

***Noise Impact Assessment
Wallis Lake Dredging Project***

July 2006



Environmental Results

ACN 050 039 828 ABN 63 050 039 828
PO Box 438 Mosman Sydney NSW 2088
phone 02 99603032, facsimile 02 9968 1043

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The information contained in this report is limited to those issues related to acoustical assessment. It is not intended that this report cover issues related to other specialist advice that may be needed. The report includes only that information about the detail of the proposal that was available at the time of the assessment.

1 Outline and Key Conclusions

This report assesses the noise and vibration impact of proposed sand dredging of Oyster Lease 80-178 in Wallis Lake, Tuncurry and the processing of dredged material on a nearby site at Grey Gum Road, Tuncurry. The aim of the project is to dredge material from the lease to a depth suitable for oyster cultivation..

This assessment considers noise and vibration produced by the dredging and processing operations and related activities as well as any potential acoustical impacts on nearby residences and land uses.

The assessment was undertaken in accordance with the Department of Environment and Conservation (DEC) requirements for the preparation of the Environmental Impact Statement.

The Department of Environment and Conservation's Industrial Noise Policy (INP) is used in this report to assess noise.

The assessment involved computer modelling of noise using SoundPlan¹. All significant noise producing activities associated with the proposal were included to determine noise levels at the nearest residential premises, taking into account noise attenuation over distance, shielding structures and the meteorology of the area.

From a noise monitoring survey of the nearby areas, the appropriate DEC noise criterion was assessed to be the Intrusiveness Criterion with a daytime value of 43 dB(A) for the processing site and 48 dB(A) for the dredging site. It is important to note that background noise levels (the basis for setting environmental noise goals) can vary between different localities according to the activities such as road traffic and industrial activities. As a result the noise survey covered seven separate locations to ensure that goals were appropriate for the different areas.

For a part of the time the dredge will be located closer to dwellings than at other times. In this assessment this was considered as the worst case situation. In this situation, the assessment concluded that noise levels at the most exposed residences would be up to 48dB(A) and within the DEC's goals.

For the processing site, the assessment concluded that noise levels could be contained to within the 43 dB(A) DEC goal.

For road traffic noise related to the movement of heavy vehicles to and from the processing site along Grey Gum Road to the main road system, it was concluded that there would be no meaningful additional noise impact. In part this was due to the fact that the road connecting the site to the main road was through an industrial area with no residential uses along its length. In addition, the noise from

¹ SoundPlan is recognised by DEC as an acceptable noise modelling program for the types of industrial and transportation sources of noise that are assessed in this report.

approximately one additional vehicle per hour will not add have any impact when considered against DEC's traffic noise guideline.

As a result of the assessment and modelling of noise emissions from the activities associated with the sand dredging and processing, it is suggested that:

- Noise from the dredge should be attenuated so that the sound power level is limited to 97 dB(A).
- 3 sided, 3m high noise walls be erected around the return waters pump and the booster pump (shown in the noise map) to reduce noise levels to the appropriate environmental noise goal.
- Noise walls be erected prior to commissioning of pumps.
- Plant and equipment should be maintained in good working order to reduce noise emissions.
- Work site should be organised to reduce the operation of reversing alarms on vehicles. Where possible, vehicle and plant movement should be designed to maximise forward movements and to minimise reversing movements.

2 Description of Site and Operations

The project involves dredging an area of Wallis Lake that will ultimately allow the return of oyster farming to that location. The sand and fines produced by the dredging will provide sand for the market and the fines will be sold as a soil conditioner mix. It is expected that the processing will yield approximately 150,000 m³ of dredged material.

Two separate areas are proposed for the project. An 8 ha area of Wallis Lake is proposed for dredging and is shown in a site plan A.1 and A.2 in Appendix A. The site proposed for processing and stockpiling of sand and fines is shown in A.1 and A.3 in Appendix A. It is approximately 6 ha and has direct access to sealed roads.

Dredged material will be pumped from the dredging site through 3.8 km of pipeline to the processing site. Four booster pumps are proposed along the length of the pipeline. The first two pumps will be located on barges while the third and fourth pumps will be located on land. A return waters pump is proposed for the processing site that will return water after dewatering and sediment pond treatment to the Wallamba River.

The dredging operation in the defined area is proposed to operate for 10 hours per day (7:00 to 17:00) over five days and for 5 hours on Saturday (7:00 - 12:00) with no work on Sundays and Public Holidays. Maintenance activities may involve an additional hour each day.

At the processing site, road trucks will be used to transport material from the site. An expected maximum of twelve truck movements per day are proposed involving six incoming and six outgoing movements.

An excavator will be operated for the transfer of material to stockpiles and for the loading of road vehicles.

3 Environmental Noise Analysis Method

3.1 Noise assessment

The essential elements of the assessment method used in this report and based on DEC's INP method are:

- Identify the nature of noise to be emitted from plant
- Identify receivers
- Assess ambient noise
- Determine project-specific noise levels for the Intrusiveness and Amenity criteria for the project
- Predict noise levels from proposed activities at identified receivers
- Compare the predicted levels with the Project Specific Goals (PSG)
- Where predicted levels exceed the goals, suggest appropriate noise controls

An operating scenario was evaluated for each site. The sites are separated by at least 2 km and so were treated as separate acoustical entities.

3.2 Vibration

Processing and the internal haul road will be a minimum of approximately 350 m to the nearest residence.

Since distances to the nearest dwellings are substantial in terms of potential vibration impacts, vibration from the operation of plant and on and off site road vehicles will be insignificant. This is particularly so given the unconsolidated geology (beach ridge and dune sands) beneath the stockpile site.

4 Identifying Noise Sensitive Receivers

4.1 Residences near the site

The location of dwellings in the vicinity of both the dredging and processing sites are shown in the site maps in Appendix A. The site map for processing site also shows buildings in the industrial area adjacent to Grey Gum Road.

4.2 Residences and land uses along the haulage route

Road trucks using the processing site will travel along Grey Gum Road to Manning Street (the main road through Tuncurry).

Since Grey Gum Road is within an industrial area and there are no residences along the road itself, it was not necessary to assess any additional road traffic noise impact on this area.

5 Describing and Measuring the Ambient Noise

5.1 Local noise environment

The acoustical environment of the areas near the dredging site is defined by noise from boating activities. Areas adjacent to water bodies may experience higher noise levels from boating or distant road traffic due to the reflective properties of water.

The processing site is within an area with a mix of semi-rural activities and residential areas. Traffic levels are low with corresponding low levels of background noise.

5.2 Noise environment survey method

A noise measurement survey was carried out of the existing acoustical environment in the vicinity of the residences.

Spot noise measurements were taken at seven locations (see site maps in Appendix A). These short term measurements provided a profile of noise levels during a typical weekday across a wide area and surrounding both the dredging and processing sites.

Measurement data was assembled into time periods of 15 minutes to produce noise level indexes that are commonly used in the description of environmental noise.

Data was then assembled into a format that provided the key noise index parameters and values that were used to determine the appropriate INP noise criteria values.

The ambient noise survey summary information is shown in the following table.

Location	LAeq	LA90	Comment on sources
A – Grey Gum Road	63.6	57.4	Noise levels due to insects
B- Erica Place	50.0	38.1	Low volume of vehicles - traffic noise
C – Taree Street (western end)	49.6	43.4	Noise from various distant boating activities
D – Taree Street (near park)	49.9	41.3	
E – Sunset Place (Wallis Lake end)	48.7	44.6	Local domestic sources such as air conditioner noise
F – Rest point Drive (Wallis Lake end)	46.6	42.6	Noise from various distant boating activities
G - Caravan park	42.2	37.6	

Figure 5.1 – LAeq (ambient noise) and the LA90 (background noise) are shown for the survey period.

Background noise levels LA90,15 during the day varied from 37.6 dB(A) at the caravan park through to 57.4 dB(A) in the industrial area. The LAeq,15 noise levels for the day period varied from 63.6 dB(A) in the industrial area due to insect noise through to 38.1 dB(A) at the caravan park.

Measurements were taken when weather conditions were fine and wind conditions acceptable. Measurements were taken at locations away from vegetation to ensure that levels represented true background noise.

5.3 Sound power testing

Sound power measurements were taken of the dredge using the testing method described in AS1217.7-1985².

5.4 Survey instrumentation

Noise instrumentation was used to assess the ambient noise levels and to determine the sound power levels of equipment. The following instrumentation was used.

- Bruel & Kjaer 2236 Type-1 precision sound level meter used in data logging mode (serial number 2054683)
- Bruel & Kjaer 4231 calibrator (serial number 1883373) was used before and after the measurements to ensure that there was no substantial

² AS1217.7-1985 Acoustics-Determination of Sound Power Levels of Noise Sources – Part 7 Survey Method.

change in calibration. The meter was within 0.1dB of the original calibration.

- Bruel & Kjaer UA 1404 outdoor microphone system was used. The microphone is fitted with a rain cover and a high performance windscreen that are designed to reduce the effects of rain and wind noise.

For the sound power testing of the dredge, the following instrumentation was used.

- A Bruel & Kjaer 2260 (s/n 2027584) Type-1 precision sound level meter was used for the sound power measurements of equipment.
- A Bruel & Kjaer 4231 (s/n 1883373) calibrator was used before and after the measurements to ensure that there was no substantial change in calibration. The meter was within 0.2 dB of the original calibration.

Both meters were NATA calibrated by the manufacturer.

6 Noise Assessment Criteria

The noise criteria and assessment methods used in the assessment was based on DEC guidelines, specifically the 'Industrial Noise Policy (INP)' and the 'Environmental Criteria for Road Traffic Noise'.

These criteria are widely utilised by DEC and councils in the assessment of a wide range of environmental noise sources.

The INP assessment process involves determining two types of criteria, the Intrusiveness criterion and the Amenity criterion³. As required in the INP, each criterion was evaluated and the more stringent one was selected as the Project Specific Goal⁴.

For off-site road traffic noise, the DEC's "Environmental Criteria for Road Traffic Noise" was used to assess traffic noise.

6.1 Determining Project-Specific Goals

To determine the Project Specific Goals as described in the INP, two criteria need to be examined. The INP Intrusiveness assessment criterion used for residences recommends that noise should not exceed the assessed background noise level by more than 5dB at the residential boundary. Where appropriate, adjustments

³ The intrusiveness criterion is based on an allowable margin of noise over the existing background noise level. It assumes that the existing background noise level is acceptable. The amenity criterion aims to ensure that progressive background noise level increases do not occur with increasing additions to background noise levels as industry increases in size in a given area.

⁴ Project Specific Goals are the noise design goals that are evaluated for the project.



are made for any impulsiveness in the noise such as tonality, low frequency, intermittency and duration.

In addition to the Intrusiveness criterion, the INP suggests that the Amenity criterion also be examined. The criterion to be ultimately used is the one that is the more stringent (that is the lowest numerical value of either the Intrusiveness or the Amenity criteria).

The Amenity criterion is intended to ensure that any continuing increase in noise levels (for example due to increasing numbers of industrial activities) is limited to maximum ambient levels within an area. The INP contains a table of Amenity criteria that relate to different types of land use. Areas range from urban-industrial through to rural areas.

The Amenity criterion is based on Table 2.1 in the INP. This provides groupings of receiver types and recommended acceptable and maximum noise levels. The receiver classifications of 'residential' for the day period were used.

For this category of land use, the appropriate levels are shown in the following table in Figure 6.1.

Type of Receiver	Indicative Noise Amenity Area	Time Period	Recommended LAeq Noise Level dB(A)	
			Acceptable	Recommended Maximum
Residence	Rural	Day	50	55
	Suburban	Day	55	60
Passive recreation		When in use	50	55
Commercial premises		When in use	65	70
Industrial premises		When in use	70	75

Figure 6.1 – Noise amenity criteria levels obtained from the INP.

Since all plant, both stationary and mobile, will operate only during daylight hours, the appropriate amenity criteria levels for these site activities are the day levels.

Figure 6.2 is a summary of the data collected and analysed from the noise survey.

Location Day (07:00-18:00)	Ambient Noise (LAeq) from survey data	Rating Background Noise RBL (LA90) from survey data
A – Grey Gum Road	63.6	57.4
B- Erica Place	50.0	38.1
C – Taree Street (western end)	49.6	43.4
D – Taree Street (near park)	49.9	41.3
E – Sunset Place (Wallis Lake end)	48.7	43.6
F – Rest Point Drive (Wallis Lake end)	42.6	38.2
G - Caravan park	42.2	37.6

Figure 6.2 – Summary of noise statistics from the noise survey developed using the INP recommended method

From the survey data and using the procedure in the INP, the Intrusiveness and Amenity goals were assessed as shown in Figure 6.3.

	Amenity goal dB(A)	Intrusiveness goal dB(A) RBL+5	Project Specific Goals dB(A)
A – Grey Gum Road	70	62.4	Intrusiveness 62.4
B- Erica Place	53	43.1	Intrusiveness 43.1
C – Taree Street (western end)	53	48.4	Intrusiveness 48.4
D – Taree Street (near park)	53	46.3	Intrusiveness 46.3
E – Sunset Place (Wallis Lake end)	55	48.6	Intrusiveness 48.6
F – Rest Point Drive (Wallis Lake end)	55	43.2	Intrusiveness 43.2
G – Caravan park	55	43.6	Intrusiveness 43.6

Figure 6.3 – Summary of noise criteria and level for each of the nominated areas.

The Project Specific Goal applicable to the operation of the dredging site for areas facing Wallis Lake was assessed to be $43+5 = 48$ dB(A).

For the area surrounding the processing site, the Project Specific Goal was assessed to be $38+5 = 43$ dB.

6.2 Road traffic noise along public roads

The DEC’s “Environmental Criteria for Road Traffic Noise” contains guidelines and criteria for the assessment of road traffic noise. The guideline was used to assess any potential impact from road traffic noise.

6.3 Site establishment (construction)

For the sand processing location, site establishment will involve the installation of booster and return pumps and the setting up of settling ponds. These processes will require the use of an excavator to create the settling ponds and vehicles to carry equipment within the site.

At the dredging site, the dredge and the barges for the pumps will be located at the designated locations.

DEC has a construction noise criterion based on an allowance of a margin of noise over the assessed background noise and depending on the period of time that construction will occur. The criteria suggested by DEC are as follows.

Construction noise criteria	Construction period less than 4 weeks	Construction period between 4 and 26 weeks	Construction period over 26 weeks
Target noise limits	Background +20dBA	Background +10dB(A)	Background +5dB(A)

Figure 6.4 – Construction period noise criteria

Since the site construction period will be of a duration between 4 and 26 weeks, the criterion for construction activities would be based on the assessed background noise level plus 10dB(A). The assessed background noise level for the dredging site was 43 dB(A). The construction noise criterion level for this site would therefore be 53 dB(A).

For the processing site, establishing the site will be in the category of 4 to 26 weeks with an allowance of 10 dB(A) above the background noise. The construction noise criterion level for this site would therefore be 48 dB(A).

7 Modelling Noise Levels

7.1 Modelling noise from quarry activities

Computer modelling of noise from sources to receivers was carried out using SoundPlan. This noise prediction software is widely used in Australia and overseas for the modelling of industrial and transportation sources and is endorsed by DEC in the INP.

The modelling process takes account of:

- directivity of emissions from the source
- divergence of sound
- air absorption
- land elevation
- shielding by barriers or berms
- ground and surface absorption and reflection
- reflection due to structures
- height of structures
- meteorological effects – temperature inversions and wind gradients and directions (not applicable in this assessment – see discussion below), temperature and humidity.

The noise propagation modelling algorithm used was the CONCAWE method.

7.2 Modelled operating scenarios

In calculating the contribution of noise for each piece of plant, the percentage of time that an individual piece was operated was taken into account. A worst case situation was assumed for both locations that were evaluated based on the maximum operating volume.

Fixed plant (including the dredge, booster pumps and return waters pump) were assumed to operate continuously during the day. This plant was assumed (as a worst case scenario) to operate at full load and continuously so maximum sound power levels were used.

It is important to note that the noise modelling software carried out the calculations based on the defined area of water (shown in the noise map) and assuming that water acts as a reflector of sound.

For the purpose of this worst-case assessment it was assumed that the excavator would operate for 80% of the time.

The modelling assumed that there would be a total of 12 vehicle movements within the site to and from the loading location within the day.

Since the Intrusiveness Criteria applies to all locations, the noise assessment index used was the LAeq,15min.

Humidity of 50% and temperature of 20 centigrade were assumed in the modelling.

7.3 Noise emissions from site plant

Sound power information for all individual items of fixed and mobile plant were defined based on information from various sources and from testing carried out.

Sound power testing was carried out on the dredge to be used.

The sources of noise from plant in the assessment was considered not to require any modification for tonality, low frequency, impulsiveness, intermittency or duration as provided in the INP.

The sound power data used in the assessment are shown in Figure 7.1.

Item ⁵	% of time of operation	Intended use	Sound Power LWA dB(A)
Dredge (m)	100	Dredging of material in Wallis Lake	97
Booster pump	100	Transfer of sand to processing site	108
Return waters pump	100	Return of water	110
Excavator	80	Loading, back loading and stockpiling	112

Figure 7.1 – Sound power levels of plant.

Road vehicles operating within the site were separately assessed as moving sources and added to noise levels of fixed plant and the excavator within SoundPlan.

7.4 Road haulage off-site and traffic noise

Grey Gum Road is the access road to the main road and passes through an industrial area with no adjoining residential land use.

A survey of truck movements was carried out a location half way along the road. There were 108 light vehicle movements and 24 heavy vehicle movements in an hour period during a weekday between 3 and 4pm. Heavy vehicle movements were 17% of the total traffic flow.

7.5 Site preparation (construction)

Setting up the site will involve the use of plant that will be used once operations commence. This will involve the testing of the dredge at the dredging site and the testing of pumps on the barges and within the processing area.

The operational mode assessment was considered to provide noise levels indicative of those that would apply during the site establishment stage.

⁵ (m) Denotes measurement taken of equipment.

7.6 Meteorological effects

7.6.1 Temperature inversions

The INP suggests two key meteorological effects should be considered in noise assessments. These are temperature inversions and wind gradients. Temperature inversions can be the cause of elevated noise levels at distances from the source where otherwise noise would be expected to have attenuated due to the distance from the source.

Noise can also be affected by the speed and direction of wind. In some circumstances, noise can be increased downwind of the source and similarly be reduced when the receiver is upwind of the source.

For both the dredging and processing sites, the effect of temperature inversions was not assessed since this phenomenon usually occurs during the night and early morning⁶. Plant and processing will be carried out only during the day period when inversions are unlikely to occur.

7.6.2 Effects of wind

According to the INP, the effects of wind need to be assessed when wind is “a feature of the area”. Wind is considered to be a feature of the area when source to receiver wind speeds of 3 m/s or less occur for 30 per cent of the time or more in any assessment period (for example the daytime period) in any season.

For this assessment, wind frequency data was used to determine whether wind is a feature of the area according to the INP definition. The wind data was taken from a site at the Forster Beach Caravan Park, a location approximately 2.5 km east of the site.

Since the source-receiver direction (between the site and the dwellings) is along the north-easterly axis, wind data for this direction was analysed. The following wind frequency information was prepared from data collected at Forster Beach Caravan Park for the period between 1999 and 2004.

⁶ The INP states in S5.2 that “Assessment of impacts is confined to the night noise assessment period (10pm to 7am), as this is the time likely to have the greatest impact—that is, when temperature inversions usually occur and disturbance to sleep is possible”

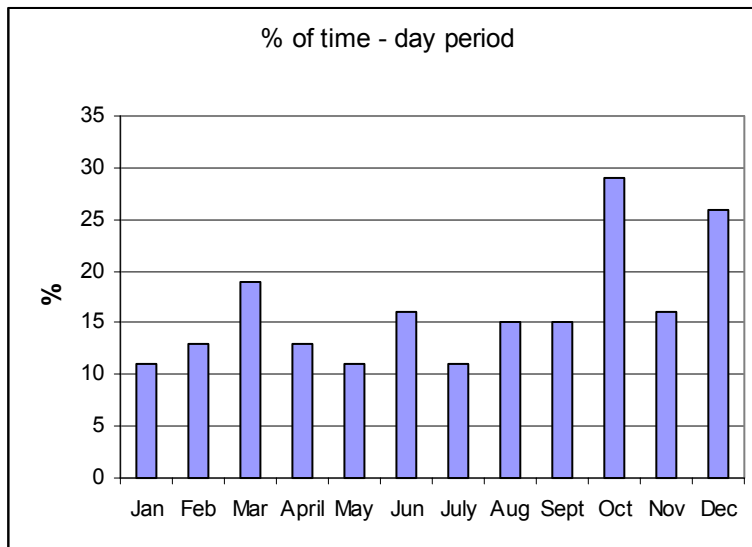


Figure 7.2 – Wind data analysis showing that wind data is within the 30% criterion for all seasons during the data collection period from 1999 to 2004.

With all seasonal occasions being within the 30% criterion that defines an area having source-receiver wind direction as a feature of the area, the influence of wind direction and speed was not included in the analysis.

It was concluded that the noise modelling described in this report could then be carried out without an adjustment for wind speed and direction since wind was assessed to be not a feature of the area (as described in the INP). Neutral wind conditions were used as the basis for the assessment of all operating scenarios.

8 Assessment Results and Discussion

8.1 Site operations

8.1.1 Dredging site

The noise map in Appendix B for the dredging site shows the noise contours associated with the operation of the dredge and the booster pump. The pump is located in the proposed position while the dredge is located in a worst-case location, in the closest location to dwellings in Taree Street during the dredging process. The dredge will be moved through all locations (gradually moving away from dwellings) within the designated area over the period of the project.

The LAeq,15min noise levels in the worst case situation of the dredge being at the closest location to the water-front residences in Taree Street are shown to be approximately 48 dB(A) which is within the PSG for this area. The booster pump produces approximately 48 dB(A) at one house at the western end of Taree Street. Noise from the dredge at the Wallis Lake end of Rest Point Drive were calculated to be approximately 40 dB(A) which is within the 43 dB(A) goal.

To ensure that the dredge does not exceed the PSG levels, the sound power rating of the dredge should not exceed 97 dB(A). This will require treatment of the engine enclosure area to reduce noise.

8.1.2 Processing site

The processing site is shown in the noise map with noise contours and partial enclosures around the return waters pump and one of the booster pumps. The PSG for the area was assessed to be 43 dB(A). The noise map indicates that noise levels at all the nominated receivers (buildings indicated in the noise maps) are within the assessed PSG.

The return waters pump and a booster pump are shown each with a three sided noise screen with a height of approximately 3m. These will be required to ensure that levels do not exceed the PSG.

8.2 Vehicle movements within the site

The movement of trucks within the site have been included in the modelling of noise as shown in the noise contour maps. The modelling includes the movement of sand carrying trucks between the stockpile area and the entrance to the site in Grey Gum Road.

The use of reversing alarms can be minimised by the design of loading arrangements in a way that reversing is reduced or avoided.

8.3 Truck traffic on public roads and noise

Grey Gum Road links the site with the main road system. This road services the industrial area along its length. There are no residential buildings adjoining the road.

The processing site traffic would add approximately an additional 1 vehicle per hour to the road system which would not have any meaningful additional impact on the acoustical environment of Grey Gum Road or the main road system.

8.4 Site preparation (construction)

Since the same plant will be used in the site preparation and operational phases, the noise impact from site preparation will be no more than the noise produced by the operational activities.

The assessment of noise from the operational phase contained in this assessment will be indicative of the noise levels associated with the site preparation phase.

Prior to the commission of the pumps, the noise walls should be installed to ensure that noise is contained.

9 Noise Mitigation Options

9.1 Recommended Noise Controls – Dredging Site

To reduce noise impact on residences it is recommended that noise levels from the dredge be attenuated so that the sound power level is limited to 97 dB(A).

Plant and equipment should be maintained in good working order to reduce noise emissions.

9.2 Recommended Noise Controls – Processing Site

It is suggested that 3 sided, 3m high noise walls be erected around the return waters pump and the booster pump (shown in the noise map) to reduce noise levels so as not to exceed the appropriate environmental noise goal.

Plant and equipment should be maintained in good working order to reduce noise emissions.

The work site should be organised to reduce the operation of reversing alarms on vehicles. Where possible, vehicle and plant movement should be designed to maximise forward movements and to minimise reversing movements.

10 Conclusions and Recommendations

This assessment of environmental noise from the proposed sand dredging and processing operations concluded that environmental noise goals could be achieved.

The assessment concluded that noise during worst-case operating conditions (when plant was closest to dwellings) would result in noise levels at the nearest residences being within the Project Specific Goals (environmental noise goals) developed from DEC noise guidelines.

For road traffic noise related to the movement of heavy vehicles to and from the processing site along Grey Gum Road to the main road system, it was concluded that there would be no meaningful additional impact since the road connecting the site to the main road was through an industrial area with no residential uses along its length.


In relation to noise from operations, noise controls will be needed to reduce plant noise levels. It is suggested that:

- Noise from the dredge should be attenuated so that the sound power level is limited to 97 dB(A).
- 3 sided, 3m high noise walls be erected around the return waters pump and the booster pump (shown in the noise map) to reduce noise levels to the appropriate environmental noise goal.
- Noise walls be erected prior to commissioning of pumps.
- Plant and equipment should be maintained in good working order to reduce noise emissions.
- Work site should be organised to reduce the operation of reversing alarms on vehicles. Where possible, vehicle and plant movement should be designed to maximise forward movements and to minimise reversing movements.




Appendix A – Site Maps




A.1 Site Plan - Dredging and Processing Sites




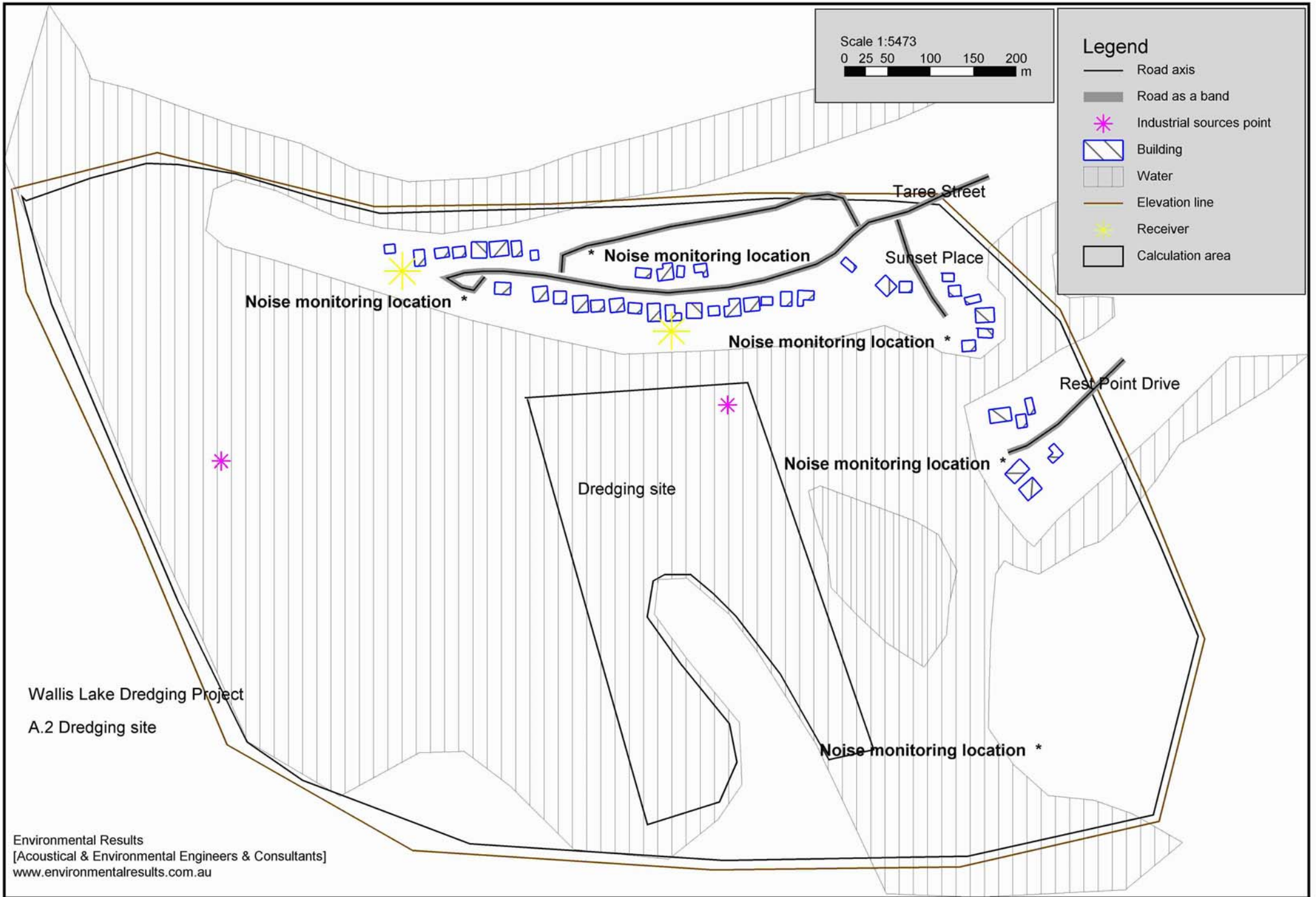
Map Not to Scale 

LEGEND

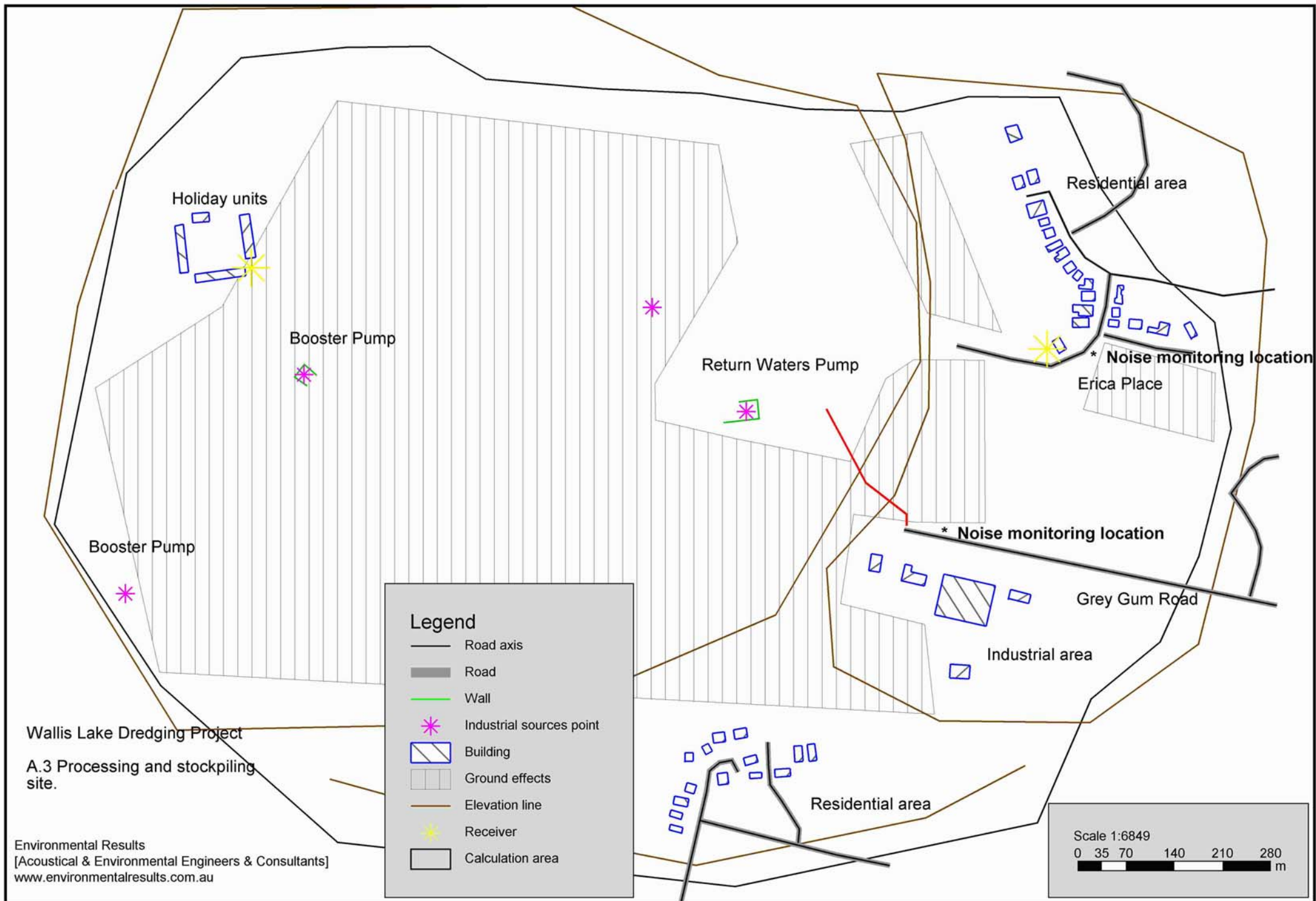
-  SEPP 14 Wetland # 590 Boundary
-  Dredge Pipeline Route
-  Return Waters Pipeline Route

-  Stockpile Site
-  Oyster Lease Dredge Area
-  Booster Pump

-  Settling Pond 1
-  Settling Pond 2



Wallis Lake Dredging Project
 A.2 Dredging site



Wallis Lake Dredging Project
 A.3 Processing and stockpiling site.

Environmental Results
 [Acoustical & Environmental Engineers & Consultants]
 www.environmentalresults.com.au

Appendix B – Noise Maps

