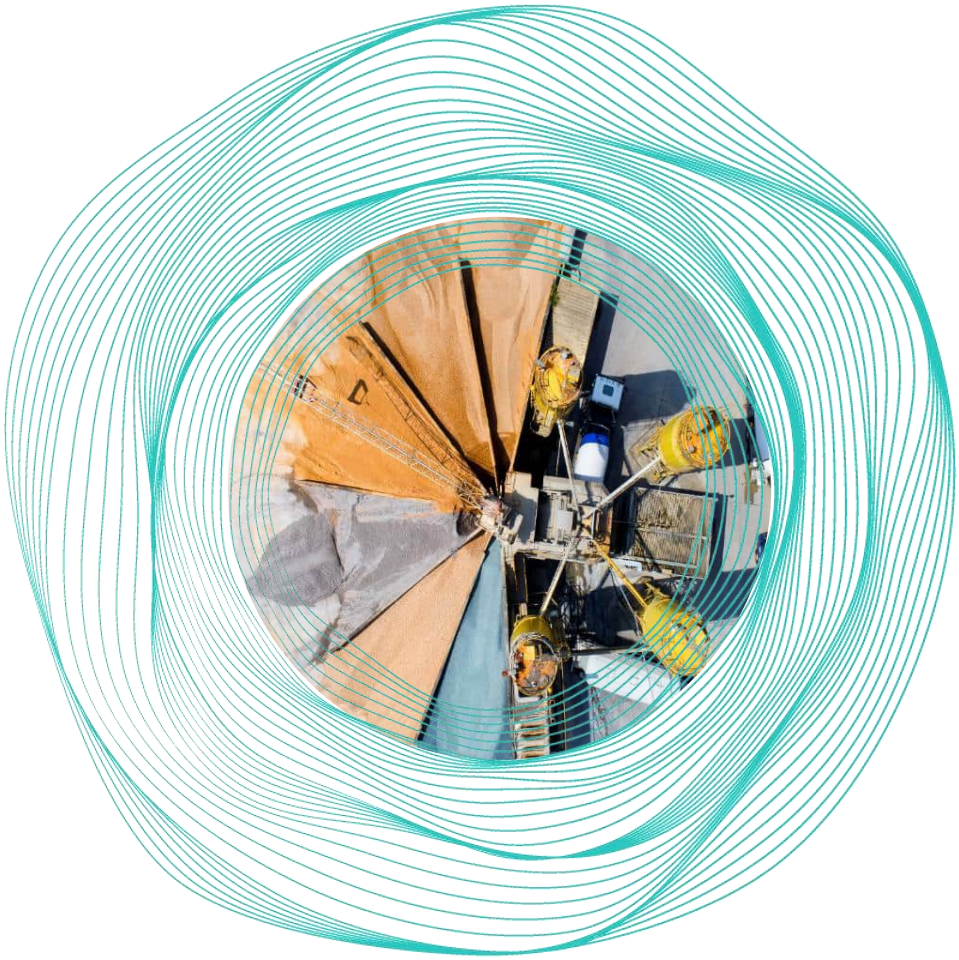
RATCH AUSTRALIA CORPORATION PTY LTD

Kemerton Power Station - MS 645 Amendment

Noise Impact Assessment

Document no. Rev 0: 411012-00930-EN-REP-0002



13 March 2024

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Synopsis

The purpose of this assessment was to determine likely impacts to the local noise environment associated with the proposed changes to operations at the Kemerton Power Station detailed in the amendments to Ministerial Statement 645. A screening level noise assessment determined a detailed assessment would be required. Noise monitoring was undertaken to determine sound power levels to be used as input to a noise model. Modelling was undertaken for both turbine generators operating simultaneously as well as in isolation.

Results showed for all modelling scenarios the predicted sound pressure levels at the closest Kwinana Strategic Industrial Area boundary were below 35 decibels (A-weighted) for both day and night environmental conditions. Based on this assessment, noise emissions associated with the changes to operations detailed in the proposed amendments to Ministerial Statement 645 are unlikely to have a significant effect on the local noise environment.

Disclaimer

PROJECT 411012-00930 - 411012-00930-EN-REP-0002: Kemerton Power Station - MS 645 Amendment - Noise Impact Assessment

Rev	Description	Originator	Reviewer	Worley Approver	Revision Date	Customer Approver	Approval Date
Rev A	Draft for internal review	Worley Consulting	Worley Consulting	Worley Consulting	12 December 2023		
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Rev 0	Issued for client use	Worley Consulting	Worley Consulting	Worley Consulting	13 March 2024		

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Executive summary

To meet increasing power demand from the Kemerton Power Station, RATCH-Australia Corporation is proposing an increase of the allowable operation time under Ministerial Statement 645 from 2,000 to 13,800 combined operational hours per year. The purpose of this assessment was to determine the impacts to the local noise environment associated with the proposed changes to the operations.

A screening level noise assessment was undertaken in line with the *Draft Guideline: Assessment of Environmental Noise Emissions* (Ref: 1), which determined a detailed noise assessment was required based on the nature of the plant and the proximity of the Kemerton Power Station site to the nearest sensitive receptors.

A detailed noise assessment for Kemerton Power Station was previously carried out by Herring Storer in 2003 (Ref: 7) which predicted noise emissions associated with the Kemerton Power Station site would not significantly impact the local noise environment. However, due to the age of the Herring Storer assessment, an updated model was undertaken to verify the results.

Noise monitoring was undertaken at the Kemerton Power Station site to be used as input into the updated noise model. The SoundPLAN v7.4 noise modelling software package was used to predict Sound Pressure Levels at the nearest Kwinana Strategic Industrial Area boundary, to compare results with the 2003 Herring Storer assessment.

Modelling scenarios included:

1. GT11 and GT12 operating simultaneously at 81 megawatts each (simulated as a singular noise source)
2. GT11 and GT12 operating simultaneously at 110 megawatts each (simulated as two noise sources)
3. GT11 operating in isolation at 110 megawatts
4. GT12 operating in isolation at 110 megawatts

Results of the noise modelling showed that for all investigated scenarios, the predicted sound pressure levels at the closest Kwinana Strategic Industrial Area boundary were below 35 decibels (A-weighted) for both day and night environmental conditions, which verified the results of the 2003 Herring Storer noise assessment.

Based on this assessment, noise emissions associated with the proposed changes to the operations of the Kemerton Power Station, detailed in the amendments to Ministerial Statement 645 are unlikely to have a significant effect on the local noise environment.

Acronyms and abbreviations

Acronym/abbreviation	Definition
dB(A)	A-weighted decibel
Draft Guideline	*Draft Guideline: Assessment of Environmental Noise Emissions*
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986*
EPA	Environmental Protection Authority
km	kilometre
KPS	Kemerton Power Station
KSIA	Kwinana Strategic Industrial Area
L_{A1}	The assigned noise level not to be exceeded for more than 1% of the time
L_{A10}	The assigned noise level not to be exceeded for more than 10% of the time
L_{Amax}	The assigned noise level not to be exceeded at any time
MS 645	Ministerial Statement 645
MW	Megawatt
Noise Regulations	*Environmental Protection (Noise) Regulations 1997*
RATCH	RATCH-Australia Corporation
SPL	Sound pressure level
SWL	Sound power level
SWIS	South West Interconnected System
WPS	Worley Power Services

1. Introduction

1.1 Background

RATCH-Australia Corporation (RATCH) owns the Kemerton Power Station (KPS) (operated by Worley Power Services (WPS)). KPS is located within the Kwinana Strategic Industrial Area (KSIA), approximately 130 kilometres (km) south of Perth and 23 km north-east of Bunbury (Figure 1-1). Constructed in 2005, the original intention of KPS was to provide peaking power to the South West Interconnected System (SWIS). Due to reduced generation power from primary suppliers, network demand of KPS has increased substantially, requiring an amendment to the current Ministerial Statement 645 (MS 645), under which the power station operates. To meet demand, RATCH is proposing an increase of the allowable operation time from 2,000 to 13,800 combined operational hours per year.

The proposed amendments to MS 645 represent a significant amendment to an approved proposal, as defined under Section 3 of the *Environmental Protection Act* (EP Act). As such, RATCH is referring to Proposal to the Environmental Protection Authority (EPA) under Section 38 of the EP Act.

1.2 Purpose of this report

The purpose of this assessment is to determine the impacts to the local noise environment associated with the proposed amendments to MS 645, and to determine if the proposed amended project will comply with the requirements of the *Environmental Protection (Noise) Regulations 1997*.

1.3 Scope of work

The scope of work for this assessment is as follows:

- Undertake a screening level noise assessment in accordance with the Department of Water and Environmental Regulation's (DWER) *Draft Guideline: Assessment of Environmental Noise Emissions* (Ref: 1).
- Depending on the outcome of the screening level assessment, investigate a detailed noise assessment for noise levels associated with the proposed changes to the operations.
- Provide a report (this document) outlining the assessment method and results of the above line items.

1.4 Limitations

Limitations of this study are identified as follows:

- Worley Consulting have prepared this assessment based on information provided by RATCH, which has not been independently verified.

1.5 Assumptions

The following assumptions have been made in this study:

- All information provided by RATCH for the purposes of this assessment is correct.
- All measured sound pressure levels (SPL) undertaken at KPS are representative of actual operations and are fit for the purpose of this assessment.

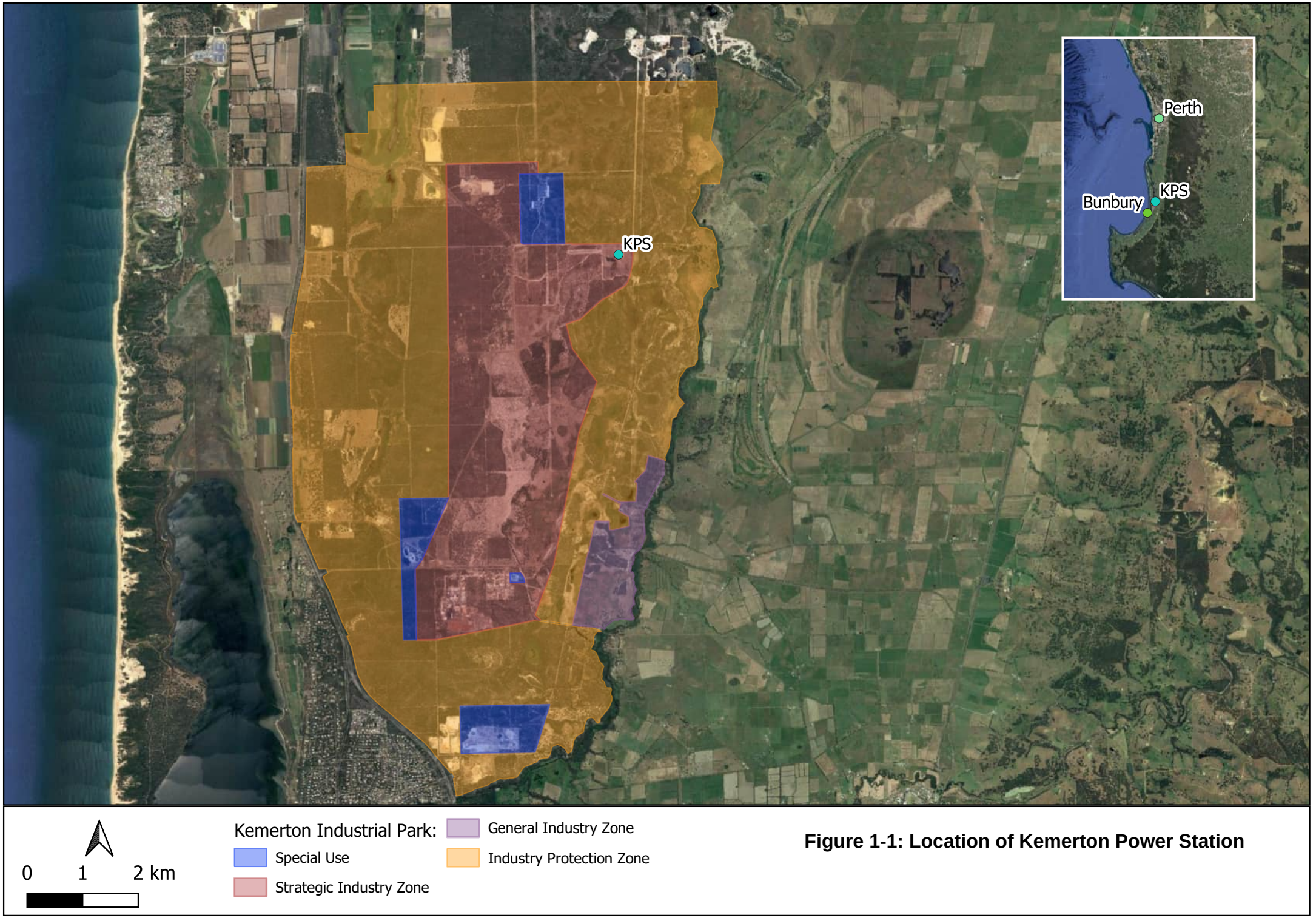

Figure 1-1: Location of Kemerton Power Station

2. Project overview

2.1 Description of operations

KPS is a gas-fired power station constructed to provide peaking power to the SWIS, and to provide spinning reserve with the SWIS to maintain system stability. KPS receives natural gas from the Dampier to Bunbury Natural Gas Pipeline to generate a nominal 260 megawatts (MW) of power. With a proposed project life of 25 years, KPS was initially approved to operate for 1,000 hours per year under MS 645, issued in February 2004. Since its approval, MS 645 has been subject to seven amendments regarding increase in quantities of liquid fuel and increase in allowable time of operation. The most recent amendment to MS 645, Amendment 7, was approved in August 2023 and increases the allowed operation time to 13,800 hour per year. Amendment 7 is valid for one year only and will expire on 11 August 2024.

2.2 Key project elements

Key project elements include the following:

- Two siemens V94.2 gas turbine generators, each capable of producing 130.5 MW.
- Two stacks associated with the gas turbine generators.
- One liquid storage tank (two megalitre capacity).
- Associated buildings and infrastructure.
- The gas turbine generators use approximately six petajoules (1,800 hours per year) of natural gas.
- The gas turbine generators can be operated using diesel fuel as a backup (up to 12 megalitres of ultra-low sulphur diesel per year (200 hours per year)).

2.3 Operational schedule

KPS operates approximately 2,000 hours per year on an ad hoc basis. However, due to high demand, in the 2022 calendar year KPS operated for a total of 3,949 hours.

3. Legal framework and standards

3.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) is Western Australia's overarching piece of environmental legislation. It provides for the prevention, control and abatement of pollution and environmental harm.

Under Section 51 of the EP Act the occupier of any premises must comply with any prescribed standards. The prescribed standards for certain noise impacts are set by the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations; Ref: 2). Noise impacts that exceed the prescribed standards are in breach of Section 51 of the EP Act.

3.2 Noise Regulations 1997

The Noise Regulations provide allowable noise levels to be received at a premises from an external source. For this assessment, the assigned noise levels relating to 'noise sensitive premises: highly sensitive area' are the most stringent to assess against. The applicable noise levels are shown in Table 3-1.

Table 3-1: Assigned noise levels for highly sensitive areas (Ref: 2)

Type of premises receiving noise	Time of day	L_{A10} (dB(A))	L_{A1} (dB(A))	L_{Amax} (dB(A))
Noise sensitive premises: highly sensitive area	7:00 am to 7:00 pm Monday to Saturday	45 + influencing factor	55 + influencing factor	65 + influencing factor
	9:00 am to 7:00 pm Sunday and public holidays	40 + influencing factor	50 + influencing factor	65 + influencing factor
	7:00 pm to 10:00 pm all days	40 + influencing factor	50 + influencing factor	55 + influencing factor
	10:00 pm to 7:00 am Monday to Saturday and 10:00 pm to 9:00 am Sunday and public holidays	35 + influencing factor	45 + influencing factor	55 + influencing factor
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premise other than those in the Kwinana Industrial area	All hours	65	80	90

Note:

- dB(A) is A-weighted decibels
- L_{A1} is not to be exceeded for more than 1% of the time
- L_{A10} is not to be exceeded for more than 10% of the time
- L_{Amax} is not to be exceeded at any time

An influencing factor is determined for each noise sensitive premises based on proximity to industrial land use, commercial premises, and main roads. Under the Noise Regulations, noise emissions for the KSIA have an adjustment of +5 dB(A) to the influencing factor (Ref: 2). Therefore, the assigned noise levels relevant to this assessment are shown in Table 3-2.

Table 3-2: Assigned noise levels for highly sensitive areas, including influencing factor (Ref: 2)

Type of premises receiving noise	Time of day	L_{A10} (dB(A))	L_{A1} (dB(A))	L_{Amax} (dB(A))
Noise sensitive premises: highly sensitive area	7:00 am to 7:00 pm Monday to Saturday	50	60	70
	9:00 am to 7:00 pm Sunday and public holidays	45	55	70
	7:00 pm to 10:00 pm all days	45	55	60
	10:00 pm to 7:00 am Monday to Saturday and 10:00 pm to 9:00 am Sunday and public holidays	40	50	60

Further, noise emissions from KPS would be considered as not "significantly contributing" to any exceedance of the assigned noise levels if the noise received at the premises is 5 dB(A) below the assigned noise level (Ref: 2). Therefore, in order to comply with the most stringent Noise Regulation, the L_{A10} value of noise received at the nearest sensitive receptor would need to be 35 dB(A) or below.

Additionally, noise emitted from any premises that exhibits certain characteristics (as defined in Item 9 of Part 2 of the Noise Regulations; Ref: 2) is subject to an adjustment as follows:

- Tonality receives an adjustment of +5 dB to the noise emitted.
- Impulsiveness receives an adjustment of +10 dB to the noise emitted.
- Modulation receives an adjustment of +5 dB to the noise emitted.
- The above adjustments are cumulative to a maximum of 15 dB.

4. Screening level assessment

The purpose of the *Draft Guideline: Assessment of Environmental Noise Emissions* (Draft Guideline; Ref: 1), is to ensure adequate information is provided to DWER for assessing applications with noise emissions, as regulated under the EP Act.

The Draft Guideline (Ref: 1) provides steps to complete a screening level noise assessment to assist applicants to identify low-level noise emissions. Where noise impacts are deemed sufficiently low, a detailed assessment is not required. Where a screening level noise assessment is not carried out, or where it identifies the potential for significant noise impacts, a detailed assessment is required.

This section of the report outlines the method and results of a screening level noise assessment undertaken for the proposed amendment to MS 645. A completed Screening Form, taken from Appendix A of the Draft Guideline (Ref: 1) is provided in Appendix A of this report.

4.1 KPS area siting

The location of the KPS site is considered regional, as it is not located in close proximity to a city or town. The closest built-up areas are Harvey (approximately 14 km north-east) and Bunbury (approximately 23 km south-west) (see Figure 4-1).

A desktop assessment was undertaken to identify possible nearby sensitive receptors. Aerial imagery (Ref: 5) were reviewed within a radius of 10 km from the Project site and buildings/infrastructure were marked as a sensitive receptor if they appeared to be a residence or facility where people are likely to work or spend a significant amount of time. In many cases, it could not be distinguished if a building was a residence or simply a shed. Therefore, a conservative approach was adopted whereby a building that could not be distinguished from a noise sensitive premises, was assumed to be a sensitive receptor. See Figure 4-1 for sensitive receptor locations.

The distance to the nearest identified noise sensitive receptor/premises (distance designated as B) is **2,025 m**.

4.2 Separation distance

An appropriate separation distance for identified industry must be sourced from *Guidance for Assessment of Environmental Factors – Separation Distances between Industrial and Sensitive Land Uses* (Ref: 3). The most relevant industry is "Electric power generation": Generating electricity – 20 MW or more (total) for natural gas & 10 MW or more (total) for other fuels.

The separation distance (designated as A) provided is **3,000-5,000 m** depending on size & location.

4.3 General screening

The general principal of the Screening Form is based on separation distance. If the distance (B) is less than the distance (A), a detailed noise assessment is required.

- (B) 2,025 m < (A) 3,000-5,000 m

Based on the above, a detailed noise assessment is required.

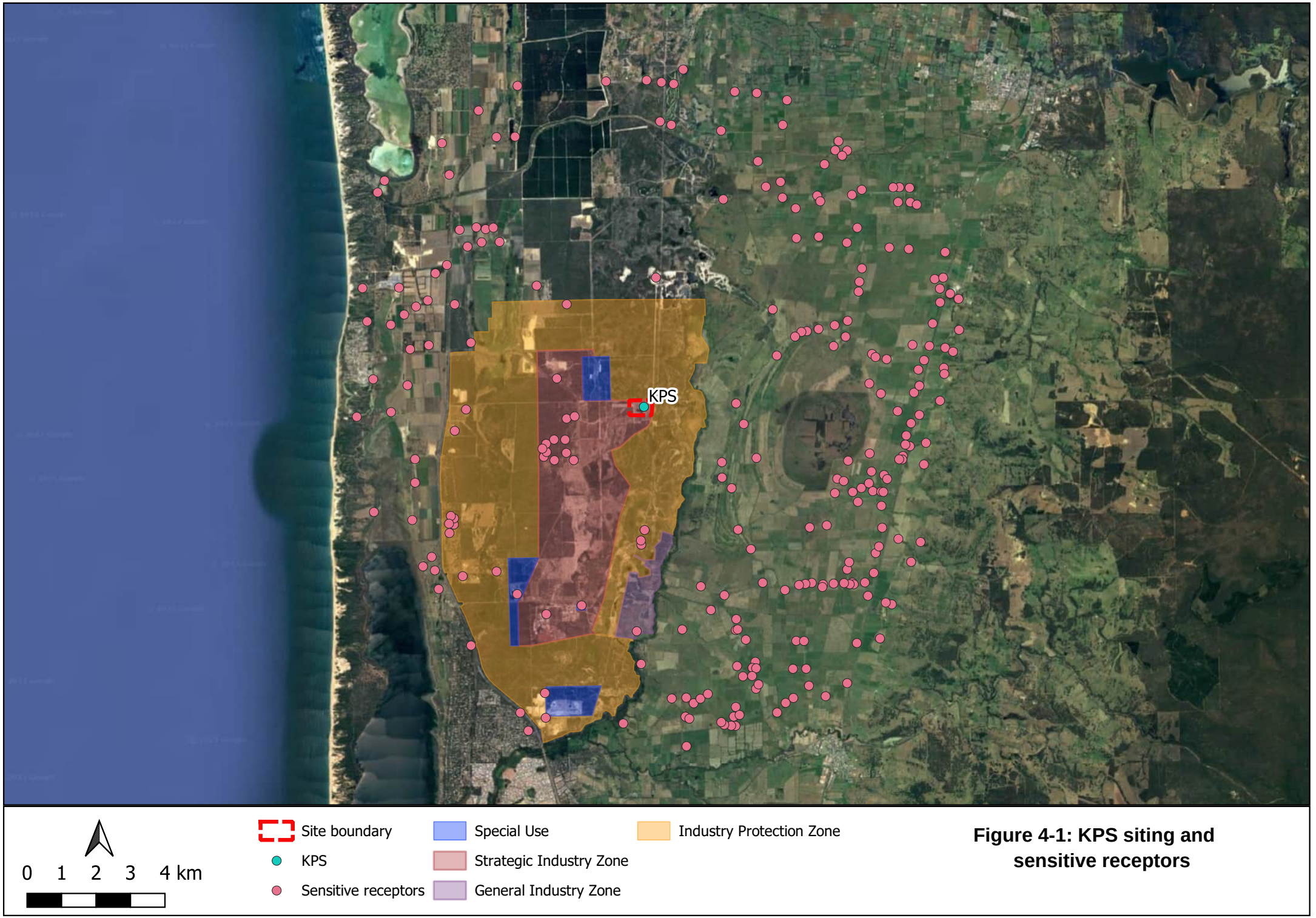

Figure 4-1: KPS siting and sensitive receptors

5. Detailed noise assessment

5.1 Existing detailed noise assessment

A detailed noise assessment for KPS was carried out by Herring Storer in 2003 (Ref: 7). The objective of the assessment was to assess the likely impact of noise from KPS at the site boundary and at the closest KSIA boundary.

Herring Storer undertook noise modelling for KPS including the following sources:

- Gas turbine
- Generator casing
- Exhaust stacks including air compressor intake
- 16 off MBV FIN fans
- 4 off MPR FIN fans
- Generator transformer
- Discharge ducts
- Filter house

Sound power levels for the above equipment were provided by Transfield Services as A-weighted spectrum data for octave band frequencies ranging from 63 Hz to 8,000 Hz as well as broadband level. Note that not all noise sources provided by Transfield Services were included in the noise model as some noise sources were considered insignificant in comparison to noise emissions from the power station.

Sound power levels used for each turbine generator in the 2003 Herring Storer assessment are shown in Table 5-1.

Table 5-1: SWLs used in the 2003 Herring Storer noise assessment for KPS (Ref: 7)

Source	Sound power level (dB(A))								
	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	Broadband
Gas turbine	100.8	93.8	85.8	97.8	84.8	89.8	80.8	71.8	96.8
Generator casing	105.8	108.8	96.8	88.8	87.8	87.8	81.8	76.8	96.6
Exhaust stacks and air compressor intake	107.3	112.5	102.8	101.6	99.7	105.6	104.6	100.6	110.7
16 off MBV FIN fans	101.3	106.5	96.8	95.6	93.7	99.6	98.6	94.6	104.7
4 off MPR FIN fans	107.3	112.5	102.8	101.6	99.7	105.6	104.6	100.6	110.7
Generator transformer	102.3	107.5	97.8	96.6	94.7	100.6	99.6	95.6	105.7
Discharge ducts	111.3	116.5	106.8	105.6	103.7	109.6	108.6	104.6	114.7
Filter house	94.3	98.5	86.8	81.6	75.7	85.6	86.6	83.6	92.0

The 2003 Herring Storer assessment (Ref: 7) predicted noise levels at the northern, southern, eastern, and western boundaries of KPS, as well as at the closest point of the boundary of KSIA. The predicted noise levels (shown in Table 5-2) were below the regulatory requirements.

Table 5-2: Results of the 2003 Herring Storer noise assessment for KPS (Ref: 7)

Location	Predicted noise level (dB(A))
Northern Boundary	57
Eastern Boundary	52
Southern Boundary	60
Western Boundary	50
Closest Boundary of KSIA	28

The overall layout of the KPS site has not changed since the 2003 assessment, and it is unlikely operational conditions pertaining to noise emissions have deviated from those used in the assessment. However, due to the age of the Herring Storer assessment, an updated noise model was undertaken to verify the results.

5.2 Verification of existing noise assessment

The following section of this report discusses the verification of the 2003 Herring Storer noise assessment.

5.2.1 Noise monitoring

To verify the noise emissions used in the Herring Storer assessment, opportunistic noise monitoring was undertaken by operational staff on 29 November 2023 at the KPS site. The procedure followed is provided in Appendix B.

Noise monitoring was carried out for two operational scenarios including:

- Both GT11 and GT12 operating simultaneously, each at 81 MW
- GT12 operating in isolation at 110 MW

The measured SPLs resulting from the noise monitoring are shown in Table 5-3, corresponding to the onsite monitoring locations shown in Figure 5-1 and Figure 5-2 respectively.

Table 5-3: Noise monitoring results

GT11 and GT12 operating simultaneously		GT12 operating in isolation[1]	
Location	**SPL (dB(A))**	**Location**	**SPL (dB(A))**
1	70	**1**	68
2	75	**2**	68
3	73	**3**	77
4	72	**4**	72
5	75	**5**	73
6	74	**6**	72
7	73	**7**	73
8	74	**8**	74
9	73	**9**	72
10	72	**10**	73
11	75	**11**	70
12	75	**12**	73
13	68	**13**	68
14	66	**14**	66
15	71	**15**	71
16	66	**16**	66
17	70	**17**	65
18	67	**18**	64
		19	65
		20	69

Note:

- The opportunity to measure SPLs from GT11 operating in isolation did not arise. For the purpose of this assessment, it is assumed SPLs measured from GT11 are equal to those for GT12 operating at the same power load.

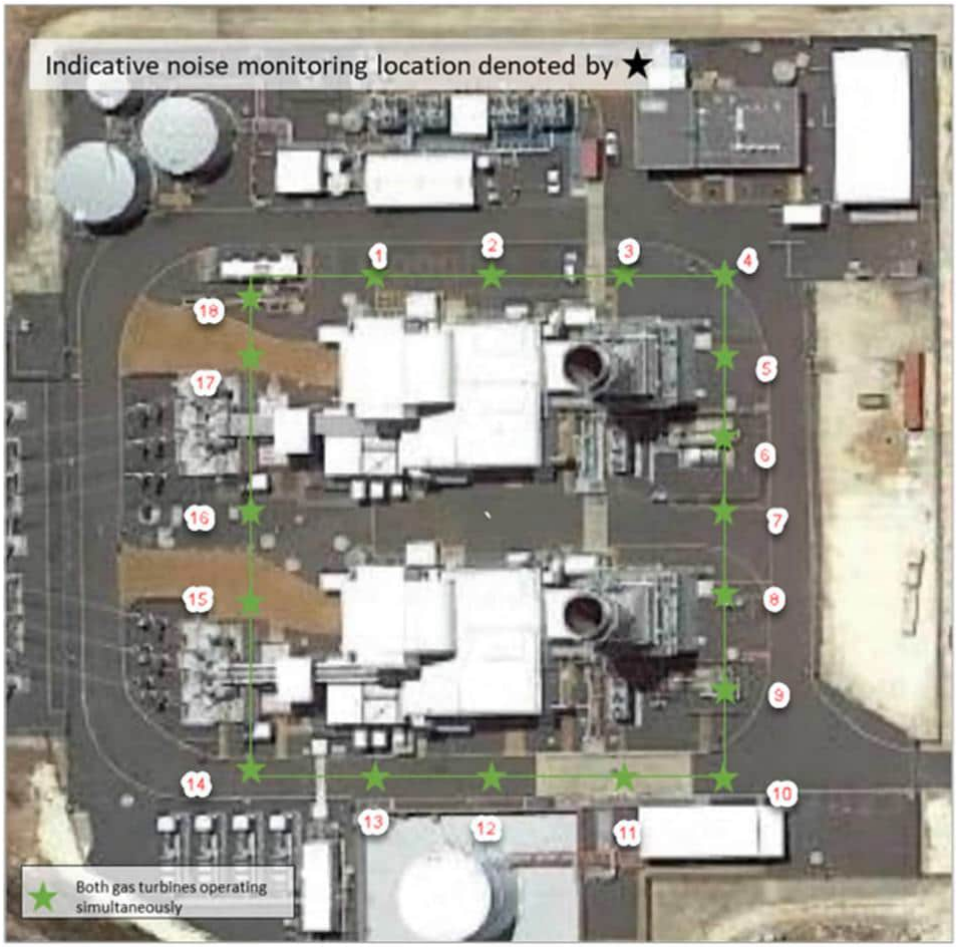

Figure 5-1: Monitoring locations for GT11 and GT12 operating simultaneously

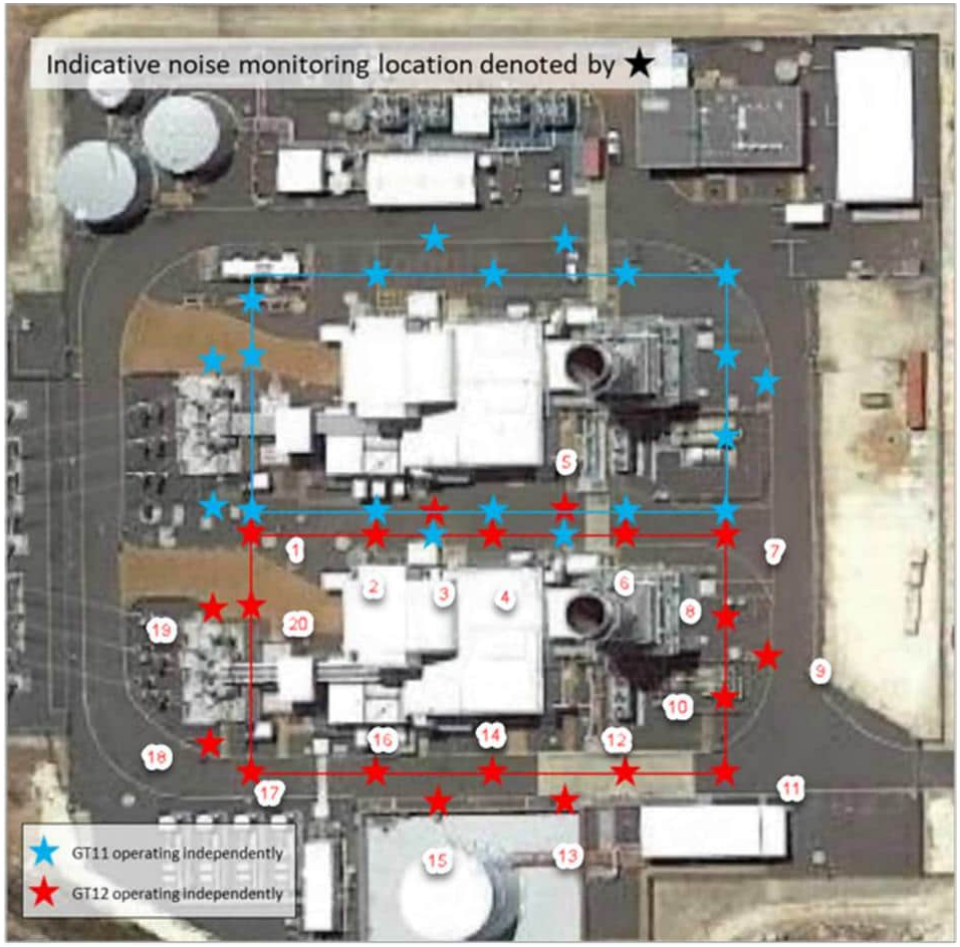

Figure 5-2: Monitoring locations for GT12 operating in isolation (the opportunity to measure SPLs from GT11 operating in isolation did not arise

Corresponding sound power levels (SWL) for the turbine generators were calculated from the measures SPLs using techniques described in International Organization for Standardization (ISO) 3746 (Ref: 7). The equation used is shown below.

$$SWL = \overline{SPL} + 10 \times \log_{10}\left(\frac{S}{S_0}\right)$$

Where:

SWL	is sound power level in decibels
SPL	is sound pressure level in decibels
S	is the area of the measurement surface in square metres
S_0	is 1 m^2

SWLs were calculated for each side of the gas turbine generators (north, east, south, and west). The resulting SWLS for each scenario are shown in Table 5-4.

Table 5-4: Calculated SWLs derived from noise measurements

Location	SWL (dB(A)) for GT11 and GT12 operating simultaneously	SWL (dB(A)) for GT12 operating in isolation
North	104.9	103.3
East	105.9	101.9
South	104.3	100.8
West	100.6	96.6

The calculated SWLs above for the single turbine generator operating in isolation correspond to the broadband SWLs provided in Table 5-1 and used in the 2003 Herring Storer assessment (Ref: 7). Note the SWLs calculated for GT12 operating in isolation were assumed to be equal to those for GT11.

5.2.2 Noise modelling

A noise model was run for each of the monitored operating scenarios to verify results from the 2003 Herring Storer assessment. Modelling scenarios included:

1. GT11 and GT12 operating simultaneously at 81 MW each (simulated as a singular noise source)
2. GT11 and GT12 operating simultaneously at 110 MW each (simulated as two noise sources)
3. GT11 operating in isolation at 110 MW
4. GT12 operating in isolation at 110 MW

5.2.2.1 Noise modelling method

The assessment was conducted using the SoundPLAN v7.4 software package. The model was defined and configured in accordance with the *Draft Guideline on Environmental Noise for Prescribed Premises* (Ref: 6). Specific details used are shown in Table 5-5.

Table 5-5: Model settings

Model element		Configuration description
Modelling software		SoundPLAN v7.4
Calculation algorithm		CONCAWE
Topographical data		Digital Elevation Model (DEM) (Ref: 4)
Noise sources		Sources modelled as volume sources with emissions shown in Table 5-4
Ground absorption coefficients	**Hardstand**	0.0 (highly reflective)
	Bare ground	0.8 (highly absorbing)
	Vegetation	1.0 (highly absorbing)
Air absorption		ISO 3891 standard
Calculation area	**Easting Range**	384830 m – 387397 m (2.5 km)
	Northing Range	6328973 m – 6330847 m (1.9 km)
	Resolution	5 m
	Elevation	2.0 m above ground level
Output information		A-weighted SPL contour plots for L_{Aeq} one each for day and night conditions

Meteorological conditions were defined in accordance with *Draft Guideline on Environmental Noise for Prescribed Premises* (Ref: 6) and are presented in Table 5-6.

Table 5-6: Meteorological Conditions Used in the Noise Model

Parameter	Day time Conditions (07:00 – 19:00)	Night-time Conditions (19:00) – 0:700)	Source of Configuration Setting
Wind Speed	4 m/s	3 m/s	*Draft Guideline on Environmental Noise for Prescribed Premises* (Ref: 6)
Wind Direction	Defined to be directly from source to receptor for all receptors (i.e., 'worst case')		
Pasquill Stability Class (CONCAWE)	E	F	
Air Pressure	1013.3 millibar	1013.3 millibar	
Air Temperature	20°C	15°C	
Relative Humidity	50%	50%	

The topographical model used for this assessment was calculated from terrain data extracted from Google Earth™ (Ref: 4). Spot heights were extracted and utilised to determine a digital terrain model within SoundPLAN v7.4 to calculate a ground surface.

Additionally, major structures and buildings were included in the model to identify any obstructions to noise propagation. The structures were manually defined from site layout plans and include industrial buildings and large storage tanks.

Additionally, as stated in Table 5-5, absorption coefficients for the surrounding ground surfaces were included in the model to simulate the effects of the surrounding land use.

5.2.2.2 Noise modelling results

Results of the noise modelling showed that for all scenarios, the predicted SPLs at the closest KSIA boundary (Industry Protection Zone) were below 35 dB(A) for both day and night conditions. Further, SPLs at the nearest sensitive receptors were below 35 dB(A) and therefore comply with the noise criteria. Noise contour figures are shown below (Figure 5-3 to Figure 5-10).

The noise modelling results verify the results of the 2003 Herring Storer detailed noise assessment (Ref: 7).

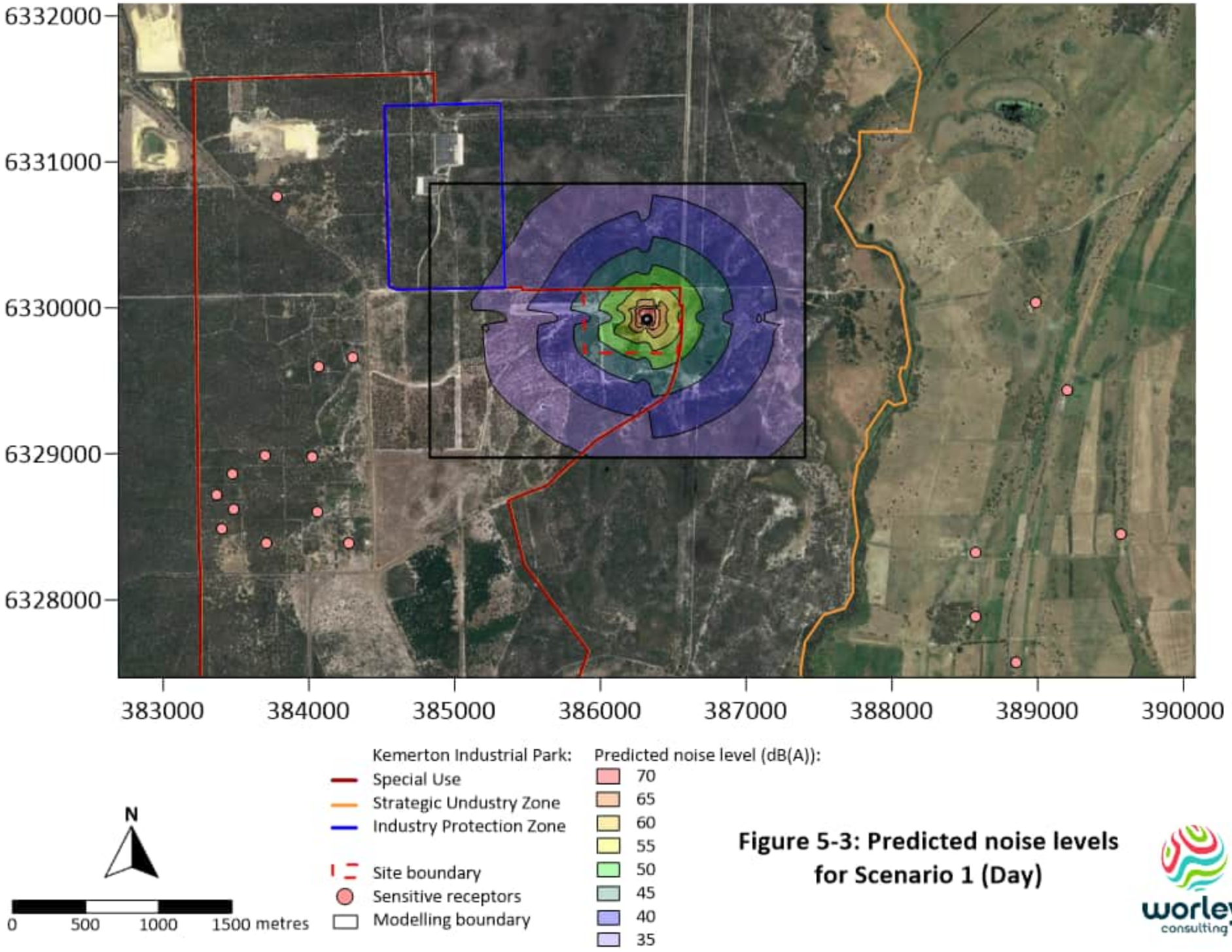

Figure 5-3: Predicted noise levels for Scenario 1 (Day)

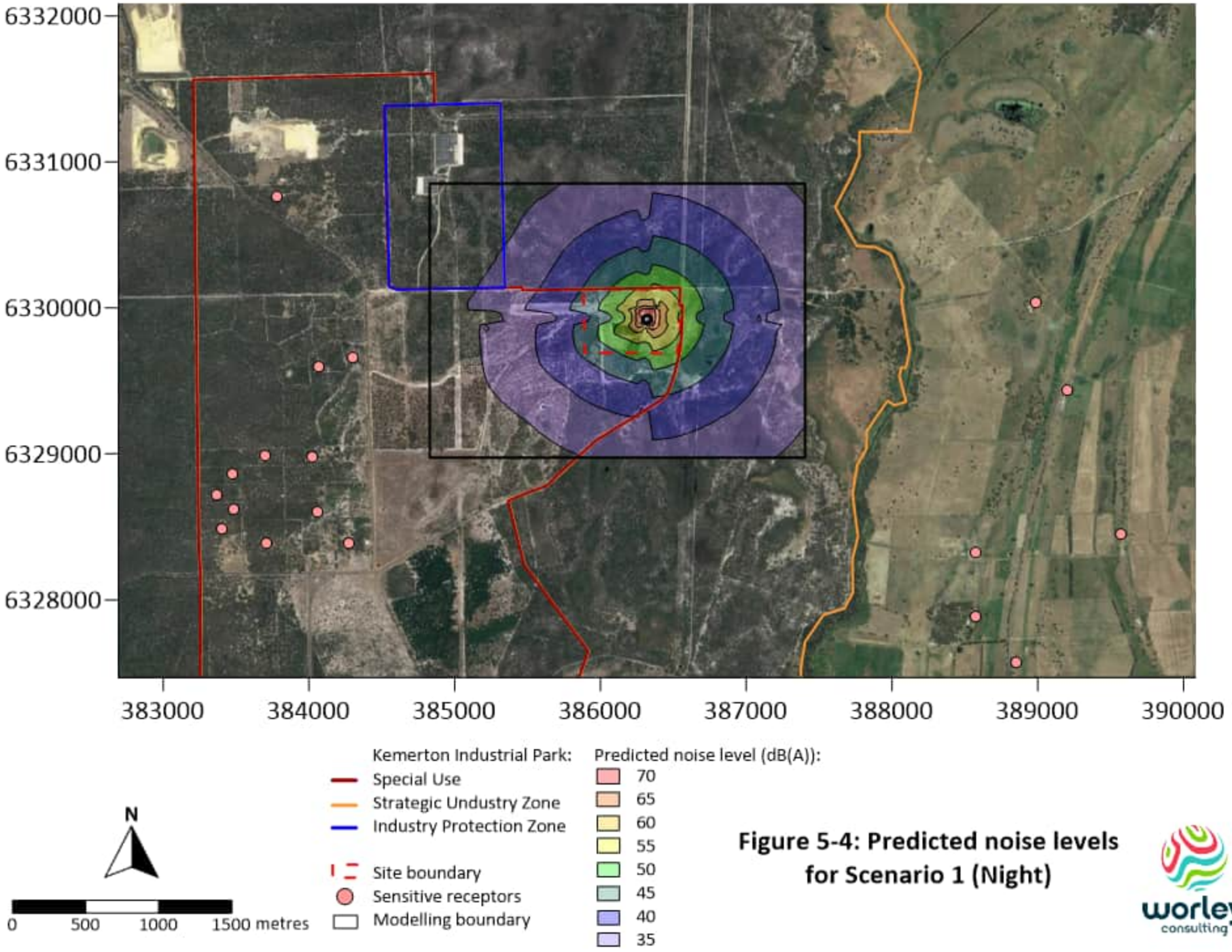

Figure 5-4: Predicted noise levels for Scenario 1 (Night)

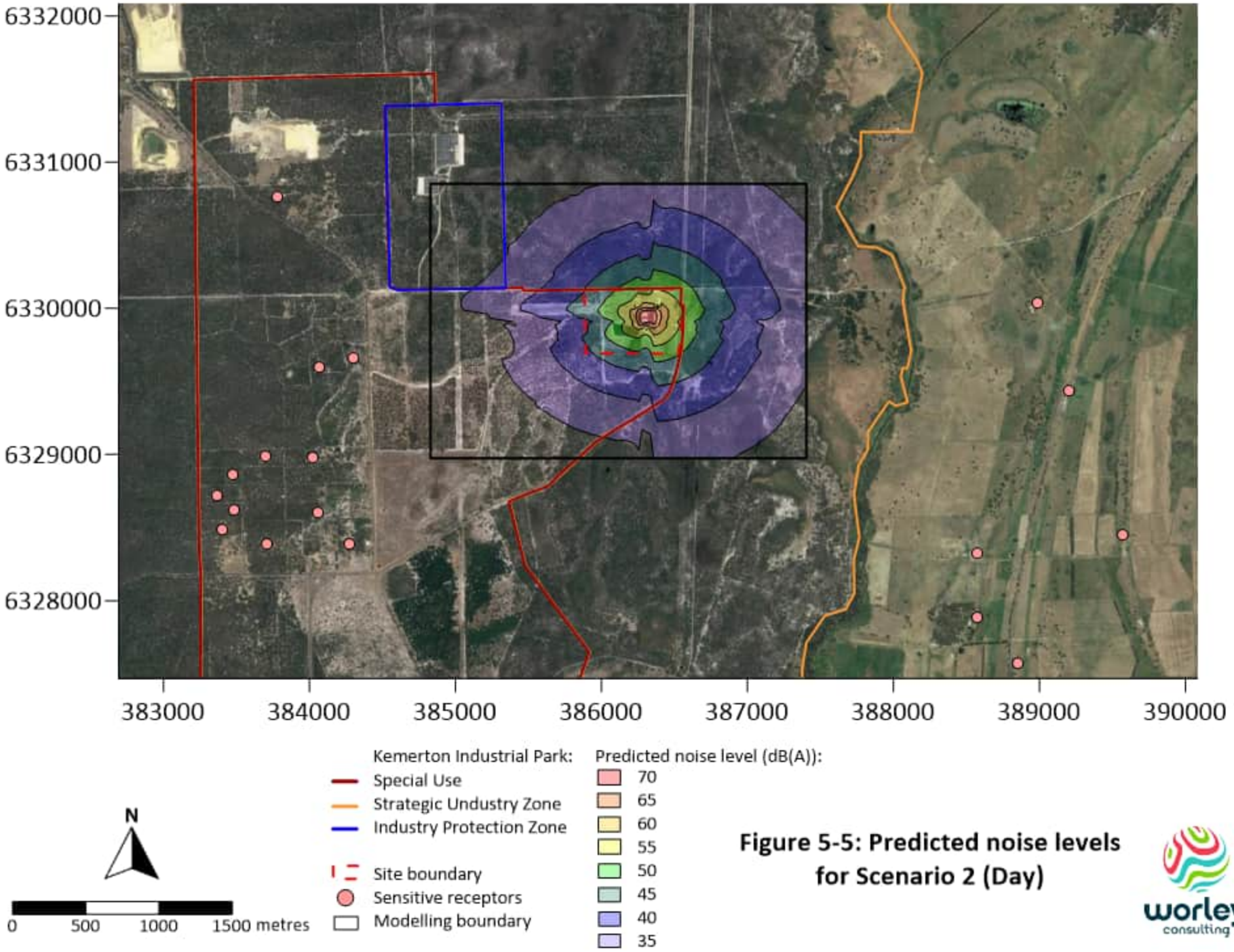

Figure 5-5: Predicted noise levels for Scenario 2 (Day)

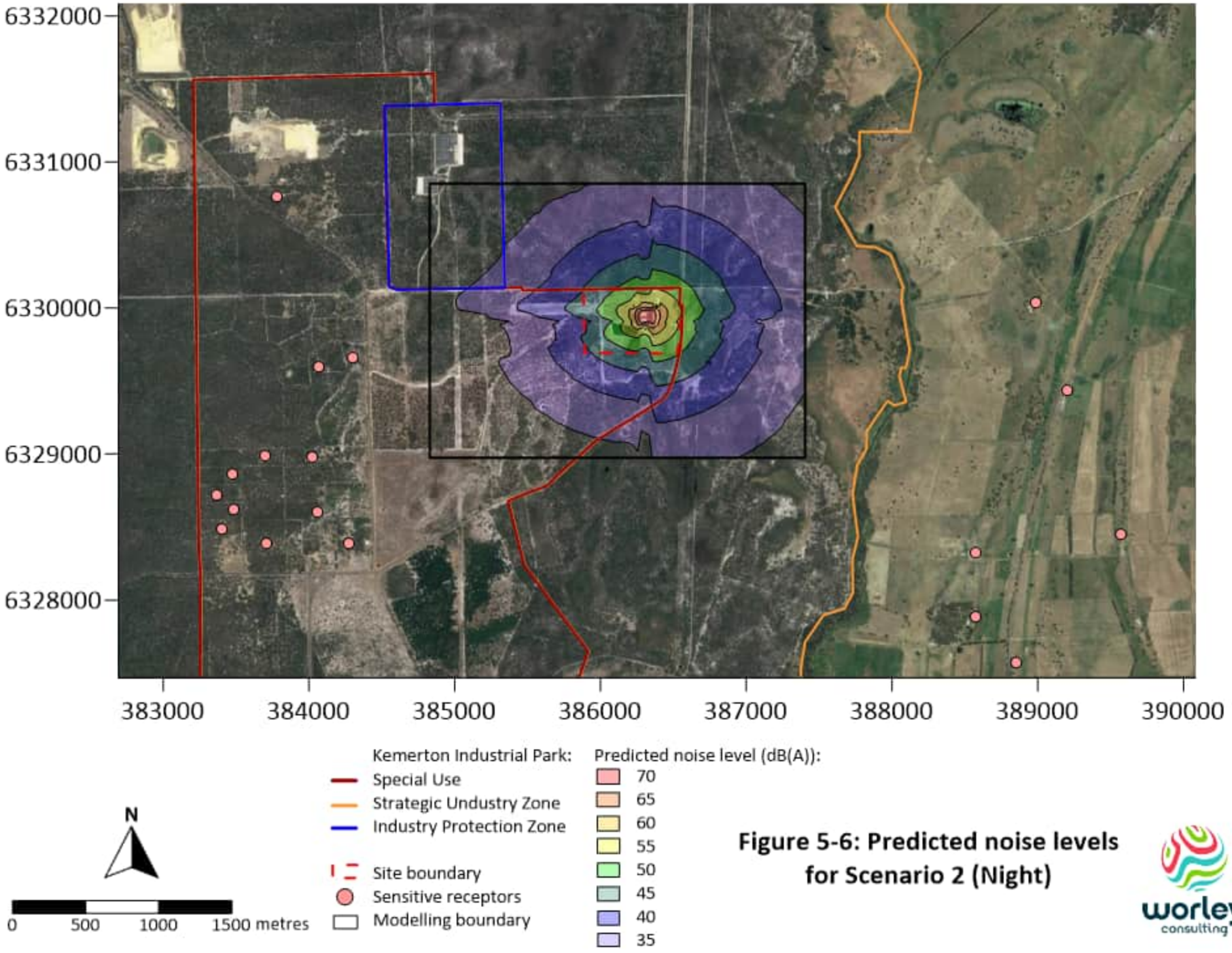

Figure 5-6: Predicted noise levels for Scenario 2 (Night)

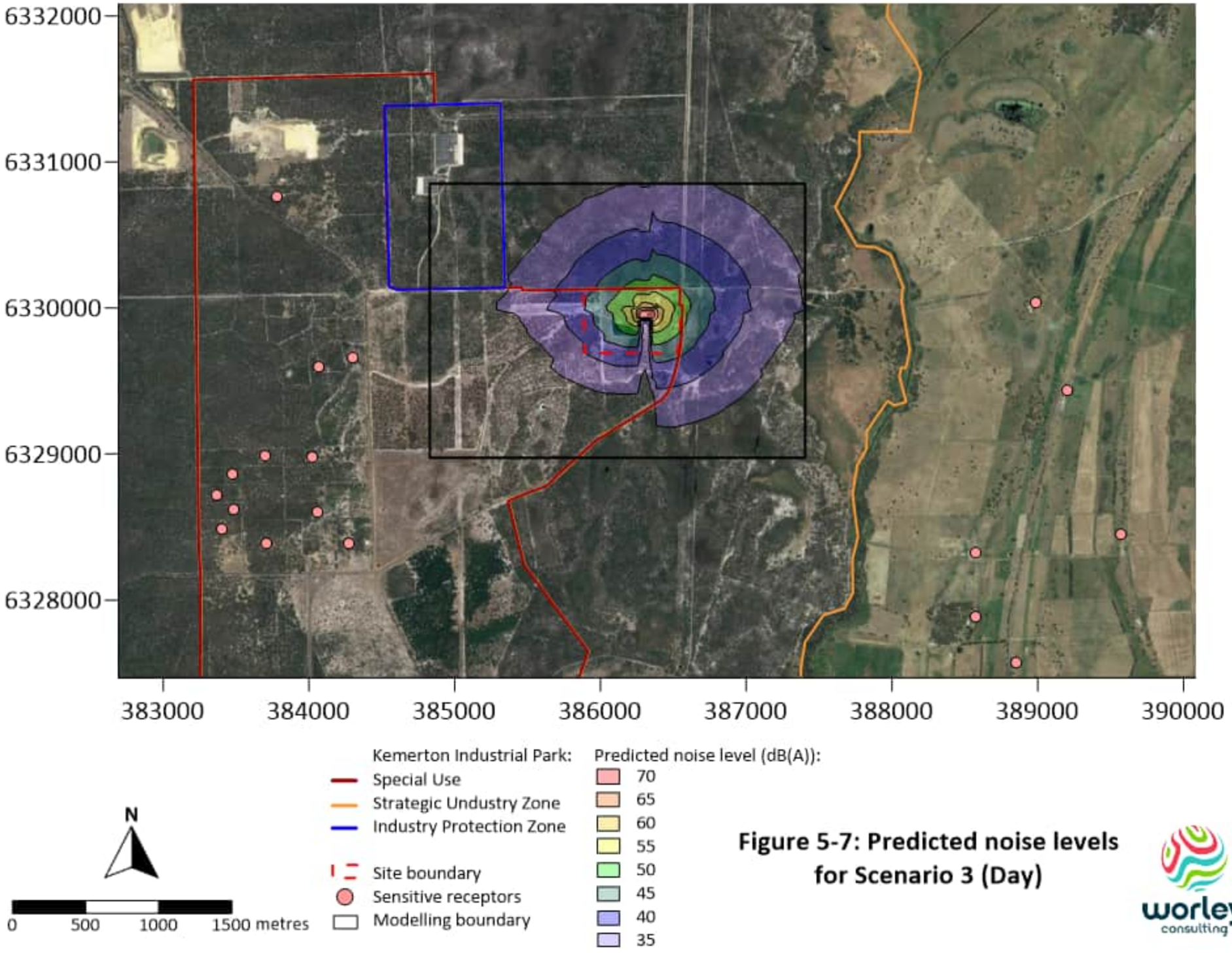

Figure 5-7: Predicted noise levels for Scenario 3 (Day)

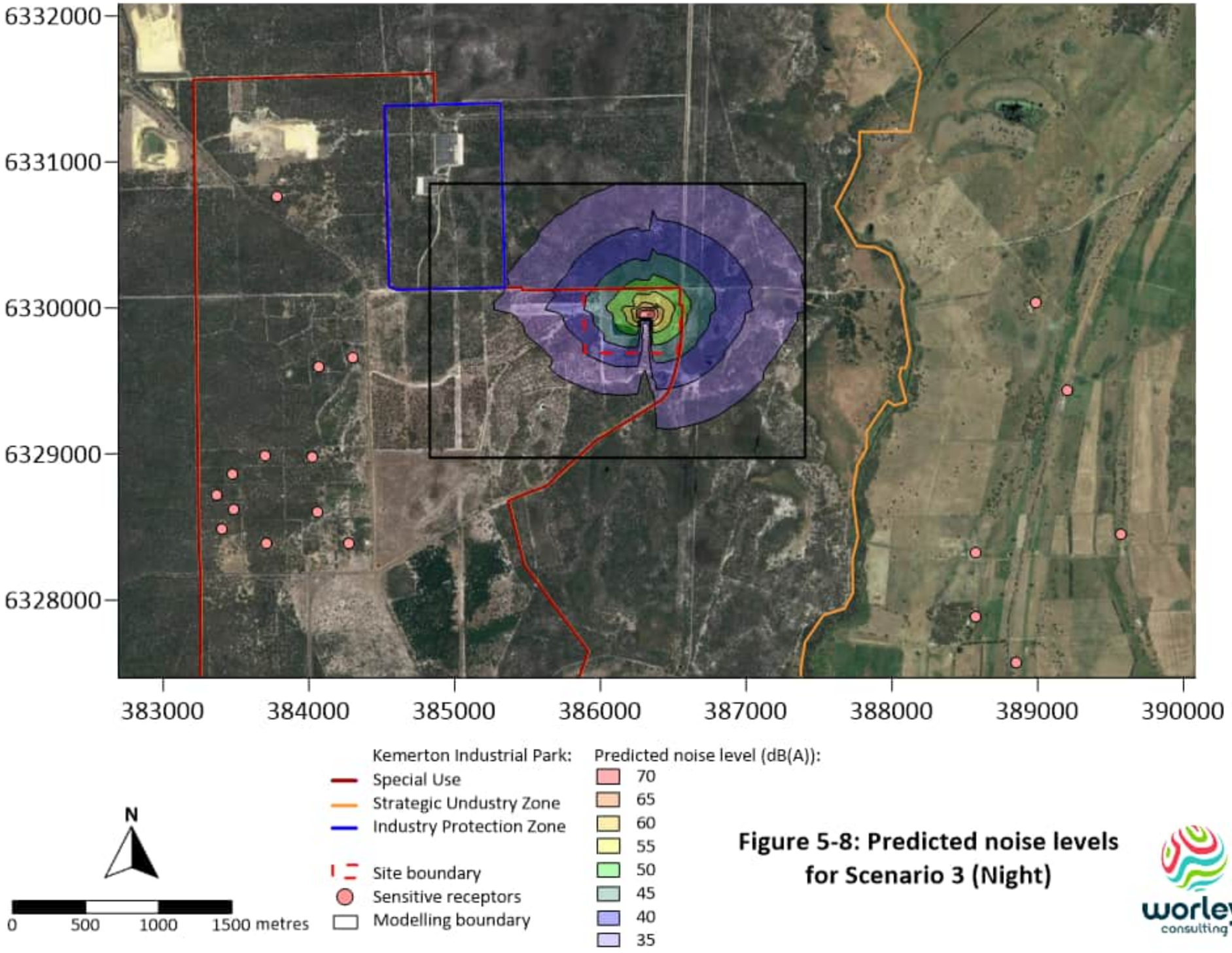

Figure 5-8: Predicted noise levels for Scenario 3 (Night)

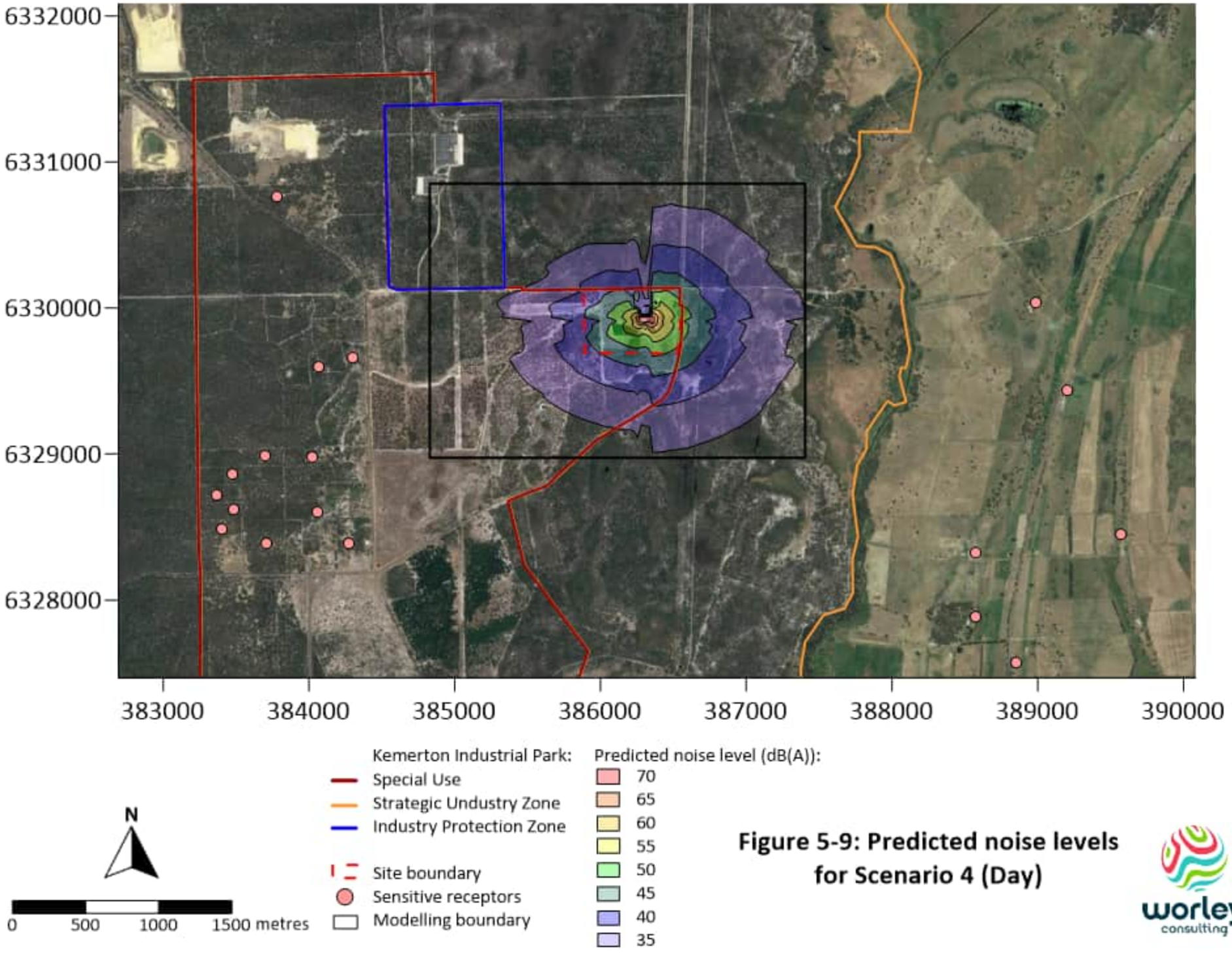

Figure 5-9: Predicted noise levels for Scenario 4 (Day)

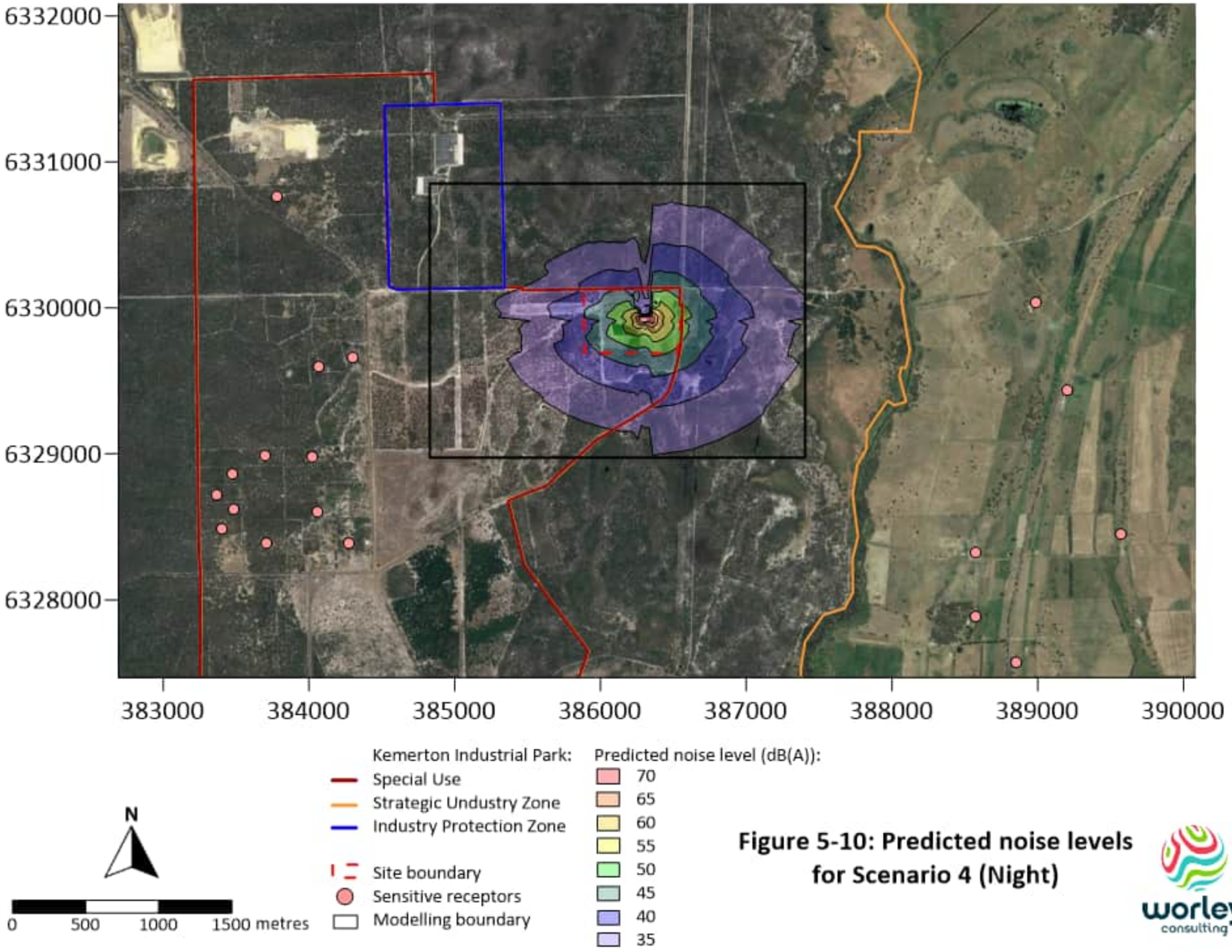

Figure 5-10: Predicted noise levels for Scenario 4 (Night)

6. Conclusion

To meet increasing power demand from KPS, RATCH is proposing an increase of the allowable operation time under MS 645 from 2,000 to 13,800 combined operational hours per year. The purpose of this assessment was to determine the impacts to the local noise environment associated with the proposed changes to the operations. A screening level noise assessment was undertaken in line with the *Draft Guideline: Assessment of Environmental Noise Emissions* (Ref: 1), which determined a detailed noise assessment was required based on the nature of the plant and the proximity of the KPS site to the nearest sensitive receptors.

A detailed noise assessment for KPS was previously carried out by Herring Storer in 2003 (Ref: 7) which predicted noise emissions associated with the KPS site would not significantly impact the local noise environment. However, due to the age of the Herring Storer assessment, an updated model was undertaken to verify the results.

Noise monitoring was undertaken at the KPS site to be used as input into the updated noise model. The SoundPLAN v7.4 noise modelling software package was used to predict SPLs at the nearest KSIA boundary, to compare results with the 2004 Herring Storer assessment.

Modelling scenarios included:

1. GT11 and GT12 operating simultaneously at 81 MW each (simulated as a singular noise source)
2. GT11 and GT12 operating simultaneously at 110 MW each (simulated as two noise sources)
3. GT11 operating in isolation at 110 MW
4. GT12 operating in isolation at 110 MW

Results of the noise modelling showed that for all investigated scenarios, the predicted SPLs at the closest KSIA boundary were below 35 dB(A) for both day and night environmental conditions, which verified the results of the 2003 Herring Storer noise assessment.

Based on this assessment, noise emissions associated with the proposed changes to the operations of the KPS, detailed in the amendments to MS 645 are unlikely to have a significant effect on the local noise environment.

7. References

1. DWER (Department of Water and Environmental Regulation) 2021, *Draft Guideline: Assessment of Environmental Noise Emissions,* Joondalup, Western Australia, May 2021, Available from: https://www.wa.gov.au/system/files/2022-03/Draft%20Guideline%20Assessment%20of%20environmental%20noise%20emissions.pdf.
2. *Environmental Protection (Noise) Regulations 1997*, Issued under the *Environmental Protection Act 1986*, Western Australia, January 2017, Available from: https://www.legislation.wa.gov.au/legislation/prod/filestore.nsf/FileURL/mrdoc_29715.pdf/$FILE/Environmental%20Protection%20(Noise)%20Regulations%201997%20-%20%5B02-c0-01%5D.pdf?OpenElement.
3. EPA (Environmental Protection Authority) 2005, *Guidance for Assessment of Environmental Factors – Separation Distances between Industrial and Sensitive Land Uses,* Western Australia, June 2005, Available from: https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/GS3-Separation-distances-270605.pdf.
4. Google Earth, 2018, Wellesley, Western Australia, Accessed December 2023.
5. Google Maps 2023, Google satellite imagery of the Kemerton Power Station and surrounds in World Geodetic System 1984, Available from: https://www.google.cn/maps/vt?lyrs=s@189&gl=cn&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D.
6. Government of Western Australia, Department of Environment Regulation 2016, *Draft Guideline on Environmental Noise for Prescribed Premises*. Draft released for consultation. Dated: May 2016. Document no.: DER2015/001319, Available from: https://www.der.wa.gov.au/images/documents/our-work/consultation/guideline-environmental-noise/draft_Guideline_on_Environmental_Noise_for_Prescribed_Premises.pdf.
7. Herring Storer, 2003, *Proposed Power Station Kemerton, Western Australia, Environmental Acoustic Assessment*, November 2003.
8. International Organization for Standardization (ISO) 3746:2010, *Acoustics, Determination of sound power levels and sound energy levels of noise sources using sound pressure.*

Appendix A. Draft Guideline: Assessment of Environmental Noise Emissions

Screening Form

Appendix A – Screening form

The General screening section of this form is the first step. Sections 1–4 of the form are activity specific. If any questions in the Screening form are answered Yes/Unsure, a detailed noise emission report is required in relation to that question.

General screening – separation distances		
Separation distance for identified industry in *Guidance for Assessment of Environmental Factors – Separation Distances between Industrial and Sensitive Land Uses*, or department agreed alternative[1]	3,000 - 5,000 m	(**A**)
Distance to nearest noise sensitive receiver/premises	2,025 m	**(B)**
Please tick the appropriate box	**Yes/Unsure**	**No**
Is the distance **(B)** less than the separation distance **(A)**?	☒ Continue straight to section 10, Detailed noise emission assessment	☐
Distance to nearest commercial receiver	_____m	**(C)**
Distance to nearest industrial receiver Tick if receiver is within the Kwinana Industrial Area	_____m ☐	**(D)**

Note 1: Where the separation distance for the industry category listed as 'case-by-case' or there is no entry in *Guidance for Assessment of Environmental Factors – Separation Distances between Industrial and Sensitive Land Uses* for the activity the applicant may consider comparison with published separation distances for similar activities or contact the department for further advice.

The screening process continues below. The screening process uses a comparison of separation distances and sound power levels, presented in Plate 1, below, to screen out noise emissions not requiring a detailed noise emission assessment.

For simplicity, the screening process defines:

- 'day' as 7am–7pm (Monday–Saturday)
- 'night' as any other time.

These definitions cover the extreme assigned level values for noise sensitive receivers only and are not consistent with the time periods specified in Table 1 of the Noise Regulations.

1. Operational noise		
Estimated sound power for all operational noise sources[1]	**Day hours** **Night hours**	_____dB(A) **(E)** _____dB(A) **(F)**
Please tick the appropriate box	**Yes/Unsure**	**No**
Plot the day **(E)** and night **(F)** values against the distance **(B)** on Plate 1 Is the operational noise above either relevant line in Plate 1?	Day hours ☐ Night hours ☐	Day hours ☐ Night hours ☐
Plot both values **(E)** and **(F)** against distance **(C)** on Plate 1 Is the operational noise above the relevant line in Plate 1 for either time period?	☐	☐
Plot both values **(E)** and **(F)** against distance **(D)** on Plate 1 Is the operational noise above the relevant line in Plate 1 for either time period?	☐	☐
2. Construction noise		
Estimated sound power for construction noise sources[1]	**Day hours** **Night hours**	_____dB(A) **(G)** _____dB(A) **(H)**
Please tick the appropriate box	**Yes/Unsure**	**No**
Plot day **(G)** and night **(H)** values against distance **(B)** on Plate 1 Is construction noise more than 10 dB above either relevant line in Figure 1?	Day hours ☐ Night hours ☐	Day hours ☐ Night hours ☐
Plot both values for **(G)** and **(H)** against distance **(C)** on Plate 1 Is construction noise more than 10 dB above the relevant line in Plate 1 for either time period?	☐	☐
Plot both values **(G)** and **(H)** against distance **(D)** on Plate 1 Is construction noise more than 10 dB above the relevant line in Plate 1 for either time period?	☐	☐

Note 1: sound power levels for various generic construction items can be found in AS 2436-2010 *Guide to noise and vibration control on construction, demolition and maintenance sites* (refer to Table A1 and Table B1).

3. Blasting		
Please tick the appropriate box	**Yes/Unsure**	**No**
Is the blasting source from a prescribed premises with a definition that includes mining and is the nearest sensitive receiver **(B)** within 1500 m?	☐	☐

4. Vibration, aircraft or amenity issues		
Please tick the appropriate box	**Yes/Unsure**	**No**
Is the prescribed premises potentially going to create any: • Emissions of vibration; • Emissions from aircraft; and/or • Impacts to any special amenity or naturally quiet areas?	☐	☐

Instructions for indicative noise prediction using Screening Plate 1

1. Identify a concentration point of noise emissions on the proposed site.
2. Estimate total A-weighted sound power level for all noise sources on site:
   - **a)** Separate levels for noise sources operating during daytime and night time may be required.
   - **b)** Estimation of sound power levels may require the assistance of an acoustic consultant.
   - **c)** Estimations do not include noise control measures.
3. Identify all nearby premises not owned by the applicant and estimate their distance to the source point on site.
4. Plot distance to the nearest premises against sound power level (day and night time) on Plate 1.
5. If plotted points are below the relevant line on Plate 1 for the type of receiver, noise is likely to be low level. If plotted points are on or above lines, a Detailed noise emission assessment is required (refer to section 10)

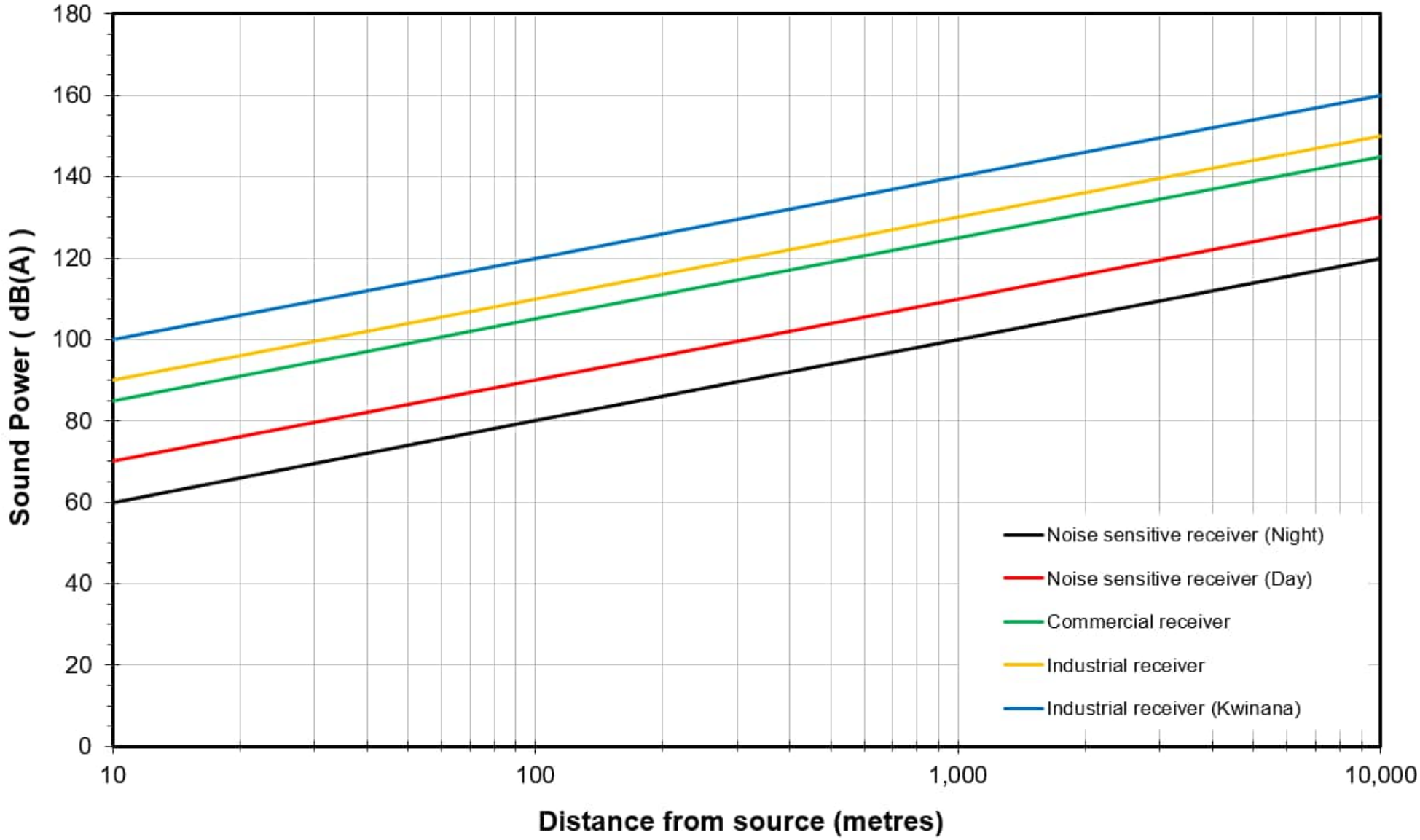

Plate 1: Screening criteria for sound power levels

Appendix B. Noise monitoring procedure

Memorandum

Subject	Equipment Noise Monitoring Procedure		
Date	28/11/2023	Pages	7
To	micheal.denham@worley.com	From	G. Formentin
CC	Grant.Hickson@Advisian.com	Richard.Olsen@Advisian.com	
Project no.	411012-00930	Doc no.	411012-00930-EN-MEM-0001
Project	MS645 Amendment		

Introduction

The purpose of this memorandum is to outline the noise monitoring procedure to measure sound pressure levels (SPL) from the two gas turbines at Kemerton Power Station. The monitoring results will be used to calculate sound power levels (SWL) for the two gas turbines, to inform a noise assessment.

Primary Reference

The primary reference for this noise measurement procedure is:

ISO 3744: *Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods for an essentially free field over a reflecting plane.*

https://doclinkonline.com/3ffad320-6dac-4373-92be-9d108d927a46

For convenience, a copy of this standard is provided in Appendix A.

Equipment Noise Monitoring Procedure

Sound Level Meter (SLM) Settings and Configuration

The sound level meter must be set up in accordance with the following:

- Ensure SLM is fitted with a windscreen (porous foam bulb around microphone)
- Select A-weighted measurements
- Measure sound pressure level at 1/3 octave band frequency (31.5 Hz – 16,000 Hz) as well as broadband level

- Ensure mode is set to measure noise in Free Field mode not Diffuse mode (see Figure 1 below)

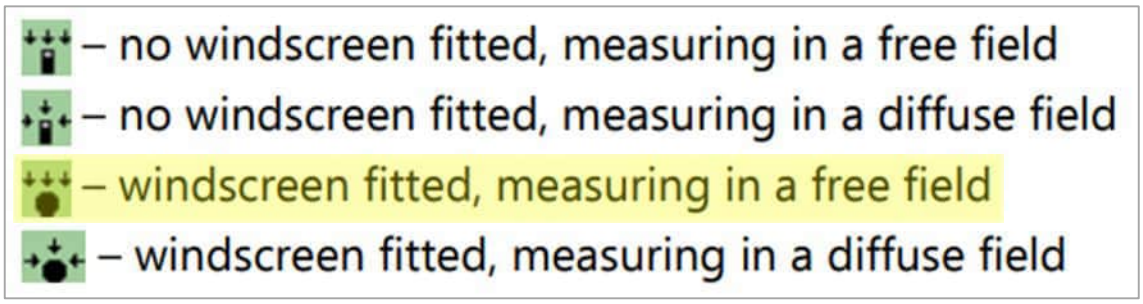

Figure 1: SLM Measurement Mode

- Measurements should be set to time-weighted equivalent values (i.e., L_{Aeq})
- Position the SLM so the microphone is pointing towards the noise source in question at 1.5 m above ground level (a tripod is best used to achieve this)
- Set the SLM to record (save) log files either to the meter itself or to an SD card

Calibration

The calibration of the SLM must be checked both before and after noise monitoring. Make note of the calibration results each time. If the results have drifted more than 1-2 dB between calibration checks, then the results may be invalidated.

Scenarios to Monitor

It will be useful to measure SPLs from each turbine operating independently as well as simultaneously, if possible.

Monitoring Location and Number of Measurements

Several measurements should be undertaken for each monitoring scenario. The distance from the noise source as well as location of the SLM in relation to the noise source should vary between measurements.

Measurements are to be taken at 1.5 m above ground level. Measurements should be taken no closer than one metre from the closest surface of the noise source and should be taken at the same distance from a variety of directions. This should be repeated for several different distances under each scenario.

For example:

Take a series of measurements five (5) meters from the surface of the active Gas Turbine from a variety of directions encircling the Gas Turbine. Repeat this process for each turbine GT11. Repeat for GT12. Repeat the process for different operating scenarios. See Figure 2 and Figure 3.

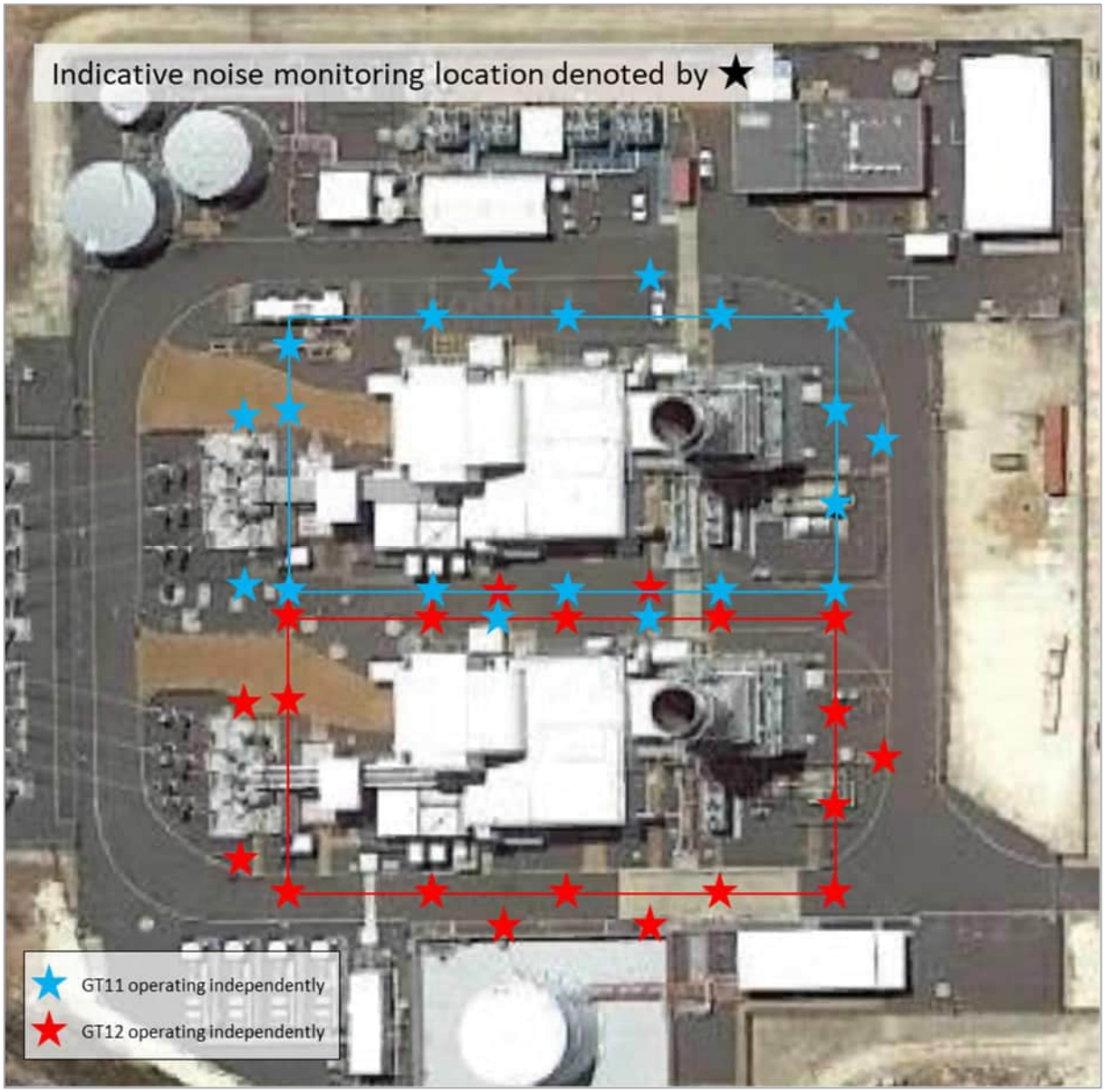

Figure 2: Indicative noise monitoring locations – Gas Turbines operating individually

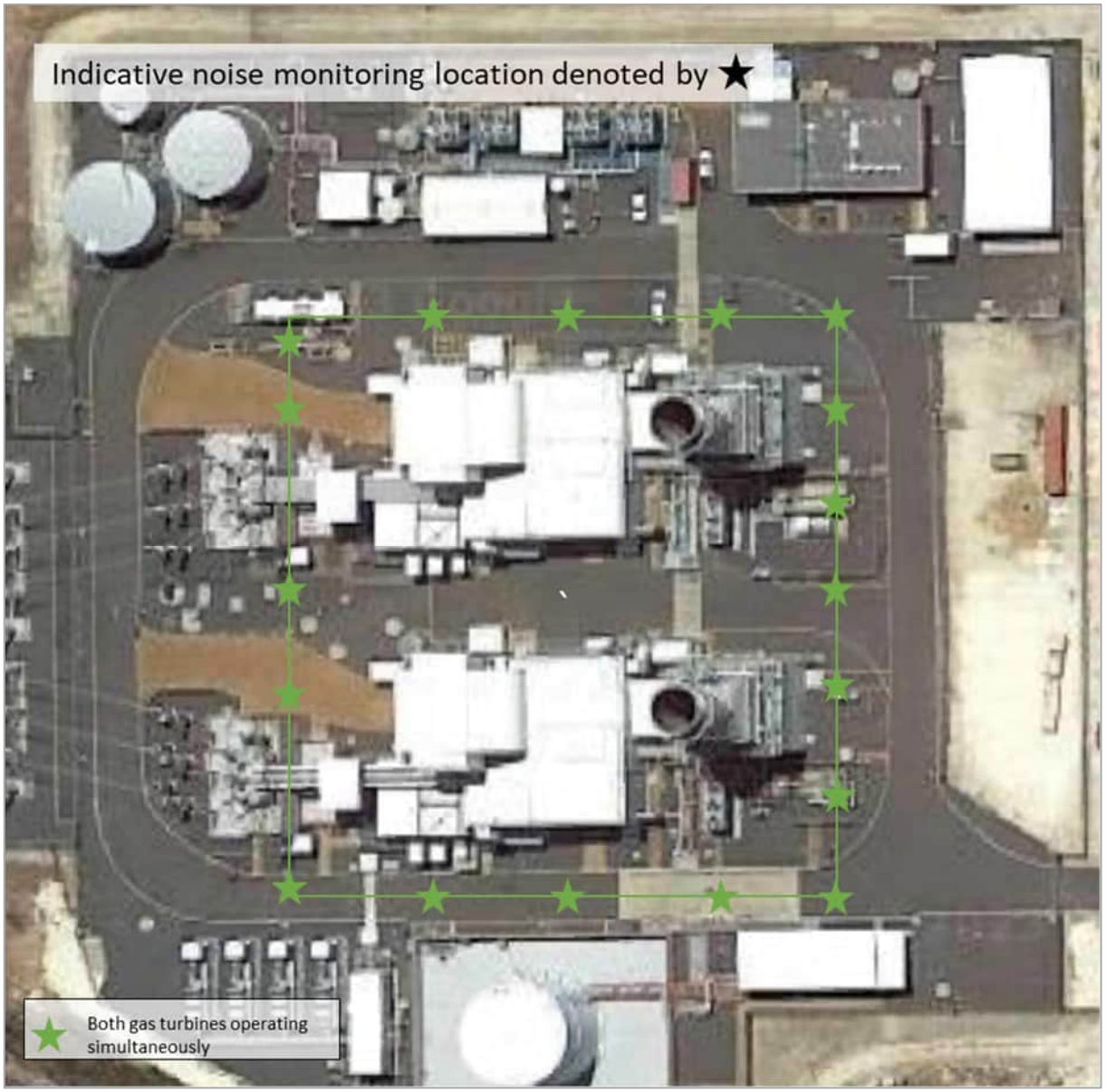

Figure 3: Indicative noise monitoring locations – Both Gas Turbines operating

Monitoring Duration

If there is no apparent periodicity in the emitted noise, the duration of each monitoring event should be approximately 10-15 seconds. If the SPL does vary over time, the duration of each measurement should last long enough to capture at least two cycles of the variability.

Data to Record

Detailed records should be kept for each monitoring event, including the following:

- Log file ID
- Operational scenario (which gas turbine(s) operational at time of measurement)

- Ambient temperature and pressure
- Operational load at time of measurement (megawatts, % duty, and/or spinning reserve, etc.)
- Location relative to noise source (for example: north surface of gas turbine at 10 m distance)
- Distance from nearest noise surface (meters)
- Start time
- Duration
- Note where the noise is emanating from (for example a specific vent or one side of the gas turbine, or the entire building)
- Make notes regarding the noise environment at time of measurement. For example, any extraneous noise source including wind, birds, cars or other noises, and the timestamp they occurred. (Where the noise measurement is affected to a large degree by extraneous noise sources the measurement may need to be repeated)
- 1/3rd Octave band and broadband L_{Aeq} measurements of Sound Pressure Level (example table below)

Table 1: Example Table for data recording

Frequency Band (Hz)	Measurement ID #:	1	2	3
	Operational Scenario:	A (50% Load 2 x GTs)	B (100% Load)	C (50% Load 1 x GT)
	Start Time:	09:30	13:00	15:45
	Duration:	10 second	15 seconds	1 minute
	Relative Location/Distance:	15 m N of		
Broadband				
31.5				
4				
50				
63				
80				
100				
125				
160				
200				
250				
315				

Frequency Band (Hz)	Measurement ID #:	1	2	3
	Operational Scenario:	A (50% Load 2 x GTs)	B (100% Load)	C (50% Load 1 x GT)
	Start Time:	09:30	13:00	15:45
	Duration:	10 second	15 seconds	1 minute
	Relative Location/Distance:	15 m N of		
400				
500				
630				
800				
1,000				
1,250				
1,600				
2,000				
2,500				
3,150				
4,000				
5,000				
6,3000				
8,000				
10,000				
12,500				
16,000				