13. NOISE AND VIBRATION

13.1. Noise Guidelines

A number of submissions questioned the suitability of the noise objectives for construction of the Project.

The noise objectives for the Project presented in Section 12.3.7 of the EIS were based on the *Environmental Protection (Noise) Policy 1997* and the Planning for Noise Control Guideline (EPA, 2004).

The *Environmental Protection (Noise) Policy 1997* has been superseded by the *Environmental Protection (Noise) Policy 2008* (EPP (Noise). The noise objectives in the EPP (Noise) are presented in Table 13-1.

Table 13-1 Noise objectives in the EPP (Noise) relevant to the Project

Noise level dB(A) measured as	Time period		
	7am - 6pm	6pm - 10pm	10pm - 7am
$L_{Aeq,adj,1\ hr}$	50	50	-
$L_{Aeq,adj,1\ hr}$ (indoor)	35	35	30
$L_{A1,adj,1\ hr}$	65	65	-
$L_{A1,adj,1\ hr}$ (indoor)	45	45	40

One submission questioned if the proposed night time noise limit L_{Amax} 52 dB(A) was adequate for the protection of sleep disturbance as the World Health Organisation recommends an indoor limit of L_{Aeq} 30dB(A).

The external night time construction noise level assessment criterion for instantaneous noise sources of L_{Amax} 52 dB(A) proposed in the EIS was based on the criteria for sleep disturbance presented in the Planning for Noise Control Guideline (EPA, 2004). The recommended World Health Organisation indoor limit of L_{Aeq} 30dB(A) is consistent with the indoor night time noise objective in the EPP (Noise) (refer to Table 13-1). Allowing the +7dB factor for partially closed windows would provide a noise objective of L_{Aeq} 37dB(A) (night) outside a noise sensitive place.

As a result of changes to noise objectives in Queensland legislation it is proposed to amend the noise and vibration criteria for construction of the Project. The revised construction noise and vibration goals are presented in Table 13-2. The predicted noise impacts associated with construction have been assessed against the noise goals in Table 13-2 in Section 13.2.1

Table 13-2 Revised construction noise and vibration goals for the Project

Project Goals	Time period		
	Day (7am - 6pm)	Evening (6pm - 10pm)	Night (10pm - 7am)
Construction Noise	$L_{Aeq,\ 1hr}$ 50 dB(A)	$L_{Aeq,\ 1hr}$ 50 dB(A)	$L_{Amax,\ 1hr}$ 52 dB(A) $L_{Aeq,\ 1hr}$ 37 dB(A)
Construction Blasting [1]			
Noise / Overpressure	115 dB Lin Pk (9/10) 120 dB Lin Pk	N/A	N/A
Vibration	5mm/s PPV (9/10) 10mm/s PPV (Max)	N/A	N/A

Blasting will only occur during daytime hours

One submission questioned the derivation of the proposed noise limits for operational maintenance activities for the Project. Section 6X of the *Environmental Protection Regulation 1998* presents time restrictions for regulated devices:

- No audible noise to be made on a Sunday or public holiday, before 8 am or after 7 pm; or
- No audible noise on a Saturday or business day before 7 am or after 7 pm.

Table 12-3 of the EIS incorrectly presented noise limits for regulated devices. It is proposed the use of regulated devices for operational maintenance activities will comply with the requirements of the *Environmental Protection Regulation 1998*.

13.2. Construction Noise and Vibration Impacts

13.2.1. Construction Activities

Section 12.4.1.4 of the EIS presented noise modelling results for four different construction scenarios.

- Scenario 1 – day time activities including dam foundation and excavation, concrete batching plant, crushing and screening, quarrying;
- Scenario 2 – night time activities during concrete batching,;
- Scenario 3 – day time activities including dam construction and the operation of a RCC batch plant; and
- Scenario 4 – night time activities during concrete batching and construction of the Left Half RCC Wall Construction.

The predicted noise levels from the various construction scenarios are presented in Table 13-1. The predicted noise levels that exceed the noise goals have been highlighted in orange.

Table 13-3 Summary of Predicted Noise Levels at Sensitive Receivers

Time Period	Daytime				Night Time							
Receiver	Scenario 1		Scenario 3		Scenario 2				Scenario 4			
R1	50	54	52	53	42	46	32	36	54	58	44	48
R2	44	49	44	49	38	43	28	33	46	50	36	40
R3	41	47	42	46	38	43	28	33	43	47	33	37
R4	39	42	37	37	37	42	27	32	39	42	29	32
R5	33	38	30	34	32	37	22	27	32	36	22	26
R6	41	38	32	27	43	47	33	37	34	38	24	28
R7	41	38	32	27	43	47	33	37	33	38	23	28
R8	40	36	30	25	41	46	31	36	32	36	22	26
Met condition	No wind, Class D	3m/s NE wind, Class D	No wind, Class D	3m/s NE wind, Class D	No wind, Class D	No wind, Class F	No wind, Class D	No wind, Class F	No wind, Class D	No wind, Class F	No wind, Class D	No wind, Class F
Construction Noise Goal	L_{Aeq} 50dB				L_{Amax} 52dB(A)		L_{Aeq} 37dB(A)		L_{Amax} 52dB(A)		L_{Aeq} 37dB(A)	

During the construction of the southern half of the dam wall, the sleep disturbance criteria of L_{Amax} 52 dB(A) and L_{Aeq} 37 dB(A) will be exceeded by 6 and 11 dB(A) respectively during temperature inversion (Class F) at the closest noise sensitive receiver (R1). The sleep disturbance criterion of L_{Aeq} 37dB(A) will be exceeded by 3 dB(A) during temperature inversion (Class F) at receiver (R2). At the other six (6) noise sensitive receivers, the construction noise levels are predicted to comply with the sleep disturbance noise criteria.

To comply with the sleep disturbance criteria, windows will need to be closed and air conditioning will be required at noise sensitive receivers (R1) and (R2). SDRC will provide acoustic treatment to both of these sensitive receivers to comply with the sleep disturbance criteria.

Daytime construction activities are predicted to comply with the daytime noise criterion at all sensitive receiver except R1. SDRC has committed to provide acoustic treatment at this residence to maintain indoor noise levels. In the event noise from construction activities is causing nuisance impacts at this sensitive receiver, SDRC has agreed to relocate the residents on a temporary basis.

13.2.2. Blasting Impacts

One submission questioned the potential for property impacts to building foundations through vibration or from fly rock. The submission requested further clarification of blast notification procedures.

The construction contractor will be required to undertake pre-condition surveys for all properties within 1 km of the dam construction site.

The blasting contractors will specifically design each blast and select the maximum instantaneous charge (MIC) weight such that no one detonation will cause vibration levels to exceed the noise and vibration goals for blasting (presented in Table 13-2). The MIC is the critical factor in controlling the impacts to local residents and sensitive receivers and changes depending on distance, geology and velocity of detonation. The blasting contractor will determine the other blasting parameters for each blast to maximise fragmentation, to reduce vibration effects, to reduce ejection risks and to control the potential for fly rock generation.

Vibration and air blast monitoring will be undertaken at sensitive receivers to confirm compliance with the noise and vibration goals for blasting in Table 13-2. Data to be collected for each blast will include:

- measured vibration;
- measured overpressure;
- maximum instantaneous charge;
- distance from blast to monitoring location;
- volume of explosives used
- number of holes;
- blast type; and
- weather conditions.

Post-condition surveys will be undertaken to confirm blasting for dam construction has not resulted in impacts to property.

All residents within a 1 km radius of the blasts will be notified of the blasting activities by at least Monday morning of the week of the blast via letter drop. The notification will include the proposed blasting works including days of the week, time of the day, number of blasts etc.

13.3. Construction Noise Mitigation and Management

One submission has recommended additional noise mitigation measures to assist in the management of air quality impacts during construction. SDRC has considered each of the recommended noise management measures in Table 13-4.

Table 13-4 Recommended Noise and Vibration Mitigation Measures

Recommended dust mitigation measures	Proponent Response
Recommend that 'smart alarms' which adjust the volume depending on the ambient level of noise or to be replaced with 'broadband' or 'quacker' alarms to operate with less annoying sound.	This has been accepted and incorporated in the Environmental Management Plan (Appendix J, Section 4.12).
That a consultation and communication process be agreed upon prior to construction commencing	This has been accepted and incorporated in the Environmental Management Plan (Appendix J, Section 4.12).
Implement noise monitoring at residence	This has been accepted and incorporated in the Environmental Management Plan (Appendix J, Section 4.12).
The access road to the construction site be located on the same site as the final access road to the recreation area to minimise noise impacts from machinery and construction traffic	This has been accepted and incorporated in the Environmental Management Plan (Appendix J, Section 4.12).
Physical treatment of residence to maintain indoor noise levels.	SDRC will treat affected local residences if noise impacts cannot be adequately managed. SDRC will ensure all proposed treatment options (e.g. air conditioning) are negotiated in a fair and equitable manner.
Relocation of affected resident in the event established mitigation measures prove to be ineffective.	SDRC agrees to relocate affected residents on a temporary basis if noise impacts cannot be adequately managed. SDRC will ensure any relocation is negotiated in a fair and equitable manner.

The proposed noise and vibration monitoring and management during construction are outlined in the Environmental Management Plan (Appendix J, Section 4.12).

The potential for noise nuisance from the Project can be further reduced through:

- Effective communications with local stakeholders on noise issues associated with construction;
- A clearly identified point of contact should local stakeholders have comments or complaints;
- Well defined process to ensure that any issues are dealt with promptly and to a satisfactory level; and
- Well defined system of recording any incidents or complaints.

All complaints about noise will be investigated promptly and appropriate action will be taken to reduce nuisance impacts. A register of noise complaints will be maintained.

13.4. Operational Noise Impacts

13.4.1. Recreational Noise

One submission raised concerns about potential for noise impacts associated with recreational activities including boats and jet skis.

The recreation area would be managed by the SDRC. SDRC currently manage the recreation area at Storm King Dam. The activities to be allowed to occur at the Emu Swamp Dam would be determined by Council, but similarly to Storm King Dam, overnight camping would be prohibited. This would reduce the potential for night-time noise impacts from users of the recreation area and potential for intrusion of nearby properties. Day-time noise impacts associated with the use of the recreation area are discussed in Section 12.4.6 of the EIS. In order to mitigate the potential noise impacts from recreation activities, management procedures controlling the use of jet skis and power boats would be administered by SDRC and included as part of the management plans for the area.

13.4.2. Pump Station Noise

One submission requested further assessment of low-frequency noise associated with the pumping stations.

The *Assessment of Low Frequency Noise Guideline* (draft) (EPA 2002) states the overall sound pressure level inside residences should not exceed 50dB(Lin) to avoid complaints of low frequency noise annoyance. This requirement is based on experimental evidence and on field annoyance data. Low frequency noise is a potential issues requiring further assessment if the internal noise level exceeds 50dB(Lin) and the dB(Lin) measurement exceeds the A-weighted measurement by more than 15 dB.

Noise levels of equipment in a pump station are relatively low (generally <75 dB(A) at 1 m). Pump stations can be enclosed and will be designed to comply with the low frequency noise criteria and a planning noise level of $L_{Aeq,\,1\,hour}$ 30 dB(A) at the noise sensitive receivers as stated in Section 12.3.4 of the EIS.