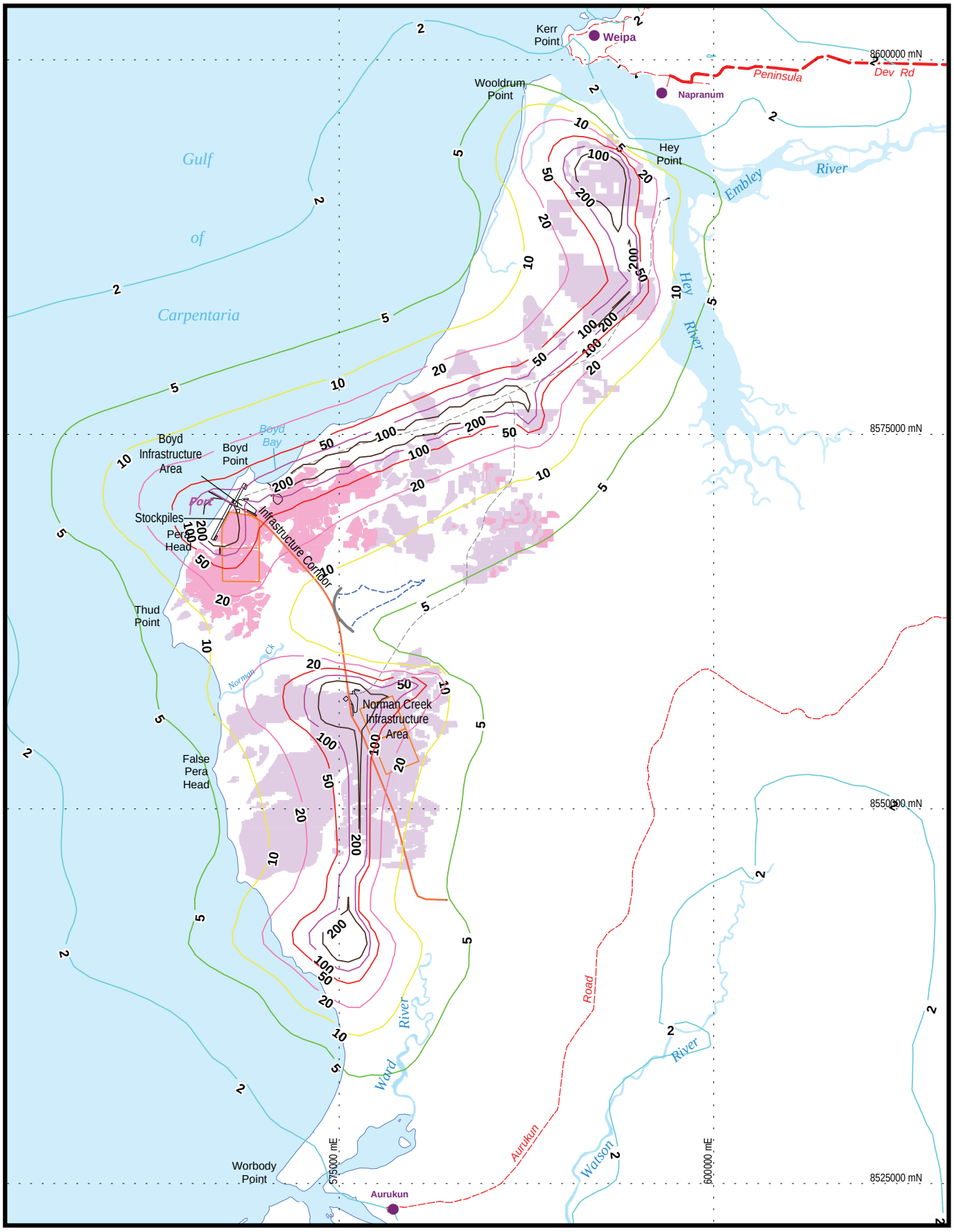
Predicted dust emissions associated with the Project were modelled using The Air Pollution Model (TAPM) based on the maximum production scenario of 50Mdptpa. The methodology adopted to generate the emissions data was:

- identification of each dust source;
- for each source, an emission/erosion potential for dry exposed surfaces was calculated based on either the *Emission Estimation Technique Manual for Mining Version 2.3* NPI (2001) or US-EPA AP-42 5th Edition (US EPA 2003); and,
- the dry emission rate (for each source and for every hour of the modelling simulation) was modified to account for the actual moisture content of the overburden, road surface, bauxite stockpiles and tailings storage facilities from both rainfall and water truck usage.

Details of the model and results are provided in Section 9 of RTA (2011 and 2012). The model assumed a spatial distribution representative of operational activities likely to cause the highest air quality impacts at the sensitive receptor residential locations of Napranum and Aurukun. The model incorporated conventional haul road watering and water sprays on chutes where trucks dump crude ore at the beneficiation plant as mitigation measures.

The modelled contours of increment in ground level dust deposition for a typical mining scenario at the 50Mdptpa production scenario are shown in **Figure 14-1**. These contours show the highest monthly increment in a 12 month period.

The 200mg/m^2/day dust deposition contour is tightly concentrated around haul roads. The contours widen out over active mining areas and industrial areas, but remain relatively constrained and do not extend significantly beyond the limit of mining.



Township
Road/track
Tailings dam
Mining Years 1 -13
Mining Years 14 - 40
Objective for residences: 120 mg/m²/day

5 Deposited Dust Annual Maximum Month (units in mg/m2/day)

South of Embley Project

Fig. 14-1: Modelled Deposited Dust

N

5 0 5km

Datum/Projection: GDA94/MGA Zone 54 Date: 13/08/2012

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Even allowing for an ambient background of 50mg/m^2/day, the modelled 200mg/m^2/day dust deposition from mining contour is well below the 500mg/m^2/day criterion indicated in the research and therefore impacts on flora, if any, are anticipated to be minor and localised. In addition, it is recognised that model results are typically conservative and recent dust deposition monitoring results from Weipa, within 1km of existing mining operations at Weipa, show typical rates of approximately 115mg/m^2/day (RTA pers comm). Anecdotal evidence from existing mining operations at Weipa indicates that there has not been vegetation loss along roads and haul routes as a result of dust emissions (RTA pers comm).

SO_2 and NO_2 emissions were also modelled and the predicted maximum annual averages were <0.1ppb and <2ppb respectively, which are an order of magnitude below relevant air quality objectives for the protection of flora and fauna.

14.4 Avoidance, Mitigation Measures and Residual Impacts

Dust mitigation measures that would be implemented include:

- restricting the area to be cleared ahead of mining to the minimum practical;
- rehabilitating mined-out areas progressively once they become available;
- haul road watering;
- minimising haul distances;
- utililising water sprays at the chutes where haul trucks dump bauxite at the beneficiation plant; and,
- utilising water sprays to clean the ship-loading conveyor belt which would reduce build-up of any fine material.

During the beneficiation process most fine particles are washed from the product bauxite and the inherent residual moisture assists in minimising the dust generated from the product stockpiles and shiploader.

The air quality modelling demonstrates that residual impacts associated with dust, SO_2 and NO_2 emissions from the Project on threatened terrestrial flora and fauna that are known, likely or possibly occur within the Project area would not be significant (refer **Section 14.3**).