Mt Piper Power Station Extension

ENVIRONMENTAL ASSESSMENT

CHAPTER 8 – NOISE IMPACTS

- September 2009

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8. Noise Impacts

The Director-General's requirements:

The Environmental Assessment must include a comprehensive operational noise impact assessment for the project, prepared in accordance with NSW Industrial Noise Policy (EPA, 2000) considering worst case operating scenarios and meteorological conditions and cumulative impacts from surrounding power stations (including Mount Piper and Wallerawang) and the Western Rail Coal Unloader. The assessment must consider the potential for low frequency noise generation and peak noise events with the potential to cause sleep disturbance.

The Environmental Assessment must also consider the potential for:

- *Construction noise impacts considering potential cumulative impacts from concurrent construction works (eg Western Rail Coal Unloader) consistent with the DECC's "Construction Noise – Existing Guidelines".*
- *Vibration impacts during construction and operation consistent with Assessing Vibration: A Technical Guideline (DECC,2006); and*
- *Traffic generated noise during construction and operation consistent with Environmental Criteria for Road Traffic Noise (EPA, 1999)*

The Environmental Assessment must include a framework for the mitigation, management and monitoring of noise impacts, particularly with respect to sensitive receptors likely to be significantly impacted by cumulative noise impacts in the local area.

8.1 Existing Environment

The detailed noise impact assessment for the project is described in **Appendix D.**

8.1.1 Noise Monitoring

In accordance with the *NSW Industrial Noise Policy* (INP) (EPA, 2000), noise monitoring was undertaken to enable appropriate noise criteria to be established. Background noise levels were measured at four locations around the Mt Piper Power Station between September and October 2005 and between July and August 2006. The locations of the noise monitoring are shown in **Figure 8-1**.

The purpose of long term noise monitoring was to provide noise level data to help characterise the influence of the existing noise sources in the vicinity of the power station and to determine variations in seasonal changes to the noise environment surrounding the power station.

- ***Figure 8-1 Location of noise monitoring***

8.1.2 Environmental Noise Measures

Unattended Noise Monitoring

Unattended monitoring was undertaken with automatic noise loggers which measure and record environmental noise. The loggers were set to record a range of noise indices at 15 minute intervals. This data were used to determine the median values for the L_{Aeq}, L_{A90}, L_{A10} and L_{A1} descriptors for the following periods:

- Day – 7am to 6pm;
- Evening – 6pm to 10pm; and
- Night – 10pm to 7am.

A summary of the noise data is shown in **Figure 8-1**. Daily profiles of the noise monitoring results are shown in **Appendix D**.

Table 8-1 Summary of Unattended Noise Survey

Location	Date	Rating Background Level (RBL)			L_{Aeq} over the assessment period		
		Day	Evening	Night	Day	Evening	Night
A	14/9/05	32	34	31	45	43	43
A'	25/07/06	31	30	31	40	44	40
B'	14/9/05	32	31	29	49	40	39
B	25/08/06	30	28	25	50	43	40
C	14/9/05	34	44	35	49	49	46
C	25/08/06	27	25	23	43	43	38
D	14/9/05	39	36	32	51	47	50
D	25/07/06	41	34	31	55	50	52

Revised noise data - B' = Humphrey Street, A' = Back Cullen Road

The noise levels at Location A are mainly influenced by natural sources such as wildlife (e.g. birds and frogs), and other sources such as traffic. The noise profiles for Location B indicate that there a fault with the logger for a large part of the monitoring period. The last three days show a more natural level of noise activity and are presented in **Table 8-1** as B'. The noise levels at Location C are constantly low during the day but increase during the evening and night periods, most likely due to wildlife activity such as frog noise. Other sources of noise at this location include cattle noise and occasional road traffic. Location D is influenced by road traffic and noise from natural sources such as birds and dogs. At the time of logger deployment a diesel pump was operational and therefore other noise sources were not audible.

Attended Noise Monitoring

Attended noise monitoring was carried out at the same locations where noise loggers had been positioned. The attended monitoring around the Power Station was conducted over two survey periods one year apart during the night time when it is assumed that background noise levels are at the lowest and the noise emissions from the power station may be detected.

The attended monitoring during these surveys has been used to establish the lowest ambient noise level and observe if the Mt Piper Power Station was audible during these times at these locations. **Table 8-2** presents a summary of the monitored noise levels and the various sources that contributed to these levels.

Table 8-2 Summary of Attended Noise Survey

Location	Date & Time	Night Time Noise Levels – dB(A)				Mount Piper P.S. Audible?	Contribution to noise environment
		L_{A90}	L_{A10}	L_{Aeq}	L_{Amax}		
A	14/9/05	24	38	34	49	N	Frogs, dogs, voices, distant traffic
A	7/08/06 23:30	29	34	33	48	Y	Mt Piper P.S. audible against background levels
B	14/9/05	25	33	29	41	N	Frogs, dogs, sheep
B	7/08/06 23:55	32	37	35	52	Y	Max from occasional dog bark, some road traffic Mt Piper P.S. audible against background levels
C	14/9/05	28	32	30	42	Y	Frogs, cows, some traffic. Mount Piper occasionally audible
C	7/08/06 00:20	24	30	31	51	N	Wallerawang audible against background levels. Became barely audible at the end of the attended monitoring Mount Piper not audible during survey.
D	14/9/05	N/A	N/A	N/A	N/A	N	Generator operational during survey
D	7/08/06 22:45	33	54	49	64	N	Max level from truck passby. Wallerawang audible and dominant background source. Mount Piper not audible during survey

Noise Monitoring Results

The current operations of the Mt Piper Power Station may only affect noise levels at nearby receivers during certain meteorological conditions such as down wind direction and during temperature inversion conditions.

During the initial noise survey in 2005, the power station noise impacts were inaudible at all receiver locations except for Location C and were below background noise levels, during the night time period where very low noise levels exist within the rural environment. For the second round of attended noise monitoring in 2006, the power station was audible at only two of the attended monitoring locations.

While the background noise levels of attended measurements in 2006 were higher than those previously measured in 2005, the unattended monitoring results were similar or less than those previously recorded which indicates that the effects of meteorological conditions has little

impact on the longer term RBL's for the night time period. During both surveys there were no observed tonal or impulsive noise emissions from the power station.

The influence of Wallerawang Power Station at some of the receiver locations is largely due to the effects of wind direction. The cumulative noise influence of the Wallerawang and Mt Piper Power Stations at sensitive receiver locations is negated by the location of the receivers in relation to the stations. When the wind is directed towards a receiver from one of the power stations, it would reduce any impacts from the other, being in a diametrically opposing direction.

8.2 Noise Criteria

The Mt Piper Environment Protection Licence 13007 does not include the provision for noise limits for current operations. The DECCW's *NSW Industrial Noise Policy* (INP) (EPA, 2000) provides the framework and process for deriving project specific noise limits for impact assessments and (separately) limits for consents and licences that will enable the authority to regulate premises that are scheduled under the *Protection of the Environment and Operations Act 1997*. The INP is designed to determine an acceptable level of impact expected at a community level, and has been used as a guideline for the noise impact assessment for the proposed power station extension. Where the INP criteria are met, no adverse noise impacts would be reasonably expected at the closest receivers. The INP requires that the noise from a development comply with the lower of the amenity or intrusive noise criteria.

8.2.1 Intrusive Noise Criteria

A noise source is considered to be non-intrusive if:

- The $L_{Aeq,\ 15\ minute}$ level does not exceed the RBL by more than 5 dB(A) for each of the day, evening and night-time periods,
- The subject noise does not contain tonal, impulsive, or other modifying factors as detailed in Chapter 4 of the INP.

From **Table 8-1**, the lowest RBL noise levels for day, evening and night the intrusive noise limits have been applied to the monitoring locations as the assessment criteria. The corresponding intrusive noise criteria for the day, evening and night-time periods are presented in **Table 8-3**. The INP states that in relation to the RBL "*Where this level is found to be less than 30 dB(A), the rating background level is set to 30 dB(A)*". The assessment of the proposed extension has included the INP guidance for a minimum RBL of 30 dB(A) at sensitive receivers, thus making the lowest intrusive noise criterion $L_{Aeq,\ 15\ minute}$ 35 dB(A) at Locations B and C.

The intrusive noise criteria are designed to account for shorter duration noise impacts and are often the most appropriate tool for assessing the effects of noise at a residential location.

Table 8-3 Derivation of Project Specific Noise Criterion

	Day	Evening	Night-time
Intrusiveness Criteria	$L_{Aeq15\ min}$	$L_{Aeq15\ min}$	$L_{Aeq15\ min}$
Project Intrusiveness Criteria	L_{A90} + 5 dB(A)	L_{A90} + 5 dB(A)	L_{A90} + 5 dB(A)
Project Specific RBL levels			
Location A	37 dB(A)	39 dB(A)	36 dB(A)
Location B	35 dB(A)	35 dB(A)*	35 dB(A)*
Location C	35 dB(A)*	35 dB(A)*	35 dB(A)*
Location D	44 dB(A)	39 dB(A)	36 dB(A)
Amenity Criteria	$L_{Aeq\ 11hr}$	$L_{Aeq\ 4hr}$	$L_{Aeq\ 9hr}$
Acceptable Amenity Criteria	50 dB(A)	45 dB(A)	40 dB(A)
Modified Amenity Criteria	-	-	-
Project Amenity Criteria	50 dB(A)	45 dB(A)	40 dB(A)
Project Noise Criteria	$L_{Aeq15\ min}$	$L_{Aeq15\ min}$	$L_{Aeq15\ min}$
Location A	**37** dB(A)	**39** dB(A)	**36** dB(A)
Location B	**35** dB(A)	**35** dB(A)	**35** dB(A)
Location C	**35** dB(A)	**35** dB(A)	**35** dB(A)
Location D	**44** dB(A)	**39** dB(A)	**36** dB(A)

(*) Adjusted to meet the INP Minimum RBL Requirement

8.2.2 Amenity Noise Criteria

The amenity criterion is based on the zoning of the residences likely to be affected by noise, the general land use near the receiver location and the extent of the existing industrial noise in the area. Where there is an existing influence of industrial noise, the INP implements modifying factors to the criteria to account for cumulative noise impacts in order to minimise background creep and control the long term noise environment. The amenity levels are more suited to planning of noise levels rather than the assessment of project specific impacts. The amenity criteria apply to the L_{Aeq} level determined for the period of assessment of day, evening or night. The definition of the noise amenity classification for the area surrounding the power station is 'Rural'. The INP recommends that for a residence located in a rural area, acceptable amenity criteria would be an L_{Aeq} of 50, 45 and 40 dB(A) for day, evening and night-time periods respectively.

8.2.3 Cumulative Noise Criteria

The INP aims to control cumulative noise impacts resulting from the combined effects of a proposed project and existing industrial noise sources by modifying the amenity criteria

depending on the level of existing impact. Where there is an existing industrial noise influence, the amenity criteria are decreased in accordance with Table 2.2 of the INP.

From **Table 8-1**, the measured existing L_{Aeq} noise levels for day, evening and night range from 45-51, 40-49 and 39-50 dB(A) respectively. At the residential locations the attended monitoring identified that there were audible emissions from the power station at two sites during the night time period. The audibility of the Mt Piper Power Station was only recorded during the second round of monitoring in 2006. Prior to this, the monitoring did not reveal any noise emissions from the power station and therefore it has been concluded that audibility is possibly a result of temperature inversion conditions and may not occur under neutral meteorological conditions.

It was estimated that under neutral meteorological conditions the noise from the existing Mt Piper Power Station was approximately 27 dB(A) L_{Aeq}. Therefore, from Table 2.2 of the INP, no penalties are applied to the acceptable amenity criteria for the night time.

8.2.4 Low Frequency Noise

Section 4 of the INP lists modifying factor adjustments to account for certain annoying characteristics of noise emissions from industrial premises. The low frequency adjustment requires that the difference between the predicted C weighted and A weighted levels is no more than 14 dB(A), without penalty. The average difference between the C weighted and the A weighted levels calculated for the Mt Piper extension project is in the order of 20 dB(A) when calculated at a receiver location and therefore the current assessment includes a penalty for low frequency noise. In accordance with Table 4.1 of the INP, a 5 dB(A) penalty has been added to the predicted noise levels.

Due to the existing low background levels, the intrusive criteria for the day-time and night-time are the most stringent of the noise goals and these were used to assess the potential for noise impacts resulting from the proposed extension of Mt Piper Power Station. The day, evening and night-time limits would apply to noise generated by the operations at any residential dwelling.

8.2.5 Sleep Disturbance Criteria

The *Environmental Noise Control Manual* (ENCM) (EPA, 1994) provides guidance in assessing the likelihood of sleep arousal due to industrial noise impacts. The assessment of sleep disturbance varies between studies and it is commonly acknowledged that not all people are affected to the same degree or by the same noise exposure. For assessment purposes, the ENCM uses the criteria based on L_{A1} noise level of the source being no more than 15 dB(A) above the L_{A90} (background) noise level, when measured outside a bedroom window. From the unattended monitoring results in **Table 8-1**, the sleep disturbance noise criterion for the nearest affected sensitive receiver (Location C) would be 38 dB(A).

8.2.6 Traffic Noise Criteria

The *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999) details the current NSW policy on road traffic noise. This document provides guidance for all road noise impacts and more specifically the setting of noise objectives that apply to developments that have the potential to create additional traffic on an existing road network. The appropriate noise goals for the proposed extension are defined in Table 1 of the ECRTN and are summarised in **Table 8-4**. For the purpose of road traffic noise assessment only, the RTA and DECCW define daytime as 7am to 10pm and night-time as 10pm to 7am Monday to Sunday.

Table 8-4 Road Traffic External Noise Objectives

Type of Development	Daytime Design Objectives	Night-time Design Objectives	Where the Criteria are Already Exceeded
Land use developments with potential to create additional traffic on existing collector roads.	60 dB(A) $L_{Aeq\ (1\ hour)}$	55 dB(A) $L_{Aeq\ (1\ hour)}$	Where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria Examples of applicable strategies include appropriate location of private access roads; regulating times of use; using clustering; using quiet vehicles; and using barriers and acoustic treatments. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2 dB(A).

8.2.7 Construction Noise Criteria

The noise objectives documented in the guidelines were used to assess the potential noise impacts during construction. The noise criteria are dependent on the existing background noise levels and the expected duration of the works. The noise goals for construction activity are expressed in terms of L_{A10} noise levels above the nominated background level and are detailed in **Table 8-5**. Based on the expected duration of the construction works category 3 would be used as the criterion for construction noise.

Table 8-5 DECCW Construction Criteria Guidelines

No.	Duration Of Works	DECCW L_{A10} Guidelines
1	Construction period of 4 weeks and under	The L_{A10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20 dB(A).
2	Construction period greater than 4 weeks and not exceeding 26 weeks	The L_{A10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10 dB(A).
3	Construction period greater than 26 weeks	The EPA does not provide noise control guidelines for construction periods greater than 26 weeks duration, however, it is generally accepted that provided L_{A10} noise levels from the construction area do not exceed a level of 5 dB(A) above background, then adverse (intrusive) noise impacts are not likely to be experienced at nearest sensitive receptor locations.

The estimated construction period for the extension of the power station is four to five years. Based on the expected duration of the works, the criterion at number 3 in the table of background + 5dB(A) would be nominated as the construction noise goal for the project.

Restrictions are also placed on the hours of construction to ensure that the acoustic amenity of the closest residences is protected. Hours of operation for construction works associated with the new building construction would follow standard construction times listed below. An allowance for negotiated variations to these times with the DECCW may be necessary where construction works would need to take place at times outside these hours for safety, access or other reasons:

- Monday to Friday - 7am to 6pm;
- Saturday - 8am to 1pm; and
- No audible construction work to take place on Sundays or public holidays.

8.2.8 Summary of Project Noise Goals

Table 8-6 summarises the project specific noise goals outlined above at the potentially most affected residence.

Table 8-6 Summary of Project Specific Noise Criteria

Description	Day	Evening	Night
Operational Criteria	$L_{Aeq\ 15\ min}$	$L_{Aeq\ 15\ min}$	$L_{Aeq\ 15\ min}$
Location A	**37** dB(A)	**39** dB(A)	**36** dB(A)
Location B	**35** dB(A)	**35** dB(A)	**35** dB(A)
Location C	**35** dB(A)	**35** dB(A)	**35** dB(A)
Location D	**44** dB(A)	**39** dB(A)	**36** dB(A)
Traffic Noise Criteria	$L_{Aeq\ 1hr}$		$L_{Aeq\ 1h\ r}$
Collector Roads	**60** dB(A)	N/A	**55** dB(A)
Sleep Disturbance Criteria	N/A	N/A	$L_{A1\ 15\ min}$
Location A			**46** dB(A)
Location B			**40** dB(A)
Location C			**38** dB(A)
Location D			**46** dB(A)
Construction Noise Criteria	$L_{A10,\ 15\ min}$		
Location A	**37** dB(A)	N/A	N/A
Location B	**35** dB(A)		
Location C	**35** dB(A)		
Location D	**44** dB(A)		

8.3 Impact Assessment

8.3.1 Methodology

A validated noise model was used to assess the potential impacts arising from the proposed extension to the Mt Piper Power Station. The model was validated by comparing predictions at known locations to measurements taken at the same locations during the noise survey. Variability of the predicted levels with the measured levels is expected at some locations, particularly those at further distances. The predicted noise levels from the model show good correlation with measured values at each location and the model is therefore considered to be acceptable for use in the prediction of noise impacts.

SoundPLAN noise prediction software was used to estimate noise levels from the new plant layout at the nearest residential locations. The modelling was based on sound power data determined by measurement of existing equipment, or in the case of proposed new equipment, noise data obtained from SKM's database. The noise model predicted the $L_{Aeq\ 15\ min}$ impacts at the nearby residences for both daytime and night-time scenarios, and also predicted the noise impacts from adverse weather conditions, as required by the INP.

8.3.2 Sources of Noise Emissions

Assessing the noise impacts at nearby residences is complicated by the number of noise sources and the high background levels at the power station. A very good approximation of the individual contribution from each major source is required to predict the noise impact at the nearby receivers. In some instances these measurements can only be taken in the absence of other noise influences, which would involve shutting down parts of the power station to accurately obtain these data. Other items such as the stack outlet cannot be measured at the source and has been estimated based on other reports of similar infrastructure.

The ancillary processes and equipment that are associated with the major noise sources also produce noise emissions that contribute to the general noise levels around the site. At closer locations the major sources of noise can be identified. When heard from a distance, however, the noise from the power station takes on the characteristic of a general roar and specific items are not able to be distinguished.

For the coal option, a list of potential noise sources is presented in **Table 8-7**. This table is not an exhaustive list of noise sources from the power station, but the main items of plant have been identified for validation of the noise model. Where noise sources are inside a building an estimate of the sound power over the facade has been made, based on internal measured levels.

It is possible that the air cooled condensers would have a significant effect on site noise emissions. There are options available to reduce operational fan noise, although this would increase capital cost. The air cooled condensers used in the noise model represent the noisier option identified, although these data would be subject to verification from an equipment supplier.

Table 8-7 Modelled Building and Equipment Sound Power Levels for Coal Fired Plant

Description	Source Type	SWL dB(A)
Primary Air Forced Draft Fans – Boilers	Building	104
Bag Filters	Building	103
Turbine Hall	Building	105
Induced Draft Fan – Stack Noise	Stack	112
Coal Pulveriser / Ball Mill	Building	104
Coal Loader Facility	Point	117
Air Cooled Condensers	Area	120

For the CCGT option, a list of potential noise sources is presented in **Table 8-8**. The major sources of noise from a CCGT include the exhaust stack, the air intake, the turbine building and the transformer building. Secondary noise sources include the feedwater pumps, start up

ejectors and blow down valves. The CCGT would also use air cooled condensers and the cooling towers could be a significant source of noise and must be carefully designed to provide adequate attenuation of noise emissions. All these components tend to have a low noise frequency, which attenuates at a slower rate than the higher frequencies and can persist over long distances. These low frequencies also tend respond less to attenuation measures applied at the source of the emissions.

Table 8-8 Modelled Sound Power Levels for Gas Fired Plant

CCGT Plant Item	Sound Power Level dB(A)	Emission Height Range (m)
Air cooled condenser	105	12
Air intake	101	14-25
Main Transformer	97	0-3
Stack Mouth	94	60
Lube Oil Cooler	94	2-4
Diffuser	93	0-7
HVAC System	93	0-3
Feed Water Pump	90	0-3
Turbine building	90	0-23

For the CCGT option, noise impacts from start up and shut down procedures may be louder than the normal operations of the plant. These events would include noise from start up ejectors, blow down valves, sirens and circuit breakers. Due to the intermittent nature of these activities, they have not been included in the modelling of normal operational noise emissions at the external receivers.

These impacts have been assessed against the DECCW sleep disturbance guidelines to determine the potential for impacts during these periods. Noise emissions used in the sleep disturbance noise assessment have been based on the shutdown operation of a 175MW class open cycle gas turbine (OCGT) plant. This is considered to be representative of the worst case for similar events in a CCGT plant expected to occur at similar or lower levels. The noise emissions are:

- At shut down, a volume of gas will be trapped in the gas supply system. This gas is normally released and this can create a reasonable noise – measured at 103 dB(A) at 20 m, but for a short period of up to about 30 seconds. If problematic, these noise emissions can be reduced by first passing the gas through a silencer;
- At start up and shut down, the gas turbine compressor bypass valves open, venting air to the heat recovery steam generator (HRSG). This can create a short lived noisy event. This

discharge is normally piped to bypass air system eventually going to the atmosphere via the HRSG and then the exhaust silencers for a CCGT;

- During start up, noise from the start up ejector may occur;
- When a generator breaker opens or closes an instantaneous noise is emitted. In a CCGT plant, this is normally inside and therefore heavily attenuated by the building enclosure. There are also breakers in the switch yard, which cannot be readily attenuated;
- In an abnormal operational situation, the HRSG safety valves of a CCGT plant may open to relieve the pressure in the steam system. This discharge normally flows through silencers to the atmosphere.

8.3.3 Meteorological Conditions

Meteorological conditions from the Mt Piper station (2001 data) were reviewed in accordance with INP guidelines to determine the frequency of adverse weather conditions that may enhance noise from the site at the nearest residences.

Wind speeds of less than 3m/s would occur for less than the DECCW recommended limit of 30% occurrence before the wind effects are considered significant. Therefore, the effects of adverse wind on the propagation of noise from the site are not required to be assessed for this project.

The meteorological assessment indicates that temperature inversions occur for approximately 42% of the time between the hours of 6pm to 7am during the winter months and therefore an assessment of adverse conditions, i.e. temperature inversions, is required.

The assessment of winds during the winter months between has also been undertaken to identify the appropriate modelling parameters for meteorological effects under inversion conditions. This is considered to be a more accurate representation of adverse meteorological conditions for the local area around the power station. During winter, the night time drainage flow is from the WSW to an ENE direction, which effectively directs noise emissions away from residential locations under inversion conditions. The majority of measured wind speeds during this time are below 1.5 m/s.

8.3.4 Operational Impacts of the Coal Option

The noise model was used to predict the noise impact from the operation of the existing Mt Piper Power Station combined with the proposed extension. The noise levels used in the modelling for existing operations have been validated in the noise model for accuracy. The results of the predictive modelling are based on the following assumptions:

- Sound power levels of new equipment are estimated and should be confirmed with equipment suppliers during the design stage;

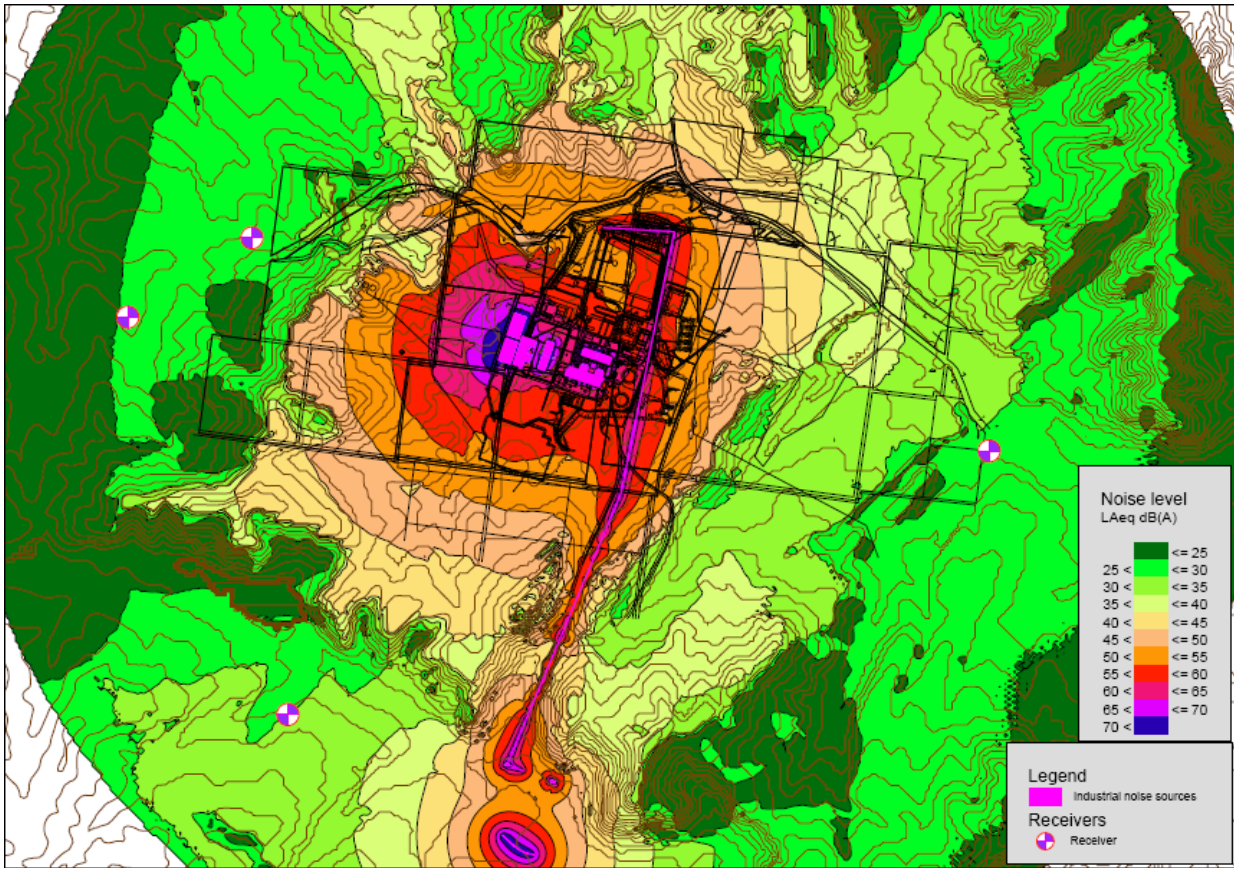
- Buildings housing the new equipment are assumed to be of the same design and construction as the existing ones and therefore have the same noise emissions;
- The power station operations do not vary between day and night and therefore noise emissions are at a continuous, constant level.

The results of the noise predictions at the nearest residences for neutral and adverse meteorological weather conditions, along with criteria for night time operations are presented in **Table 8-9**. The assessed adverse weather conditions include an F class stability and a 1.5m/s wind from the source to the receiver. The INP default conditions include a 3m/s wind or an F class stability with a 2m/s wind from the source to the receiver. These results have been adjusted to account for low frequency noise impacts by adding 5 dB(A) to the predicted values.

The results indicate that the predicted noise levels would provide compliance of the INP criteria for night time neutral weather conditions. Conversely predictions under adverse weather conditions indicate that there is potential for marginal exceedances of the project specific criteria during these times. The predicted noise levels for neutral meteorological conditions are shown as noise contours in **Figure 8-2**.

- **Table 8-9 Predicted Levels at Key Residential Locations Coal Fired Option**

Location	Predicted Noise Level Neutral Weather Conditions $L_{Aeq\ 15\ Min}$	Predicted Noise Level Assessed Adverse Weather Conditions $L_{Aeq\ 15\ Min}$	Predicted Noise Level INP Default Adverse Weather Conditions $L_{Aeq\ 15\ Min}$	Project Specific Criteria $L_{Aeq\ 15\ Min}$
	Day or Night	Night	Night	Day or Night
A	33 dB(A)	33 dB(A)	34 dB(A)	36 dB(A)
B	30 dB(A)	30 dB(A)	31 dB(A)	35 dB(A)
C	35 dB(A)	35 dB(A)	39 dB(A)	35 dB(A)
D	33 dB(A)	36 dB(A)	36 dB(A)	36 dB(A)



- ***Figure 8-2 Predicted Operational Noise Contours – Coal Fired Powered Station (Neutral Conditions)***

The major contributions to the predicted noise levels at the nearby residences are noise emission from the stacks and the air cooled condensers. The duplication of the power station would be expected to add approximately 3 dB(A) to the existing noise levels at any receiver location. As it is proposed to use air cooled condensers in place of cooling towers for the extension works, it is expected that the condensers would increase this noise level by a further 2-3 dB(A) based on the available data.

As previously mentioned, the exhaust stacks often provide a noise impact over long distances due to the low frequency noise emissions that attenuate at a slower rate than the higher frequencies. Noise from exhaust stacks and air cooled condensers is generally tonal at the lower frequencies and it is these tones that are often audible.

As the predicted noise levels at the nearest residences are estimated to be nominally at the DECCW INP noise criterion, due to the steady state nature of the noise emissions from the

power station and the infrequent stoppages, sleep disturbance impacts due to loud noise events are not likely to occur as the result of operations of the proposed extension.

Should the coal fired option be chosen and approved for construction, it is intended that pre- and post-noise monitoring be undertaken prior to the final commissioning of the project in order to quantify the impact on the nearby residential receivers under a variety of meteorological conditions.

8.3.5 Operational Impacts of the Combined Cycle Gas Turbine Option

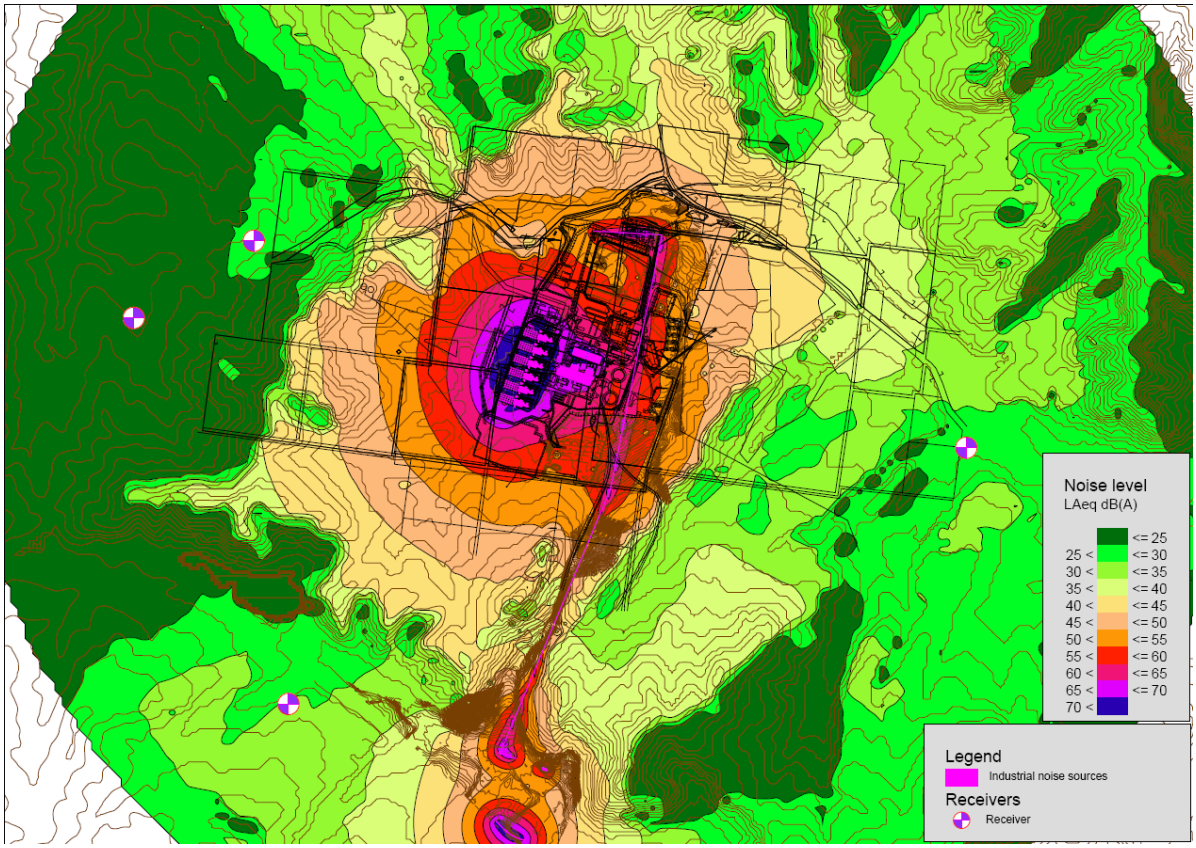
The cumulative noise impacts from the existing coal fired plant, the rail coal unloader and the proposed CCGT extension have been considered in the CCGT noise modelling scenario.

Similar to the coal option, the results of the noise predictions at the nearest residences for neutral and adverse meteorological weather conditions, along with criteria for night time operations are presented in **Table 8-10**.

The results for the CCGT indicate that the predicted noise levels would comply with the INP night time criteria at all locations under neutral and assessed adverse meteorological conditions. Predictions of noise impacts due to default adverse weather conditions indicate the potential for a marginal exceedance at residential locations in Blackmans Flat and a substantial exceedance of the project specific criteria for residences in Pipers Flat, to the south of the power station. The predicted noise levels for neutral meteorological conditions are shown as noise contours in **Figure 8-3**. These contours do not carry the 5 dB(A) penalty for low frequency impacts.

Table 8-10 Predicted Levels at Key Residential Locations CCGT Option

Location	Predicted Noise Level Neutral Weather Conditions $L_{Aeq\ 15\ Min}$	Predicted Noise Level Assessed Adverse Weather Conditions $L_{Aeq\ 15\ Min}$	Predicted Noise Level INP Default Adverse Weather Conditions $L_{Aeq\ 15\ Min}$	Project Specific Criteria $L_{Aeq\ 15\ Min}$
	Day or Night	Night	Night	Day or Night
A	31 dB(A)	31 dB(A)	33 dB(A)	36 dB(A)
B	27 dB(A)	27 dB(A)	29 dB(A)	35 dB(A)
C	35 dB(A)	36 dB(A)	40 dB(A)	35 dB(A)
D	32 dB(A)	36 dB(A)	36 dB(A)	36 dB(A)



- ***Figure 8-3 Predicted Operational Noise Contours – Gas Fired Powered Station (Neutral Conditions)***

For the operation of the CCGT component of the power station, there is the potential to run one or all of the six CCGTs, depending on the ultimate configuration. The modelling has assumed that all six CCGT would be operational simultaneously and therefore this may be considered as a worst case.

The representative receiver locations indicate that noise guidelines would be met at the majority of locations. However, under adverse weather conditions when the coal unloader and the power station are fully operational, the addition of a low frequency noise penalty indicates an exceedance of the noise goals by up to 5 dB(A) is possible for receivers to the south of the power station at Pipers Flat. This is primarily because of the addition of a low frequency penalty being applied to the combined influence of the power station and the coal unloader. Under normal circumstances, the coal unloader operations would not draw the low frequency penalty in its own right.

Due to the potential for noise impacts that are louder than normal operations to occur (such as stop/start associated noise), an assessment of sleep impacts from start up and shut down noise sources has been undertaken for the CCGT. Based on estimated noise levels of 103 dB(A) at 20 metres, an assessment of the potential for sleep disturbance impacts has been made. These results are shown in **Table 8-11**.

- **Table 8-11 Predicted Sleep Disturbance Levels at Key Residential Locations**

Location	Predicted Noise Level INP Default Adverse Weather Conditions L_{A1}	Project Specific Criteria L_{A1}
	Night	Day or Night
A	33 dB(A)	46 dB(A)
B	26 dB(A)	40 dB(A)
C	29 dB(A)	38 dB(A)
D	34 dB(A)	46 dB(A)

The noise level for peak events from the CCGT are expected to be significantly lower than the sleep disturbance criteria at all sensitive receiver locations.

8.3.6 Vibration Impacts

The nearest residential receiver is several kilometres from the existing and proposed extension site. At these distances vibration impacts from the power station cannot be experienced. Furthermore, a new source of vibration emissions such as the proposed extension would not combine to provide a cumulative vibration impact at sensitive receiver locations.

8.3.7 Construction Noise Impacts

General Construction Works

The construction program and methodology for the proposed extension would be subject to the requirements of detailed design and establishment of construction processes and, therefore, a full assessment of noise impacts is not possible at this stage. In general, it should be noted that while the noise emissions from construction activities in the immediate vicinity of the power station would be high, it would not provide a noise impact above and beyond the operational noise from the existing power station.

The predictions listed in **Table 8-12** are considered representative of anticipated noise levels based on a projected 'typical' construction scenario, with all equipment operating simultaneously. The predicted noise levels are not necessarily the worst case impacts but should be used as a guide to the level of impact expected.

- **Table 8-12 Predicted $L_{A10,\ 15\ minute}$ Noise Levels from Construction Activities at Key Receivers**

Location	Noise Levels from general construction activities	
	Nominal Distance (m)	$L_{A10\ dB(A)}$
A	1700	<20
B	2800	<20
C	1800	21
D	2800	<20

The noise from general works has been assessed and in all cases the estimated construction noise levels would be below background for daytime noise emissions. Specific noisy activities such as impulsive or explosive noise emissions or night time works may require a more detailed review at the design stage, although the predicted levels indicate that construction noise would remain within the criterion of 32 dB(A) at the nearest receiver.

The effects of cumulative construction noise impacts have been considered for the project along with vibration impacts. As the construction noise from the proposal would not be audible at the nearest receiver locations, noise impacts from any other construction activities (including the Western Rail Coal Unloader) occurring at the same time, where audible at a receiver location, would be that sole source of construction noise and therefore there would be no additional noise impacts from the proposal.

No additional noise mitigation measures are recommended at this time other than the implementation of appropriate management strategies during construction.

Construction Traffic Noise

The traffic noise assessment has been undertaken using traffic data outlined in **Section 14.4**. The power station currently operates 24 hours per day. The proposed duplication of the power station would require an increase in staff numbers, including both day and night shift operations personnel. The project has assumed that there would be no corresponding increase in the number of coal trucks using public roads as the coal delivery via the internal access roads and overland conveyor would continue and coal would also be delivered via the proposed rail coal unloader at Pipers Flat.

Based on the increase in road traffic for the construction period, changes to the general noise environment have been estimated for both peak and normal construction activities. These increases as well as the potential change in noise levels from road traffic due to staff increases on the Castlereagh Highway have been estimated in **Table 8-13**.

- **Table 8-13 Predicted Road Traffic Noise Impacts – Proposed Extension**

	Predicted Noise Impacts dB(A)		
	Operations	**Construction**	**Construction Peak**
Change in general traffic noise	<1	1	2

The change in daytime road traffic noise as the result of the proposed power station extension is not expected to be noticeable. This is largely due to the low number of extra vehicles that may potentially be required to service the additional staff movements. The estimated change in traffic noise levels for the 4.5 year construction period is predicted to be 2 dB(A) for the daytime period during peak times and 1 dB(A) at other times. This level of increase is not considered to be significant.

8.4 Mitigation Measures

8.4.1 Specific Noise Mitigation Measures

Specific mitigation measures for the Mt Piper Power Station site have not identified at this time. The assessment of noise impacts from the combined operations of the power station indicates that noise levels would be within the criteria for neutral and assessed adverse meteorological conditions and therefore no additional noise reduction is necessary based on the assumed design.

For default adverse meteorological conditions as prescribed by the DECCW INP, exceedances may be expected at locations where the influence of the coal unloader is further penalised for low frequency noise emissions in combination with the existing and proposed power station extension. The potential for noise reductions are currently unquantified. However, further noise reductions are expected to be able to be identified once the type and make of the proposed power station extension has been resolved.

Similarly, management measures for potential impacts cannot be identified at this stage until a final design has been confirmed. It is expected that care taken to minimise noise emissions during the design stage (pending project approval), would be the most effective management strategy.

8.4.2 Mitigation, Management and Monitoring Framework

Background Noise Monitoring

Noise monitoring would be undertaken prior to and after the project approval but prior to operations in order to determine long term trends in the local noise environment**.** Two types of

noise measurements would be required to ensure adequate reporting of background and project related noise emissions. These include:

- Periodic short-term attended measurements using a hand held sound level meter; and
- Longer term unattended monitoring using automatic noise loggers.

Attended measurements using Type 1 handheld sound level meters are primarily for spot checks, which are used to assess the instantaneous levels of the noise environment. These measurements are to be used to check equipment operational noise levels and project-specific noise levels at representative locations as required.

Unattended noise monitoring using noise-logging instrumentation is used for long term monitoring of project related noise emissions. These monitors sample continuously over each 24-hour period. The instrumentation must be set up to record the relevant environmental noise parameters in 15-minute time intervals over a minimum period of 7 days.

Noise Monitoring Program

Monitoring would be undertaken to ensure that both existing background noise levels and operational equipment noise levels are captured prior to commencement of any works and after construction has been completed. Noise levels would be measured at representative receiver locations identified in this report or where new receiver locations are developed that may have an exposure to the operations of the Mt Piper site.

A program to assess the existing noise levels at receiver locations around the Mt Piper site would aim to capture noise data under various meteorological conditions. This data can be used to establish a noise profile for receiver locations during seasonal variations of the noise environment.

If the measured levels show substantial influence from low frequency noise resulting from the power station alone, 5dB(A) must be added to the measured noise level before comparing the level to the project noise objectives.

Modelling During Design

To determine the requirement for and extent of mitigation measures, it would be necessary to model the potential noise impacts from the equipment likely to be used in the operation of the power station. The modelling would allow testing of design options to meet noise criteria set as part of the licence developed for the operation of the new plant.

Monitoring during Operation

Following commencement of operation of the plant it would be necessary to implement a verification process to test the predictions of the modelling and to determine whether the criteria set for plant operation are being met.