PART B – AEIS

19. NOISE AND VIBRATION

19.1. Impacts on terrestrial fauna

One submission detailed the requirement to update information in the EIS regarding noise impacts on wildlife and include proposed noise mitigation measures where appropriate.

Noise may act as a stressor for animals as well as acting to mask acoustic signals that are essential for functions such as communication, predator detection, and mating (Brown, 2000). Recent studies offer suggestive, although inconclusive, evidence of substantial changes in many ecosystems as a result of masking (Barber *et al.* 2009).

Although noise from human disturbance may impact fauna, there is currently limited understanding of the implications of these impacts and how these impacts vary for different species and situations. Direct physiological effects of noise on fauna are difficult to measure in the field and the impacts are usually limited to observed behavioural changes (Bejder *et al.*, 2009).

During construction, areas will be cleared and fenced. Disturbance from the construction of the pipeline will be temporary, with pipe laying fronts advancing daily. Risk of impacts to fauna from blasting is low as significant blasting will only occur for construction of the dam with limited areas of low level blasting on the pipeline. Blast zones would be within the dam construction footprint boundary and fauna are expected to avoid these areas. Construction activities for the dam will occur for an extended period (of up to 3 years) and has the highest potential to impact nearby fauna.

Noise from Project operations will be limited to the area surrounding a small number of infrastructure such as pump stations, and associated ancillary facilities during periods of operation and maintenance. Critical facilities such as pump stations will be cleared and fenced, and it is likely fauna will move away from these areas.

While it is difficult to propose specific noise mitigation measures in the absence of information on how noise from human activities may impact the particular fauna present in the Project area, the following management measures have been suggested to reduce impacts as far as practicable:

- install adequate fencing of the construction area to prevent fauna access;
- consider during detailed construction planning, allowance for buffer distances between construction activities and areas where protected species have been identified (including vehicle movement routes). Important habitats for threatened fauna are discussed in Section 9.2.6 of the EIS;
- minimise preventable noise from equipment through measures such as keeping both stationary and mobile plant and equipment in good working condition (including mufflers, enclosures etc.), and avoiding leaving engines running on standby for extended periods; and
- select equipment with the lowest noise rating that meets task requirements.

19.2. Justification of standards

A submitter requested that the following guidelines and standards should be included in the noise chapter:

- AS1055.1 and AS1055.2, 1997. “Description and Measurement of Environment Noise, Recognised Sleep Disturbance Criteria”;

- British Standards BS7385, part 2, 1993 “Evaluation and Measurement for Vibration in Buildings, Guide to Damage Levels from Ground-borne Vibration”, BS6472, 1992 - Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80 Hz);
- Australian/New Zealand Standard AS/NZS 2107-2000, Acoustics –“Recommended Design Sound Levels and Reverberation Times for Building Interiors”; and
- “World Health Organisation Night noise guidelines for Europe”, 2009.

AS1055

AS1055-1997 has already been included and mentioned in Section 19.1.3.2 of the EIS:

“In accordance with AS1055-1997, data was considered to be wind affected if the maximum wind gust exceed 5m/s any day containing a four hour total.“

British Standards BS6472 1992, and BS7385, part 2, 1993

In Queensland, vibration impact from blasting is typically assessed using the Ecoaccess Guideline – Noise and Vibration from blasting (2006) and non blasting related construction vibration impact is typically assessed with other criteria such as those contained in BS6472 1992, and BS7385 1993.

As discussed in Section 19.1.1.4 of the EIS, vibration impact from blasting has been assessed with the nominated Ecoaccess Guideline.

Apart from blasting, impact piling and vibratory rolling are generally the highest vibration generating construction activities. Impact piling is unlikely to be required for the Project. For other non blasting related construction activities, vibration levels reduce to minimal levels at distances of more than 20 m. Separation distances between the construction equipment and known noise sensitive receivers (NSR’s) are greater than 20 m throughout the Project area. Non blasting related construction vibration levels are not expected to cause any vibration impacts at the NSR’s and therefore, BS6472 1992 and BS7385 1993 have not been included in Chapter 19 of the EIS. However, if any NSR are found to be within 20 m from construction activities, further assessment should be carried out.

Australian/New Zealand Standard AS/NZS 2107-2000

Australian/New Zealand Standard AS/NZS 2107-2000 provides recommended design sound levels for different areas of occupancy in buildings. The $L_{Aeq,adj,1hr}$ acoustic quality objectives in *EPP (Noise)* which has been included in Chapter 19 of the EIS are in line with the recommended design sound levels in AS/NZS 2107-2000. Since *EPP (noise)* is statutory legislation which has precedence over AS/NZS 2107-2000, AS/NZS 2107-2000 was not included.

“World Health Organisation Night noise guidelines for Europe”, 2009

“World Health Organisation Night noise guidelines for Europe”, 2009 provides recommended noise criteria for avoiding sleep disturbance. The sleep disturbance criteria in the WHO noise guideline is referred to and included in the Ecoaccess Guideline – Planning for noise control, which was detailed in Section 19.1.1.3 of the EIS. Therefore the WHO noise guideline was not included.

19.3. Noise impacts on public facilities that are sensitive receivers

A submitter proposed that the EIS should identify receptors other than residential dwellings, and identity impacts and mitigation measures.

Public facility sensitive receivers have been considered in the EIS assessment. In assessing potential noise impacts from the operation of the dam, pipeline, and associated infrastructure, the noise criteria was based on noise monitoring conducted at locations that were considered representative of all noise sensitive receivers for the Project. This included noise monitoring at Taroom Hospital which was representative of areas where the dominant land use includes public facilities such as schools, churches, and hospitals. The noise criteria was calculated in line with DEHP's Planning for noise control guideline, and is applicable in the assessment of Project related noise for public facility sensitive receivers. This calculated noise criteria for residential dwellings are lower than the criteria for public facility sensitive receivers, and compliance with the residential dwelling criteria would also result in compliance with the criteria for public facility sensitive receivers. For construction noise, a $L_{Aeq,\ 1hr}$ 50 dB(A) noise criteria was applied based on the *EPP (Noise)* acoustic quality objectives.

For the dam construction and operation, the EIS identified the nearest sensitive receiver to be a residential dwelling located 6 km northwest of the dam. Predicted noise levels at this location indicated compliance with the noise criteria for both construction and operation. No public facilities were affected.

For the construction of the pipeline, the EIS predicted the construction noise criteria would be exceeded at NSR's within 870 m of construction activities. For NSR's where noise levels were predicted to exceed the criteria, environmental management plans (EMP) are to be implemented to manage potential noise impacts. Draft EMPs were detailed in Section 29.9.15 of the EIS, additional information can be found in **Appendix B29**.

For the operation of the pipeline, pump stations were identified as the highest contributors of noise but there are no public facilities proximal to them.

Noise from the road works and clay extraction activities were assessed for associated infrastructure. Noise from road works were predicted to exceed the criteria for NSR's located closer than 880 m of construction activities, where the nearest NSR's were residential dwellings (not public facilities). Noise from extraction activities will exceed the criteria for NSR's located closer than 800 m. For NSR's where noise levels were predicted to exceed the criteria, the EIS recommended that EMPs be implemented to manage potential noise impacts. The EIS also recommended that no significant extraction activities occur within 800 m of NSR's.

19.4. Vibration levels at sensitive receivers

It was requested that the vibration assessment demonstrate that the propagation of the shock waves from blasting is at a distance such that the shock wave is absorbed by the soil before reaching the sensitive receptor. It also requested that the distance, soil type and charge used for the calculation be stated.

Vibration impact from blasting and details about the separation distances and charge were discussed in Section 19.2.2.2 of the EIS. The effect of variation in soil type is covered by the constant K_a and is explained in Section 19.6 of the AEIS.

19.5. Construction noise impact during the construction of the pipeline

A submitter requested the assessment to outline strategies, including negotiating acceptable outcomes with noise sensitive receptors located within the identified 870 m buffer where the acoustic quality objectives cannot be met. Section 29.9.15 of the EIS (the draft EMP for Noise and Vibration) included each of the mitigation measures nominated by the submitter.

19.6. Graphical presentation of mass of explosives

A submitter requested the revision of the graphical presentation of mass of explosives displayed in Figure 19-4 of the EIS. Figure 19-4 was used to determine the charge mass that might cause an exceedence of the guideline at the nearest sensitive receiver. This procedure was used because the actual charge mass to be used would not be confirmed until a contractor was appointed. The accompanying text noted that the resultant charge mass was much greater than any charge mass likely to be used.

A site constant (K_a) refers to the level of constraint of the charge, and it generally has a value of 10 to 100 for confined blast hole charges. The values of "Ka" used for the calculations are the values recommended in the Australian Standard (AS2187.2 – 2006) that are deemed to cover the range of ground propagation conditions usually encountered at most sites. Rock/soil conditions are highly variable from site to site and there are literally an infinite number of conditions that can exist ranging from "normal" vibration propagation in a hard uniform material or any variant involving augmentation or attenuation from the "normal" condition. These variations are caused by soil layering (harder or softer) above or below the rock layer, fractures and fault lines in the rock strata and varying water table height, all of which can modify the vibration energy radiating from the blast. A higher site constant (K_a) subsequently requires a higher buffer distance.

Figure 19-4 (EIS) has been revised and is represented in **Figure 19-1**. The figure shows how the distance required to dissipate airblast overpressure varies with blast size and site constant (Ka). This figure illustrates that, for even the largest likely construction blast of 500 kg/delay, the airblast overpressure goal (115 dBL) is met at a distance of about 900m if Ka = 10 and just over 4km if Ka = 100. The figure also shows that, as the explosive charge/delay reduces, the distance required for the airblast overpressure to drop below the nominated goal also reduces.

When a largest likely construction blast of 500 kg/delay is considered, the methods specified in AS2187.2 – 2006 predict that ground vibration levels will be below the 5 mm/s peak particle velocity limit at 650m for 50% of all blasts and less than 1.8km for 95% of all blasts. Therefore, the airblast overpressure criteria will be the main factor in setting buffer distances.

Given the nearest sensitive receiver is at 6km from the blast site these results demonstrate that there is negligible risk of damage from even the largest likely construction blast.

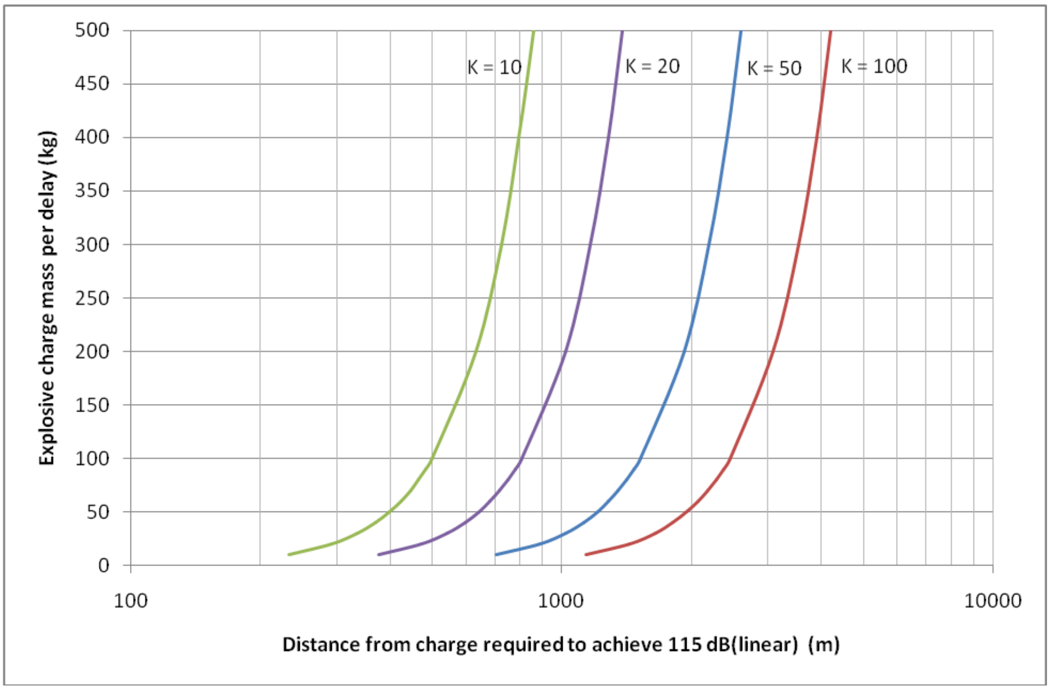

Figure 19-1 – Revised Figure 19-4: Distance required to dissipate airblast overpressure for varying explosive charge mass and site constant (Ka)

19.7. Pump station noise during operations

A submitter noted that the sound pressure level for pump stations during operation was very high and requested additional discussion of noise mitigation options.

An error in the reporting of noise emissions from pump stations has been noted. Table 19-14 of the EIS included a generator in the assessment of operational phase impacts of pump stations but the pumps will be powered by mains electricity. The sound power level (SWL) of the generator was significantly higher than that of the pumps in the assessment. A new assessment with revised noise modelling results has subsequently been prepared. The revised noise modelling results show the buffer distance required to meet the L_{Aeq} 28 dB(A) criteria will reduce from 6 km to approximately 500 m with a 10 dB(A) reduction noise enclosure. The location of pump stations is largely fixed by proximity to the dam or topography, though pump station 4, which is primarily a boosting station, has some flexibility as to its location.

The pumps will operate at night in a rural area so the acoustic objective is relatively low. Mitigation measures have been detailed in the project draft EMP updated as **Appendix B29**.