



**Independent Acoustic
Consultancy Practice**

Operational Noise Impact Assessment

**Project DRAGON
Port Talbot**

6387/NIA1_V5

Operational Noise Impact Assessment

Project:	Project DRAGON
Site Address:	Land at Crown Wharf Port Talbot
HA Reference:	6387/NIA1_V5
Date:	30/10/2023
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1. INTRODUCTION

A new industrial development known as Project DRAGON is proposed on Land at Crown Wharf, Port Talbot Docks.

The Proposed Scheme is to comprise a new facility for the production of sustainable aviation fuel (SAF) using “LanzaJet™ ATJ technology” [ATJ] and processes developed and licenced by the Applicant.

An operational noise impact assessment has been carried out as part of an Environmental Statement (ES) to be submitted in support of a forthcoming planning application. Furthermore, this operational noise impact assessment is intended to be submitted as a technical appendices to the ES and therefore should be read in conjunction with the ES.

It should be noted that a further construction noise impact assessment has been completed and submitted separately.

A baseline noise survey has been carried out and is included in Hunter Acoustics report 6387/ENS1_Rev1 dated 15/05/2023, also provided as a technical appendices to the submitted ES.

This report has therefore been commissioned to predict noise levels from proposed activities and plant, allowing an assessment of the impact to be made.

1.1 Pre-application Discussions

Pre-application consultation was undertaken with the Local Planning Authority's acoustician (Red Twin Limited) and Natural Resources Wales (NRW) as set out below:

Date	Consultation	Summary
14 th June 2022	Hunter Acoustics (HA) Letter	HA note on assessment methodology and receptor locations
8 th July 2022	Red Twin (RT) Limited Technical Note	Response to methodology. Broadly agreed however additional receptor locations including 'quiet areas' identified in the LDP highlighted as well as request for assessment to Mumbles to be scoped, as well baseline survey to be conducted at different times of the year.
22 nd July 2022	HA Letter	Rebuttal of request for assessment to Mumbles due to distance (13km) and critical receptors much closer and also of repeating baseline surveys at different times of the year
25 th May 2023	Teams Meeting (HA, NPT, RT, NRW, Turley, LanzaTech)	Methodology of assessment and scenarios to be modelled discussed. HA and LanzaTech explained change to enclosed ground flare, demonstrating good acoustic design. Red Twin confirmed they had not received Scoping Report at this stage.
2 nd June 2023	HA email to Red Twin / NPT	Request for feedback on review of scoping report.
7 th June 2023	Email from NRW to Turley	Confirm NRW have no further comments on noise chapter other than what was discussed at the meeting

2. CRITERIA

2.1 Planning Policy Wales

The Welsh Government's Planning Policy Wales (Edition 11) dated February 2021 sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes (TANs), Welsh Government Circulars, and policy clarification letters which together with PPW provide the national planning policy framework for Wales.

Reference to noise is made in Paragraph 6.74: Framework for Addressing Air Quality and Soundscape, which states that:

"6.74 The planning system should maximise its contribution to achieving the well – being goals, and in particular a healthier Wales, by aiming to reduce average population exposure to air and noise pollution. In doing so, it should consider the long – term effects of current and predicted levels of air and noise pollution on individuals, society and the environment and identify and pursue any opportunities to reduce, or at least, minimise population exposure to air and noise pollution".

Reference is also made to noise in Paragraphs 6.7.15 - 17:

"Location of Commercial, Industrial and other Potentially Polluting Development

6.7.15 For the purposes of this section, potentially polluting development includes commercial, industrial, energy and agricultural or transport infrastructure. Such development should be located in areas where there is low potential for public exposure, or where its impact can be minimised. Novel or new development types may potentially cause pollution and should be carefully considered, and where appropriate, decisions should be based on the precautionary principle.

6.7.16 Relevant considerations in making planning decisions for potentially polluting development are likely to include:

- location, including the reasons for selecting the chosen site itself;*
- impact on health and amenity;*
- effect of pollution on the natural and built environment and the enjoyment of areas of landscape and historic and cultural value;*
- impact on groundwater and surface water quality;*
- effect on biodiversity and ecosystem resilience, including where there may be cumulative impacts on air or water quality which may have adverse consequences for biodiversity and ecosystem resilience;*
- the risk and impact of potential pollution from the development, insofar as this might lead to the creation of, or worsen the situation in, an air quality*

management area, a noise action planning priority area or an area where there are sensitive receptors; and

- impact on the road and other transport networks, and in particular on traffic generation, particularly where the proposed development is not transport infrastructure itself.*

6.7.17 The location of potentially polluting development adjacent to sensitive receptors will be unacceptable where health and amenity impacts cannot be minimised through appropriate design and mitigation measures. It is the overall expectation that levels of pollution should be reduced as far as possible and for this reason the location of potentially polluting development should be taken into account as part of overall strategies in development plans to ensure it can be appropriately located and maximum environmental benefits can be gained through measures such as green infrastructure.”

2.2 Technical Advice Note (Wales) 11

The below summarises the advice given TAN11 (1997) regarding new noise generating developments.

“3. This note provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

4. Local authorities should adopt a corporate approach and ensure close co-operation between planning and environmental health departments when considering noise and noise generating developments.

Development Control

Noise generating development

8. Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.

9. Noise characteristics and levels can vary substantially according to their source and the type of activity involved. In the case of industrial development, for example, the character of the noise should be taken into account as well as its level. Sudden impulses, irregular noise or noise which contains a distinguishable continuous tone will require special consideration. In addition to noise from aircraft landing and taking off, noise from aerodromes is likely to result from engine testing as well as ground movements. The impact of noise from sport, recreation and entertainment will depend to a large extent

on frequency of use and the design of facilities. Advice on assessing noise and on factors to consider in relation to the major noise sources including roads, railways, airports, industrial and recreational noise and their measurement is given in Annex B.

Noise from industrial and commercial developments

B17. The likelihood of complaints about noise from industrial development can be assessed, where the Standard is appropriate, using guidance in BS 4142: 1990. Tonal or impulsive characteristics of the noise are likely to increase the scope for complaints and this is taken into account by the "rating level" defined in BS 4142. This "rating level" should be used when stipulating the level of noise that can be permitted. The likelihood of complaints is indicated by the difference between the noise from the new development (expressed in terms of the rating level) and the existing background noise. The Standard states that, 'A difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance'. Since background noise levels vary throughout a 24 hour period it will usually be necessary to assess the acceptability of noise levels for separate periods (e.g. day and night) chosen to suit the hours of operation of the proposed development. Similar considerations apply to developments that will emit significant noise at the weekend as well as during the week. In addition, general guidance on acceptable noise levels within buildings can be found in BS 8233: 1987."

TAN11 refers to BS 4142:1997 and BS 8233:1987. These have been superseded by BS 4142:2014+A1:2019 (see Section 2.3 below) and BS 8233:2014 (see Section 2.6 below).

2.3 Local Policy

The following noise related policies are contained within the Neath Port Talbot County Borough Council Local Development Plan (2011-2026), adopted January 2016:

2.3.1 Policy EN 8 'Pollution and Land Stability'

"Proposals which would be likely to have an unacceptable adverse effect on health, biodiversity and/or local amenity or would expose people to unacceptable risk due to the following will not be permitted:

- *Air pollution;*
- *Noise pollution;*
- *Light pollution;*
- *Contamination;*
- *Land instability;*
- *Water (including groundwater) pollution.*

Proposals which would create new problems or exacerbate existing problems detailed above will not be acceptable unless mitigation measures are included to reduce the risk of harm to public health, biodiversity and/or local amenity to an acceptable level.”

Paragraph 5.3.46 goes on to state:

“In relation to noise, potentially noisy proposals should not be located close to sensitive uses (such as hospitals, schools and housing) and new noise-sensitive developments should not be located near to existing noisy uses (including industry and existing or proposed transport infrastructure) unless it can be shown that adverse effects can be dealt with through mitigation measures incorporated into the design. Where noise levels are likely to be a significant issue, developers may be required to provide information to show that no nuisance is likely to be caused through increased noise levels at sensitive locations if the development proceeds. Policy EN10 sets out policy relating to designated Quiet Areas.”

2.3.2 Policy EN 10 ‘Quiet Areas’

“In order to protect areas of tranquillity within urban areas, the following ‘Quiet Areas’ have been identified:

Reference	Quiet Area
EN10/1	Neath Abbey Ruins, Neath
EN10/2	Mount Pleasant Park, Neath
EN10/3	Skewen Park, Neath
EN10/4	Shelone Woods, Neath
EN10/5	Victoria Gardens, Neath
EN10/6	Church Place, Neath
EN10/7	Talbot Memorial Park, Port Talbot
EN10/8	Vivian Park, Port Talbot
EN10/9	Baglan Park, Port Talbot
EN10/10	King George V Park, Pontardawe

Development proposals that would have unacceptable impacts on the characteristics that led to the designation will be resisted.”

2.4 Environment Agency / Natural Resources Wales (NRW)

The latest Guidance ‘Noise and vibration management: environmental permits’ produced jointly by The Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency and published 23 July 2021 and updated 31 January 2022.

The guidance states, “You must use ‘BS 4142: Methods for rating and assessing industrial and commercial sound’ to quantify the level of environmental noise impact from industrial processes.”

2.5 British Standard 4142:2014+A1:2019

British Standard 4142:2014+A1:2019 “Methods for rating and assessing industrial and commercial sound”, provides current guidance for the assessment of industrial noise affecting residential receivers.

This standard describes a rating method comparing L_{Aeq} noise levels from the industrial source with pre-existing background L_{A90} levels at the residential receiver. It advises at a difference (industrial noise - background) of:

- +10dB or higher, likely to be an indication of a significant adverse impact, depending on the context.
- A difference of + 5dB, likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

A sliding scale of penalties can be applied to industrial/commercial sound levels which have acoustically distinguishing characteristics, including tonality, impulsivity and intermittency.

Tonality – A penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible.

Impulsivity – A penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it clearly perceptible, and 9dB where it is highly perceptible.

Other sound characteristics – Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied

Intermittency – If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

BS 4142:2014 states under section 11;

"Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.

- 1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

- 2) *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/ or commercial nature is likely to be perceived and how people react to it.*

NOTE 3 Consideration should be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

- 3) *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
 - i) *facade insulation treatment;*
 - ii) *ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
 - iii) *acoustic screening."*

In addition to the above, the Association of Noise Consultants (ANC) have produced a Technical Note to BS 4142:2014+A1:2019, dated March 2020 (v1.0).

It states under 'Other Contextual Matters' – *"The assessor may also wish to consider matters such as the:*

- *character of a particular neighbourhood;*
- *former uses at or close to a site;*
- *legitimacy of the industrial use, e.g. planning permissions or environmental permits;*
- *implementation of best practicable means for a given process or activity; or*
- *local convention or perceptions.*

When relying on such matters, it is incumbent for the assessor to make clear all elements of context."

It goes on to say, *"There is no theoretical limit to how the context can or should influence the impact assessment, but any alteration of the conclusions of an assessment due to context should be sufficiently explained and justified for the specific circumstances in question."*

2.6 British Standard 8233:2014

British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings' includes internal noise criteria of habitable rooms in residential dwellings, as shown below;

Table 2.1 – BS 8233:2014 Internal Ambient Noise Criteria for Habitable Rooms

Location	Desired		Reasonable *	
	07:00 to 23:00	23:00 to 07:00	07:00 to 23:00	23:00 to 07:00
Living room	35 dB $L_{Aeq,16hr}$	-	40 dB $L_{Aeq,16hr}$	-
Dining room/area	40 dB $L_{Aeq,16hr}$	-	45 dB $L_{Aeq,16hr}$	-
Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$	40 dB $L_{Aeq,16hr}$	35 dB $L_{Aeq,8hr}$

* NOTE 7 states *"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved."*

2.7 Best Available Techniques (BAT)

For Best Available Techniques (BAT) we would refer to Reference Document for the Production of Large Volume Organic Chemicals from the Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control), 2017.

Section 2.4.10 'Techniques to reduce noise and vibration' provides the following advice:

The techniques listed below are described in full in the CWW BREF and are considered generally applicable across the LVOC sector.

A combination of techniques can be used to reduce noise and vibration, for example:

- *noise prevention by suitable construction (e.g. prevention of resonant vibration);*
- *selection of equipment with inherently low vibration (e.g. steadily running machines instead of pulsating machines; screw compressors instead of reciprocating compressors);*
- *sound absorbers (e.g. for safety valves, combustion machines);*
- *anti-vibration mountings (e.g. pumps mounted on rubber foundations);*
- *noise control booth / encapsulation of the noise sources (e.g. compactors, centrifuges);*
- *disconnection of vibration sources and surroundings (e.g. separate foundations for reciprocating compressor and any connected pipes); and*
- *consideration at the design stage of proximity to potential receptors (e.g. residential areas).*

The application of the techniques listed above should be informed by the noise management plan, which is part of the environmental management system (EMS) and can include all or a combination of the following elements:

- *a noise management strategy;*
- *protocols for carrying out noise monitoring;*
- *a protocol for response to identified noise complaints;*
- *an ongoing noise prevention and reduction programme;*
- *an implementation plan and timetable;*
- *a reporting programme;*
- *a review programme.*

The Best Available Techniques (BAT) Reference Document for Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector (CWW BREF) by the Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control, 2016), states that in order to prevent or, where that is not practicable, to reduce

noise emissions, BAT is to use one or a combination of the techniques given below subject to applicability.

	Technique	Description	Applicability
a	Appropriate location of equipment and buildings	Increasing the distance between the emitter and the receiver and using buildings as noise screens.	For existing plants, the relocation of equipment may be restricted by a lack of space or excessive costs.
b	Operational measures	This includes: i. improved inspection and maintenance of equipment; ii. closing of doors and windows of enclosed areas, if possible; iii. equipment operation by experienced staff; iv. avoidance of noisy activities at night, if possible; v. provisions for noise control during maintenance activities.	Generally applicable.
c	Low-noise equipment	This includes low-noise compressors, pumps and flares.	Applicable only when the equipment is new or replaced.
d	Noise-control equipment	This includes: i. noise-reducers; ii. equipment insulation; iii. enclosure of noisy equipment; iv. soundproofing of buildings.	Applicability may be restricted due to space requirements (for existing plants), health, and safety issues.
e	Noise abatement	Inserting obstacles between emitters and receivers (e.g. protection walls, embankments and buildings).	Applicable only to existing plants, since the design of new plants should make this technique unnecessary. For existing plants, the insertion of obstacles may be restricted by a lack of space.

3. SOUND SENSITIVE RECEPTORS

The site plan in Figure B.1 of Appendix B shows the proposed site and surrounding area.

The following sound sensitive receptors (SSRs) have been identified at this stage within a 1.3km radius from the site (which picks up the closest residential receptors in each direction), agreed with NPT CBC during pre-application discussions:

Table 3.1 – Sound Sensitive Receptor Locations

ID No.	Description	Approx. Distance to Nearest Operational Site Boundary (m)
SSR1	Dwellings at Mariners Point	890
SSR2	Dwellings at Darwin Rd / Newbridge Rd	900
SSR3	Dwellings on Isaac's Place / Borough St	1090
SSR4	Dwellings on Green Park St	1050
SSR5	Dwellings on Water St / Blanco's Hotel	1150
SSR6	Flats above shops on Station Rd	990
SSR7	Dwellings on Talbot Rd	745
SSR8	Dwellings on Lower West End	575
SSR9	Dwellings on St Alban's Terrace	810
SSR10	Dwellings on Duke St	1000
SSR11	Port Talbot Magistrates' Court	790

In addition to the above, consultation with NPT CBC / Red Twin Limited also highlighted the following quiet areas defined in the Neath Port Talbot LDP Policy EN10 as Vivian Park (1.6km north-west of the site) and Talbot Memorial Park (830m north-east of the site).

4. BASELINE NOISE SURVEY

Detailed methodology and results of the baseline noise survey carried out are included in Hunter Acoustics report 6387/ENS1_Rev1 dated 15/05/2023 which consisted of combination of short-term day/night sample measurements and long-term continuous monitoring.

The site plan in Figure B.1 of Appendix B shows the measurement positions used, namely:

Table 4.1 – Continuous Monitoring Location Details

Position	Description
A	On fence outside 27 Mariners Point, 2.5m above ground level. Representative of sound climate at residential receptors on Mariners Point.
B	On top of wall section in council car park adjacent to Blanco's Hotel, approx. 4.5m above ground level. Representative of sound climate at Blanco's Hotel and residential receptors on Water Street / Green Park Street.
C	Along Tata Steel's north-eastern boundary, approx. 36m away from Harbour Way, 1.5m above ground level. Representative of residential receptors on Lower West End.

Table 4.2 – Sample Measurement Location Details

Position	Description
1	Adjacent to residential dwellings along Newbridge Road
2	In front of residential dwellings along Water Street
3	At the rear of Port Talbot Parkway station car park, approx. 14m from dwellings along Talbot Road
4	At eastern exit of Harbour Way roundabout, approx. 120m from residential dwellings along Prince Street
5	On Harbourside Road, adjacent to HMCTS Port Talbot Justice Centre
6	At northern boundary of proposed site & access road for Tata Steel
7	At southern area of proposed site
8	On Moorland Road, adjacent to entrance to Vivian Park
9	Along Park View, adjacent to rear of Talbot Memorial Park

Note: All sample measurement microphone positions approximately 1.5m above local ground level.

The following minimum consistent daytime and night-time background L_{A90} sound levels have been determined in our baseline survey report, repeated below for ease of reference:

Table 4.3 – Minimum Consistent Daytime and Night-time Background L_{A90} Results

Period	Position		
	A	B	C
Daytime (0700-2300hrs) $L_{A90,1hr}$ (dB)	45	49	54
Night-time (2300-0700hrs) $L_{A90,15min}$ (dB)	45	40	52

Results of sample measurements are also repeated below:

Table 4.4 – Sample Measurement Results

Position	Date	Start Time (hh:mm)	Duration (mins)	L_{Aeq} (dB)	L_{Amax} (dB)	L_{A90} (dB)
1	01/09/2022	10:24	15	55	82	46
1	01/09/2022	11:23	15	54	67	46
1	02/09/2022	00:04	15	49	61	47
1	02/09/2022	00:16	15	48	55	46
2	01/09/2022	11:04	15	64	86	49
2	01/09/2022	12:04	15	66	89	53
2	02/09/2022	00:27	15	53	77	42
2	02/09/2022	01:39	15	50	73	42
3	01/09/2022	15:26	15	57	75	49
3	01/09/2022	17:11	15	53	70	49
3	02/09/2022	01:19	15	45	58	42
3	02/09/2022	02:03	15	44	53	42
4	01/09/2022	14:44	15	59	76	53
4	01/09/2022	16:12	15	60	72	55
4	02/09/2022	00:56	15	59	78	46
4	02/09/2022	01:41	15	51	69	46
5	01/09/2022	15:05	15	54	69	51
5	01/09/2022	16:33	15	53	68	51
5	02/09/2022	00:53	15	52	67	44
5	02/09/2022	02:01	15	45	53	44
6	01/09/2022	13:18	15	63	81	51
6	01/09/2022	13:56	15	64	79	52
6	01/09/2022	23:56	15	57	74	51
6	02/09/2022	00:32	15	55	76	51
7	01/09/2022	13:37	15	51	60	49

7	01/09/2022	14:14	15	53	62	51
7	01/09/2022	23:37	15	53	62	51
7	02/09/2022	00:14	15	53	62	51
8	02/09/2022	10:44	15	55	78	41
8	02/09/2022	11:44	15	56	75	42
9	01/09/2022	15:48	15	56	67	54
9	01/09/2022	17:33	15	59	79	53

The observed sound climate at each position was as follows:

Table 4.5 – Observations of Soundscape at Sample Measurement Locations

Position	Daytime Soundscape	Night-time Soundscape
1	Road traffic, harbour activity from steelworks, birdsong	Steelwork noise, alarms from steelworks, road traffic, train, trees, helicopter
2	Road traffic controlled	Steelwork noise, road traffic, light breeze
3	Road traffic, steelworks, train	Road traffic and train, trees, low frequency at steelworks
4	Train, road traffic, steelworks plant, wind turbine or substation low frequency	Road traffic and train, trees, low frequency at steelworks
5	Road traffic, steelworks, train	Industrial noise, distant road traffic, wind, bushes, trees, train
6	Controlled by a nearby stack to the east and HGV pass-bys	Breeze in trees, HGV pass-bys and industrial fan
7	Controlled by a nearby industrial fan/stack to the east	Controlled by a nearby industrial fan/stack to the east
8	Pedestrians in park, dogwalkers, plane traffic, trees	-
9	Children playing on field, road traffic	-

5. SOURCE SAMPLE MEASUREMENTS OF SHIP ACTIVITY

5.1 Procedure

Hunter Acoustics attended Plymouth's Cattedown Wharves on Wednesday 5th July 2023 from 1830hrs to 0230hrs on Thursday 6th July to undertake source sample measurements of a similar vessel to that proposed to be used at Project Dragon to gather source data for use in the prediction model.

Measurements were undertaken of the vessel with engine running at the dock when manoeuvring and then with pumps running to off-load product.

Parameters logged included duration, $L_{Amax,F}$, L_{Aeq} , L_{A90} and third octave band spectra, along with continuous audio and 100ms data to allow detailed post analysis of results.

Various measurement positions were used, as shown on the plan below, which included near and far-field locations:

Figure 5.1 – Sample Measurement Locations



Table 5.1 – Ship Noise Sample Measurement Location Details

Position	Description
A	21m from side of ship at 4m height, line of sight to pumps and engine
1	20m from side of ship at engine
2	20m from rear of ship
3	40m from rear of ship
4	90m from rear of ship
5	South west coast path, 1-2 Cottages at The Quay, approx.. 560m from rear of ship
6	3-4 Boringdon Terrace, approx. 330m from side of ship
7	Mountbatten Centre, approx. 600m from front of ship

All measurement locations at 1.2m above local ground height with exception of Position A which was logging at 4m height.

5.2 Meteorological Conditions

Conditions were calm and dry during sample measurements, with an occasional gentle WSW breeze.

5.3 Equipment Used

The following measurement equipment was used during the surveys:

Table 5.2 – Equipment List

Make	Description	Model	Serial Number	Last Calibrated	Certificate No.
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-08723-E0	29 October 2021	TCRT21/1759
	Preamplifier	MA220	1820	29 October 2021	TCRT21/1759
	Filters	XL2-TA	A2A-08723-E0	01 November 2021	TCRT21/1763
	Microphone Capsule	MC230	9381	29 October 2021	TCRT21/1759
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-13022-E0	18 August 2021	TCRT21/1571
	Preamplifier	MA220	6853	18 August 2021	TCRT21/1571
	Microphone Capsule	MC230	A14127	18 August 2021	TCRT21/1571
NTi	Type 1 - Sound Level Meter	XL2-TA	A2A-14577-E0	23 June 2022	UK - 22 -051
	Preamplifier	MA220	7485	23 June 2022	UK - 22 -051
	Microphone Capsule	MC230	A15594	23 June 2022	UK - 22 -051
Larson Davis	Calibrator (94.00dB / 114.03dB @ 1kHz)	CAL200	19047	15 August 2022	44788-19047-CAL200
Leica	Laser measure	DISTO D510	1081540163	14 May 2018	1081540163

Measurement systems were calibrated before and after the surveys and no variation occurred.

Note: Copies of traceable calibration certificates for all equipment are available upon request.

5.4 Results

The following details results of sample measurements undertaken of the ship.

Table 5.3 – Source Sample Measurement Results

Pos	Description	Duration (secs)	Distance (m)	Height (m)	L_{Aeq} (dB)	$L_{Amax,F}$ (dB)
1	20m from side rear, engine running	15	20	1.5	67.2	68.4
-	30m from rear of ship, engine running	20	30	1.5	65.6	66.6
3	40m from rear of ship, engine running	32	40	1.5	65.1	67.1
4	90m from rear of ship, engine running	30	90	1.5	59.8	61.1
1	20m from ship, engine dropped in level	10	20	1.5	61.4	63.4
1	20m from ship, engine off, generators only	22	20	1.5	56.9	63.1
-	9m from side of ship, approx. 16m to pumps	31	16	1.5	67.3	69.1
3	35m from rear of ship, provides screening to pumps	33	35	1.5	61.5	62.9
4	94m from rear of ship	31	94	1.5	54.8	56.5
-	125m from rear of ship	30	125	1.5	54.4	55.7
-	24m from side of ship, 3x pumps running	33	24	1.5	62.5	63.9
-	8m from side of ship, 15m to pumps	12	15	3	68.7	69.7
7	Mountbatten Centre, pumps audible	73	~600	1.5	34.7	37.3
6	3 Boringdon Terrace, pumps clearly audible, tonal	43	~330	1.5	47.3	50

6	4 Boringdon Terrace, pumps clearly audible, tonal	18	~330	1.5	47.6	49.5
5	South West Coast Path, from rear of ship, pumps audible, tonal	38	560	1.5	42.5	44.9
5	South West Coast Path, from rear of ship, pumps audible, tonal	31	560	1.5	41.9	43.9

Octave band data is included in Table B.1 of Appendix B.

At off-site measurement locations during ship off-loading, tonality was highly perceptible at 330m, reducing to clearly perceptible at distances of 500-600m during the measurements attracting a 4dB character correction under BS 4142.

During the ship off-loading scenarios presented in this report, it is therefore proposed to include a 4dB penalty for tonality for receptors within 600m of the ship as opposed to the 3dB for the general site operations.

The noise model has been calibrated using the 47dB(A) at 330m measurement from the 3no pumps running and then adjusted to allow for up to 6no pumps running as worst-case.

The ship pass-by has been modelled and calibrated using the 60dB(A) at 90m from the rear of the ship with engine running measurement.

6. NOISE MODELLING

Our analysis has used the proprietary Predictor (v2023) computer modelling software, in conjunction with procedures of ISO 9613.

This model allows noise levels from noise sources to be predicted over large distances and varying terrain. Attenuation is included accounting for distance, air absorption, ground absorption and screening losses from site topography/local structures.

Note that existing structures immediately east of the Production Development Zone (PDZ) area have been taken out of the model as this area is to be used as a Temporary Construction Area (TCA).

LIDAR contour data has been used for terrain modelling, along with site observations and Google Earth for buildings. 8m AOD development plateau assumed across the PDZ, as per 'Earthworks and Levels'.

The intervening ground between site and receptors consists mainly of reflective hard ground and water, with some smaller green areas which are included in the model as soft ground.

The analysis predicts resultant noise levels at the SSRs.

Drawings used in our assessment are referenced in Appendix D.

6.1 Source Plant Noise Data

Source noise data used in the model for the various items of plant is detailed in Appendix C.1 taken from initial information provided by the project engineering team, Technip Energies (TE) and in-house database figures.

Following liaison with TE, the following information has been made available for assessment at planning stage, prior to detailed engineering design.

6.1.1 Enclosed Ground Flare

Following Best Available Techniques (BAT) to control noise at source, the scheme is to utilise an enclosed ground flare as opposed to an elevated flare.

We are advised that in the general day to day running of the plant, the flare should not be in use, however it is required in two main scenarios;

- a) Start-up/shutdown of the plant (assumed worst case, once every 6months initially but reducing to every two years, could last for 48hrs, no combustion noise)

- b) Emergency (assume worst case, once every 10years, at this level for 30mins before reducing)

TE advises that noise levels are expected at 80dB(A) at 1m from the wind fence and 52dB(A) at 150m for start-up flaring. For emergency flaring, this increases to 90dB(A) at 1m from the wind fence and 62dB(A) at 150m.

The following spectra shape has been provided for the enclosed ground flare:

Table 6.1 – Ground Flare Spectra Shape

Un-weighted Octave Band Sound Pressure Levels at 1m from Wind Fence of Ground Flare								Overall dB(A)
63	125	250	500	1000	2000	4000	8000	
75.2	71.5	72.5	75.6	70.0	68.0	69.7	77.5	79.7

The model has therefore been calibrated with the above spectra shape to equal the 150m distance figures quoted above in each scenario.

6.1.2 Cooling Towers

There are 3no banks of cooling towers proposed. Sound power level data has been provided by TE for outlet, inlet and casing radiated noise.

The noisier inlets have been modelled facing into the site (i.e. south), away from critical residential receptors. We understand this can be accommodated and represents best practice in terms of plant orientation.

A 5dB reduction in levels is indicated to be required at this stage and therefore a limit of 70dB(A) at 10m from the north of the cooling towers (all running) is set and included in the modelling.

Sound power level data have also been provided by TE for the cooling water pumps.

6.1.3 Compressors

Following BAT and good practice, large compressors are to be housed in enclosures on the southern site boundary. The final design of these buildings is to be confirmed at detailed design stage however a maximum limit of 65dB(A) at 10m from the enclosure has been modelled at this stage.

Spectra shape for a compressor taken from the Predictor database has been used to generate source sound power levels to set 65dB(A) at 10m in the model. These are included in Appendix C.1.

6.1.4 Pumps

There are a significant number of pumps proposed on the scheme.

TE has provided levels of 80dB(A) at 1m and 85dB(A) at 1m for the various pumps, as guaranteed by Vendors and state these are conservative figures. Limits of 60 and 65dB(A) at 10m should therefore be met from the pumps respectively.

We are advised by TE that where multiple pumps are referenced for a particular item on drawings, that they are duty/spare configuration and it is only expected that one pump would run in normal operation, with exception of the cooling water pumps (P-4710A/B/C/D/E 4 to run simultaneously, 1 spare) and fire water pumps in emergency (P-4601A/B/C/D 3 to run simultaneously, 1 spare).

Spectra shape for a centrifugal pump from the Predictor database have been used to generate source sound power levels to meet 80-85dB(A) at 1m in the model. These are included in Appendix C.1.

6.1.5 HP Boiler

Octave band spectra have been provided by TE for stated level of 85dB(A) at 1m. A limit of 65dB(A) at 10m should therefore be met from the HP Boiler and should be confirmed by Vendors at the detailed design stage.

It is understood the HP Boiler has a 23m stack. This has been included in the model with a limit set at 65dB(A) at 10m which it is understood is achievable. TE advised:

"Flue gas is forced draft fan driven. As such anticipated noise from stack is less than 85 dBA due to convection coils reflecting noise back to boiler firebox."

6.1.6 Utilities and Storage Vendor Packages

For remaining noise generating plant identified by TE within the Utilities and Vendor Packages, spectra shape for pumps, boilers, compressors and fans taken from the Predictor database have been used and adjusted to meet the dB(A) at 1m levels quoted by TE. These are included in Appendix C.1.

Vendors to confirm that limits of 60 and 65dB(A) at 10m are met from these packages (quoted at 80 and 85dB(A) at 1m respectively) at the detailed design stage.

6.1.7 Diesel Generators

Figures of 83dB(A) at 7m have been used for the diesel generator sets.

Spectra shape for diesel generator taken from the Predictor database has been used to generate source sound power levels to meet 83dB(A) at 7m in the model. These are included in Appendix C.1.

Vendors to confirm this limit is met at the detailed design stage.

6.1.8 Ship

Noise levels for the ship pass-by and off-loading have been based on sample measurements undertaken as discussed in Section 5.

6.1.9 Remaining Items of Plant

TE have advised remaining plant is assumed quiet and is not therefore included in the modelling.

6.2 Noise Model Scenarios

Scenarios modelled are set out in Appendix C, including flows/speeds of mobile sources and percentage on-times for fixed plant.

Note: As all plant is indicated to run 100% of the time, the daytime and night-time $L_{Aeq,1hr}$ and night-time $L_{Aeq,15min}$ predicted levels are the same from the main plant.

With regards to HGV movements, 4no movements in a worst case one-hour period equate to 1no movement in a 15minute period which is considered robust based on the estimated worst-case 26 two-way HGV movements per day (during the unlikely event of disruption in the shipping supply chain, resulting SAF being transported via trucks).

Scenario 4 is representative of daytime only as it is understood testing of diesel generators would not occur at night.

With regards to the ship movement, 1no one-way movement is considered reasonable in a one-hour period. For night-time however, as the modelling software works on a 1hr period, to estimate the 15min period, 4no one-way movements have been modelled to equate to 1no movement in a 15-minute period.

Therefore, with exception of the with ship movement scenario and diesel generator testing scenario, daytime modelling is also representative of night-time modelling.

6.3 Noise Model Results

Predicted levels at critical receiver locations are shown in Table 6.2 below;

Table 6.2 – Noise Model Predictions

Sound Sensitive Receptor (SSR)	Height (m)	Scenario						
		1	1a	1b	2	3	4	5
		Normal Operation	Normal Operations with Ship Movement (Day $L_{Aeq,1hr}$)	Normal Operations with Ship Movement (Night $L_{Aeq,15mins}$)	Ship Off-loading	Start-up Flare	Emergency Flare	Generator Testing
SSR1 - 27 Mariners Point	1.5	40	44	49	41	40	42	41
SSR1 - 27 Mariners Point	4.5	40	45	50	41	40	42	41
SSR2 - 1 Darwin Road	1.5	39	40	43	41	40	42	40
SSR2 - 1 Darwin Road	4.5	39	40	43	41	39	42	40
SSR3 - 4 Isaac's Place	1.5	38	38	39	40	38	41	40
SSR3 - 4 Isaac's Place	4.5	40	40	41	43	40	42	41
SSR4 - 5 Green Park Street	1.5	38	38	40	40	38	40	40
SSR4 - 5 Green Park Street	4.5	38	39	40	40	38	40	41
SSR5 - Blanco's Hotel	1.5	37	37	38	39	37	39	38
SSR5 - Blanco's Hotel	4.5	37	38	39	40	38	39	39
SSR5 - Blanco's Hotel	7.5	38	38	39	40	38	39	39
SSR6 - 21 Station Road	1.5	36	37	38	38	36	38	37
SSR6 - 21 Station Road	4.5	38	38	39	41	38	40	39
SSR7 - 105 Talbot Road	1.5	40	40	40	42	40	41	40
SSR7 - 105 Talbot Road	4.5	43	42	42	45	42	46	42
SSR8 - 10 Lower West End	1.5	41	42	42	45	42	44	42
SSR8 - 10 Lower West End	4.5	43	43	44	46	44	46	44
SSR9 - 19 St Albans Terrace	1.5	39	39	40	42	39	40	39
SSR9 - 19 St Albans Terrace	4.5	41	42	42	46	42	42	42

SSR10 - 21 Duke Street	1.5	36	36	37	39	36	37	36
SSR10 - 21 Duke Street	4.5	37	37	37	39	37	38	37
SSR11 - Magistrates Court	1.5	42	43	44	45	43	45	44
SSR11 - Magistrates Court	4.5	42	43	44	45	43	45	44
Talbot Memorial Park	1.5	39	39	40	42	39	41	40
Vivian Park	1.5	32	33	35	34	33	35	33

Noise map contour plots are included in Appendix C.4 for each scenario set out above.

7. ASSESSMENT OF INDUSTRIAL NOISE IMPACT

7.1 Acoustic Character Correction

Noise from plant on site is not indicated to contain impulsive or intermittent characteristics as we understand the plant is all generally running continuously. Pumps, fans, compressors etc. can however contain tonal content at source.

Given the distance between the site and residential receptors (minimum approx. 500m from ship offloading to SSR8, Lower West End) and the predicted absolute sound levels in relation to the existing sound climate, it is likely that tonality may be just perceptible from the site which would warrant a 2dB character correction under BS 4142:2014+A1:2019.

For robustness at this stage however, a 3dB penalty has been included for sound characteristics that are readily distinctive against the residual acoustic environment, as specified in BS 4142:2104+A1:2019.

For the ship off-loading scenario however, as discussed in Section 5.4, a 4dB correction has been included for tonality being clearly perceptible at receptors around 600m or less from the ship (SSR 7 and SSR8), based on sample measurements discussed in Section 5.

7.2 Impact Assessments

The following tables show predicted rating levels against measured background sound levels to provide an initial outcome of the impact, depending on context.

Note: The background sound levels quoted are night-time background sound levels for a worst-case night-time assessment with exception of Scenario 1a and 5 which are daytime scenarios.

7.2.1 SSR1 – 27 Mariners Point

Table 7.1 – SSR1 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background at Pos A L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	40	3	43	45	-2
1a (Normal with Ship Day)	45	3	48	45	3
1b (Normal with Ship Night)	50	3	53	45	8
2 (Ship Off-loading)	41	3	44	45	-1
3 (Start-up Flare)	40	3	43	45	-2
4 (Emergency Flare)	42	3	45	45	0
5 (Generator Testing, Day)	41	3	44	45	-1

With rating levels indicated to be in line with the night-time background, BS 4142 would indicate this is a low impact, depending on context.

At +3/+8dB during ship movements (day/night), an adverse impact is indicated likely depending on context. Given this is an infrequent event (potential for 2no two-way trips per week), we would suggest this could be modified to adverse impact less likely when considering context (discussed further in Section 7.3).

7.2.2 SSR2 – 1 Darwin Road

Table 7.2 – SSR2 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	39	3	42	45	-3
1a (Normal with Ship Day)	40	3	43	45	-2
1b (Normal with Ship Night)	43	3	46	45	1
2 (Ship Off-loading)	41	3	44	45	-1
3 (Start-up Flare)	40	3	43	45	-2
4 (Emergency Flare)	42	3	45	45	0
5 (Generator Testing, Day)	40	3	43	45	-2

With rating levels indicated to be in line with (by 1dB) or below the night-time background, BS 4142 would indicate this is a low impact, depending on context.

7.2.3 SSR3 – 4 Isaac's Place

Table 7.3 – SSR3 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	40	3	42	40	3
1a (Normal with Ship Day)	40	3	42	49	-6
1b (Normal with Ship Night)	41	3	43	40	4
2 (Ship Off-loading)	43	3	45	40	6
3 (Start-up Flare)	40	3	42	40	3
4 (Emergency Flare)	42	3	45	40	5
5 (Generator Testing, Day)	41	3	43	49	-5

With rating levels indicated up to 4dB above the night-time background, BS 4142 would indicate an adverse impact is less likely, depending on context.

At +6dB during ship off-loading during the night, an adverse impact is indicated depending on context.

At +5dB during emergency flaring during the night, an adverse impact is indicated depending on context. Given this is an emergency event (potential 1 in 10 years), we would suggest an adverse impact is less likely when considering context (discussed further in Section 7.3).

During daytime, rating levels fall below background and therefore a low impact is indicated, depending on context.

7.2.4 SSR4 – 5 Green Park Street

Table 7.4 – SSR4 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	38	3	41	40	1
1a (Normal with Ship Day)	39	3	42	49	-7
1b (Normal with Ship Night)	40	3	43	40	3
2 (Ship Off-loading)	40	3	43	40	3
3 (Start-up Flare)	38	3	41	40	1
4 (Emergency Flare)	40	3	43	40	3
5 (Generator Testing, Day)	41	3	44	49	-5

With rating levels indicated up to 3dB above the night-time background, BS 4142 would indicate an adverse impact is less likely, depending on context.

During daytime, rating levels fall below background and therefore a low impact is indicated, depending on context.

7.2.5 SSR5 – Blanco's Hotel

Table 7.5 – SSR5 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	38	3	41	40	1
1a (Normal with Ship Day)	38	3	41	49	-8
1b (Normal with Ship Night)	39	3	42	40	2
2 (Ship Off-loading)	40	3	43	40	3
3 (Start-up Flare)	38	3	41	40	1
4 (Emergency Flare)	39	3	42	40	2
5 (Generator Testing, Day)	39	3	42	49	-7

With rating levels indicated up to 3dB above the night-time background, BS 4142 would indicate an adverse impact is less likely, depending on context.

During daytime, rating levels fall below background and therefore a low impact is indicated, depending on context.

7.2.6 SSR6 – 21 Station Road

Table 7.6 – SSR6 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	38	3	41	40	1
1a (Normal with Ship Day)	38	3	41	49	-8
1b (Normal with Ship Night)	39	3	42	40	2
2 (Ship Off-loading)	41	3	44	40	4
3 (Start-up Flare)	38	3	41	40	1
4 (Emergency Flare)	40	3	43	40	3
5 (Generator Testing, Day)	39	3	42	49	-7

With rating levels indicated up to 4dB above the night-time background, BS 4142 would indicate an adverse impact is less likely, depending on context.

During daytime, rating levels fall below background and therefore a low impact is indicated, depending on context.

7.2.7 SSR7 – 105 Talbot Road

Table 7.7 – SSR7 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	42	3	45	42	3
1a (Normal with Ship Day)	42	3	45	49	-4
1b (Normal with Ship Night)	42	3	45	42	3
2 (Ship Off-loading)	45	4	49	42	7
3 (Start-up Flare)	42	3	45	42	3
4 (Emergency Flare)	46	3	49	42	7
5 (Generator Testing, Day)	42	3	45	49	-4

With rating levels indicated to up to 3dB above the night-time background, BS 4142 would indicate this is a low impact, depending on context.

At +7dB during ship off-loading during the night, an adverse impact is indicated depending on context (discussed further in Section 7.3).

At +7dB during emergency flaring during the night, an adverse impact is indicated depending on context. Given this is an emergency event (potential 1 in 10 years), we would suggest an adverse impact remains less likely when considering context (discussed further in Section 7.3).

During daytime, rating levels fall below background and therefore a low impact is indicated, depending on context.

7.2.8 SSR8 – 10 Lower West End

Table 7.8 – SSR8 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	43	3	46	52	-6
1a (Normal with Ship Day)	43	3	46	54	-8
1b (Normal with Ship Night)	44	3	47	52	-5
2 (Ship Off-loading)	46	4	50	52	-2
3 (Start-up Flare)	44	3	47	52	-5
4 (Emergency Flare)	46	3	49	52	-3
5 (Generator Testing, Day)	44	3	47	54	-7

Rating levels fall at or below background for all scenarios and therefore a low impact is indicated, depending on context.

7.2.9 SSR9 – 19 St Albans Terrace

Table 7.9 – SSR9 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	41	3	44	46	-2
1a (Normal with Ship Day)	42	3	45	53	-8
1b (Normal with Ship Night)	42	3	45	46	-1
2 (Ship Off-loading)	46	3	49	46	3
3 (Start-up Flare)	42	3	45	46	-1
4 (Emergency Flare)	42	3	45	46	-1
5 (Generator Testing, Day)	42	3	45	53	-8

Rating levels fall at or below background for all scenarios and therefore a low impact is indicated, depending on context.

At +3dB during ship off-loading during the night, an adverse impact is indicated less likely depending on context.

7.2.10 SSR10 – 21 Duke Street

Table 7.10 – SSR10 Impact Assessment

Scenario	Predicted L_{Aeq} (dB)	Rating Penalty	Rating Level L_{Ar} (dB)	Background L_{A90} (dB)	Excess over Background (dB)
1 (Normal Operation)	37	3	40	46	-6
1a (Normal with Ship Day)	37	3	40	53	-13
1b (Normal with Ship Night)	37	3	40	46	-6
2 (Ship Off-loading)	39	3	42	46	-4
3 (Start-up Flare)	37	3	40	46	-6
4 (Emergency Flare)	38	3	41	46	-5
5 (Generator Testing, Day)	37	3	40	53	-13

Rating levels fall below background for all scenarios and therefore a low impact is indicated, depending on context.

7.2.11 SSR11 – Magistrates Court

Absolute levels of 42-45dB $L_{Aeq,1hr}$ daytime are predicted outside the Magistrates Court. Existing daytime background sound levels measured at this location were 51dB $L_{A90,15mins}$ with existing daytime ambient levels at 53-54dB $L_{Aeq,15mins}$.

Although not a residential receptor, BS 4142 would assess this as a low impact depending on context.

With absolute levels well below existing ambient levels, a low impact is indicated at this receptor location.

7.2.12 Designated Quiet Areas

As highlighted in Section 2.3.2 of this report, Talbot Memorial Park and Vivian Park are designated quiet areas in NPT CBC local policy.

Predicted levels to Talbot Memorial Park are in the range 39-42dB $L_{Aeq,1hr}$. Existing daytime background sound levels at Position 9 adjacent to the rear of Talbot Memorial Park were around 53-54dB $L_{A90,15mins}$. Predicted levels to Vivian Park are in the range 32-35dB $L_{Aeq,1hr}$. Existing daytime background sound levels at Position 8 adjacent to Vivian Park entrance were around 41-42dB $L_{A90,15mins}$.

Therefore with predicted levels falling well below existing background sound levels, the development proposal is not indicated to have unacceptable impacts on the designated quiet areas.

7.3 Context

Referring to Section 11 of BS 4142 (quoted in 2.5 of this report), the following section outlines the context:

7.3.1 Absolute Sound Levels

Absolute sound levels from the operations are indicated to fall at or below 45dB L_{Aeq} externally for the majority of scenarios at all receptors, with exception of scenarios/receptors outlined below.

Through a partially open window, this would equate to 30dB (assuming a 15dB loss) which is in line with desirable level inside bedrooms at night quoted in BS 8233:2014, quoted in Section 2.6 of this report.

During the emergency flaring and ship off-loading scenarios, levels of up to 46dB L_{Aeq} are indicated at SSR7 and SSR8. At these levels, through a partially open window, this marginally exceeds the 30dB level however falls in the range between desirable and reasonable inside bedrooms (30-35dB L_{Aeq}) in line with BS 8233:2014.

For the ship pass-by at night, an $L_{Aeq,15min}$ of up to 50dB is predicted at SSR1 (Mariners Point) however these are infrequent (up to 2no two-way trips per week).

Outcome: No modification of impact due to absolute noise sound levels.

7.3.2 Character of Specific Sound Level

BS4142 advises: *"Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound."*

At this stage, it is envisaged that a tonal component to the sound could be just perceptible at the receptors in the existing sound climate (+2dB, however +3dB used in assessments).

Based on sample measurements of the ship off-loading, tonality could be clearly perceptible at receptors around $\leq 600m$ away (+4dB).

This has been accounted for in the character correction in the initial numerical assessment.

Outcome: No modification of impact due to character.

7.3.3 *Character of a Particular Neighbourhood*

The proposed site is located on the Port Talbot Docks adjacent to Tata Steel and Hanson Cement, both of which operate 24/7.

Receptors are therefore located near to a well-established industrial area and have an industrial noise component in their existing sound climate.

Outcome: No modification of impact due to character of neighbourhood.

7.3.4 *Emergency Flaring*

It is not uncommon for higher limits to be permissible during emergency scenarios. The emergency flaring is not a typical part of the operations. It is estimated this event could potentially happen 1 in 10 years.

It is also understood that during this state of emergency, the flare noise levels would likely fall to those in line with the start-up flaring after around 30mins.

Outcome: Modification of impact due to likely occurrence to adverse impact less likely at SSR3.

7.3.5 *Ship Movement*

We understand that only 2no two-way ship movements are indicated to occur per week.

Outcome: Modification of impact at SSR1 due to likely occurrence to adverse impact less likely.

7.3.6 *Ship Off-loading*

It is understood the ship off-load process can take up to 18hrs.

Ship pumps off-loading during the night have the potential to cause an adverse impact at SSR3 and SSR7. It is understood this would occur once every 7-14 days.

It should be noted that the ship pumps are not in control of the applicant and an element of ship activity around a well-established port is to be expected.

Outcome: No modification of impact due – remains an adverse impact at SSR3 and SSR7.

7.4 Uncertainty

7.4.1 Background Sound Levels

All reasonable measures were employed to minimise the uncertainty in measuring and assessing the background sound levels at the nearest Sound Sensitive Receivers:

- Long-term monitoring was carried out at 3 positions representative of SSRs to the west, north and east of the site. Long-term monitoring was carried out over a week-long period in order to capture a range of background sound levels.
- Long-term monitoring was supplemented by daytime and night-time sample measurements at intermediate positions.
- Type 1 / Class 1 sound level meters were used in the noise monitoring. Measurement systems were calibrated before and after the surveys and no variation occurred.
- Meteorological conditions were recorded during the monitoring. Data used in the analysis of background sound levels omitted any adverse weather conditions that occurred during the latter part of the survey.
- Measured background sound levels were statistically analysed in accordance with BS 4142. For a robust assessment the lowest consistent L_{A90} values were selected.

Uncertainty in background sound levels is therefore assessed as low.

7.4.2 Noise Prediction and Impact Assessment

There is a degree of uncertainty in the source noise data used in the modelling as the scheme is not yet fully designed, and the full plant noise data is not currently available. All plant modelled is discussed in Section 6.1 and fully listed in Appendix C.

The following steps have therefore been taken to minimise the uncertainty insofar as is possible:

- Significant sources – Flare, Cooling Towers – noise levels have been confirmed by the project engineering team, Technip Energies (TE).
- Noise measurement of similar ship unloading activities undertaken at representative site and used to calibrate noise model.
- Noise limits for other plant are based on single-figure limits provided by TE, with spectra shapes taken from the Predictor database.

- Noise model follows the procedures of ISO 9613.
- Noise sources have been calibrated to near-field positions in the model to validate the far-field receivers.

The source data input in the model effectively becomes limits for plant for suppliers to quote against at the detailed engineering design stage of the scheme.

8. CONCLUSION

A planning stage noise impact assessment has been carried out for Project DRAGON at Land at Crown Wharf in Port Talbot.

A baseline noise survey was undertaken by Hunter Acoustics Ltd and is detailed in full in report 6387/ENS1_Rev1 dated 15/05/2023.

Nearest sound sensitive receptors have been identified in each direction from the site.

Three-dimensional modelling has been carried out using Predictor v2023 which in turn uses methodology of ISO 9613.

Input data for the model has been provided by the project engineering team (Technip Energies) however at planning stage, it has been necessary to set limits for some items of plant based on information provided. Sample measurements of representative ship activities have also been measured to reduce uncertainty in the modelling.

Overall, noise impact at surrounding receptors identified is considered low to adverse impact less likely when assessed in accordance with BS 4142 with exception of ship off-loading activities where an adverse impact is indicated at SSR3 and SSR7.

APPENDIX A - ACOUSTIC TERMINOLOGY

Human response to noise depends on a number of factors including loudness, frequency content and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'.

The following units have been used in this report:

dB(A)	The sound pressure level A-weighted to correspond with the frequency response of the human ear and therefore a persons' subjective response to frequency content.
L_{eq}	The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period.
L_{max}	The highest instantaneous sound level recorded during the measurement period.
L_{10}	The sound level which is exceeded for 10% of the measurement period. i.e., The level exceeded for 6 minutes of a 1-hour measurement - used as a measure of background noise.
L_{90}	The sound level which is exceeded for 90% of the measurement period. i.e., The level exceeded for 54 minutes of a 1-hour measurement - used as a measure of background noise.
$L_{Ar,Tr}$	The 'rating' level, as described in BS 4142:2014 – the specific noise plus any adjustment for the characteristic features of the noise.
SSR	Sound sensitive receiver

APPENDIX B - DIAGRAMS, GRAPHS AND TABLES

Figure B.1 – Site Plan Showing Monitoring Locations and Sound Sensitive Receptors

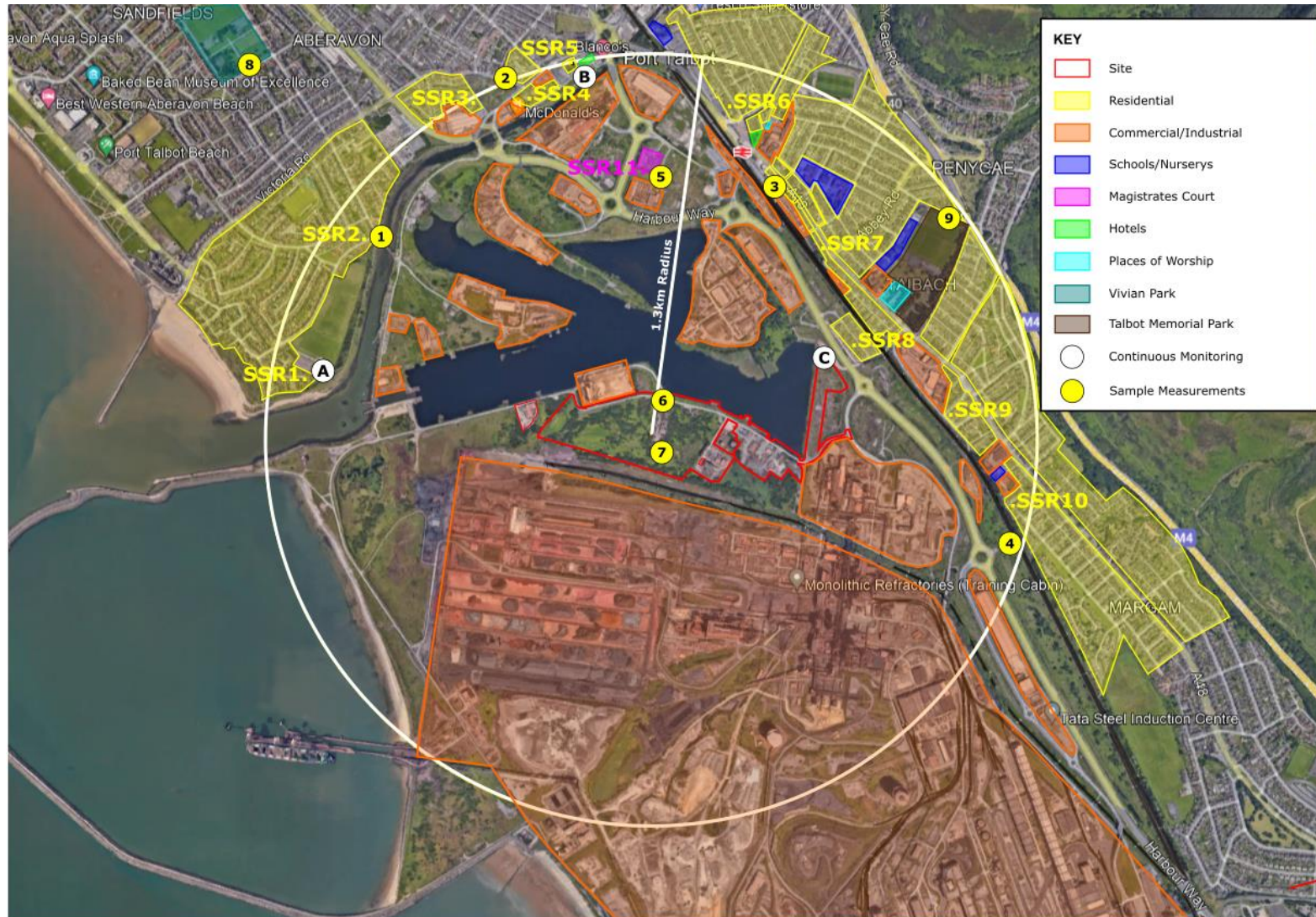


Table B.1 – Source Sample Measurement Results including Octave Band Spectra

Pos	Description	Duration (secs)	Distance (m)	Height (m)	L_{Aeq} (dB)	$L_{Amax,F}$ (dB)	L_{eq} at Octave Band Centre Frequencies (dB)							
							63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
1	20m from side rear, engine running	15	20	1.5	67.2	68.4	87.1	73.3	69.7	65.3	59.5	53.5	46.9	37.7
-	30m from rear of ship, engine running	20	30	1.5	65.6	66.6	81.0	70.4	66.4	64.6	59.4	54.8	47.7	38.5
3	40m from rear of ship, engine running	32	40	1.5	65.1	67.1	79.7	72.0	65.9	63.7	59.5	54.1	47.1	37.0
4	90m from rear of ship, engine running	30	90	1.5	59.8	61.1	75.6	67.3	60.8	58.6	53.7	46.9	38.5	28.4
1	20m from ship, engine dropped	10	20	1.5	61.4	63.4	80.0	71.2	65.3	58.4	53.3	49.2	42.8	32.4
1	20m from ship, engine off, generators only	22	20	1.5	56.9	63.1	66.7	66.8	61.0	54.0	49.3	45.4	40.4	28.6
-	9m from side of ship, approx. 16m to pumps	31	16	1.5	67.3	69.1	73.4	71.2	69.7	63.2	59.6	60.9	53.0	47.5
3	35m from rear of ship, provides screening to pumps	33	35	1.5	61.5	62.9	66.2	65.7	62.8	61.1	56.1	49.9	40.9	31.4
4	94m from rear of ship	31	94	1.5	54.8	56.5	59.3	60.6	55.6	52.6	50.1	44.5	34.6	26.6

-	125m from rear of ship	30	125	1.5	54.4	55.7	63.2	65.5	55.3	53.3	48.1	43.2	32.5	24.5
-	24m from side of ship, 3x pumps running	33	24	1.5	62.5	63.9	72.5	74.0	62.4	61.3	54.7	52.5	44.7	36.3
-	8m from side of ship, 15m to pumps	12	15	3	68.7	69.7	75.4	75.4	68.6	66.2	63.5	60.7	51.9	46.6
7	Mountbatten Centre, pumps audible	73	~600	1.5	34.7	37.3	51.6	44.8	34.9	32.1	26.9	23.2	16.6	16.4
6	3 Boringdon Terrace, pumps clearly audible, tonal	43	~330	1.5	47.3	50	53.4	53.4	43.8	47.6	40.7	38.3	27.0	17.4
6	4 Boringdon Terrace, pumps clearly audible, tonal	18	~330	1.5	47.6	49.5	53.2	51.4	44.5	47.9	41.2	39.4	26.4	16.5
5	South West Coast Path, from rear of ship, pumps audible, tonal	38	560	1.5	42.5	44.9	52.5	50.4	42.3	43.8	35.0	28.8	20.2	16.4
5	South West Coast Path, from rear of ship, pumps audible, tonal	31	560	1.5	41.9	43.9	53.5	52.1	40.0	43.2	34.1	27.8	18.4	16.2

APPENDIX C - NOISE MODELLING

C.1 Noise Model Input Data

Table C.1 – Mobile Plant Sound Power Noise Data Used in Model

Plant Item / Activity	Height (m)	L_{WA} at Octave Band Centre Frequencies, Hz (dB)								L_{WA} (dB)
		63	125	250	500	1000	2000	4000	8000	
HGV on site (<20km/h)	1	79	88	92	97	100	98	91	94	104
Ship	5	97	98	99	103	101	95	87	74	107
LGV/cars on site (<20km/h)	0.75	69	76	78	81	84	84	78	71	89

Table C.2 – Fixed Plant Sound Power Noise Data Used in Model

Plant Item / Activity	Max Height (m)	L_{WA} at Octave Band Centre Frequencies, Hz (dB)								L_{WA} (dB)
		63	125	250	500	1000	2000	4000	8000	
Heat Exchanger HE-1351	10.5	66	82	83	88	80	78	74	68	91
Heat Exchanger HE-1451	6.5	66	82	83	88	80	78	74	68	91
Heat Exchanger HE-1511	10.5	66	82	83	88	80	78	74	68	91
Heat Exchanger HE-2401	7.5	66	82	83	88	80	78	74	68	91
Heat Exchanger HE-2601	5.25	66	82	83	88	80	78	74	68	91
Heat Exchanger HE-2200	18.5	72	80	90	93	87	85	77	62	96
Heat Exchanger HE-2403	18.5	72	80	90	93	87	85	77	62	96
Heat Exchanger HE-2650	18.5	72	80	90	93	87	85	77	62	96
Heat Exchanger HE-2750	6.5	67	75	85	88	82	80	72	57	91
Heat Exchanger HE-2760	6.5	67	75	85	88	82	80	72	57	91
HE-1102	10.25	92	98	92	91	80	77	73	69	91
HE-1251	31.8	61	67	70	74	73	72	66	68	79
HE-1331	9.5	61	67	70	74	73	72	66	68	79

HE-1333	13.5	61	67	70	74	73	72	66	68	79
Pump P-1112A/B	25	64	79	85	88	89	86	82	78	94
Pump P-1120A/B	2.5	59	74	80	83	84	81	77	73	89
Pump P-1132A/B	2.5	64	79	85	88	89	86	82	78	94
Pump P-1362A/B	16	59	74	80	83	84	81	77	73	89
Pump P-1453A/B	1	64	79	85	88	89	86	82	78	94
Pump P-1462A/B	12	59	74	80	83	84	81	77	73	89
Pump P-1522A/B	25	59	74	80	83	84	81	77	73	89
Pump P-1532A/B	12	64	79	85	88	89	86	82	78	94
Pump P-1540A/B	4	59	74	80	83	84	81	77	73	89
Pump P-1612A/B	25	59	74	80	83	84	81	77	73	89
Pump P-1652A/B	0.5	59	74	80	83	84	81	77	73	89
Pump P-1811A/B	1	59	74	80	83	84	81	77	73	89
Pump P-1821A/B	2.5	64	79	85	88	89	86	82	78	94
Pump P-2120A/B	1	64	79	85	88	89	86	82	78	94
Pumps P-2211A/B	1	64	79	85	88	89	86	82	78	94
Pumps P-2302A/B	1	64	79	85	88	89	86	82	78	94
Pumps P-2340A/B	1	64	79	85	88	89	86	82	78	94
Pump P-2402A/B	2.5	64	79	85	88	89	86	82	78	94
Pump P-2421A/B	4	59	74	80	83	84	81	77	73	89
Pump P-2453A/B	1	64	79	85	88	89	86	82	78	94
Pump P-2481A/B	1	64	79	85	88	89	86	82	78	94
Pump P-2490A/B	1	59	74	80	83	84	81	77	73	89
Pump P-2602A/B	1	64	79	85	88	89	86	82	78	94
Pump P-2603	1	59	74	80	83	84	81	77	73	89
Pump P-2662A/B	4	59	74	80	83	84	81	77	73	89
Pump P-2672A/B	1	64	79	85	88	89	86	82	78	94
Pump P-2711A/B	8	59	74	80	83	84	81	77	73	89

Pump P-4251A/B	3	59	74	80	83	84	81	77	73	89
Pump P-4540A/B/C	3	64	79	85	88	89	86	82	78	94
Pump P-4601A/B/C	3	64	79	85	88	89	86	82	78	94
Pump P-4610A/B	3	64	79	85	88	89	86	82	78	94
Pump P-4710A/B/C/D	3	85	94	90	85	81	80	78	73	97
Pump P-4740A/B	3	64	79	85	88	89	86	82	78	94
Pump P-5011A/B	3	64	79	85	88	89	86	82	78	94
Pump P-5030A/B	3	64	79	85	88	89	86	82	78	94
Pump P-5030A/B	3	64	79	85	88	89	86	82	78	94
Pump P-5040A/B	3	64	79	85	88	89	86	82	78	94
Pump P-5460A/B	3	64	79	85	88	89	86	82	78	94
Pump P-5510A/B	3	64	79	85	88	89	86	82	78	94
Pump P-5671A/B	3	64	79	85	88	89	86	82	78	94
Pump P-5810A/B	3	59	74	80	83	84	81	77	73	89
Pump P-6020A/B	3	64	79	85	88	89	86	82	78	94
Pump P-6110A/B	3	64	79	85	88	89	86	82	78	94
Pump P-6170A/B	3	59	74	80	83	84	81	77	73	89
Pump P-6420A/B	3	64	79	85	88	89	86	82	78	94
Pump P-6480A/B	3	64	79	85	88	89	86	82	78	94
Pump P-6450A/B	3	64	79	85	88	89	86	82	78	94
Pump P-6601A/B	3	64	79	85	88	89	86	82	78	94
Pump P-6911A/B	3	64	79	85	88	89	86	82	78	94
Pump P-7001A/B	3	64	79	85	88	89	86	82	78	94
Pump P-7151A/B	3	64	79	85	88	89	86	82	78	94
Pump P-7951A/B	3	64	79	85	88	89	86	82	78	94

Vacuum Pump Package Z-2680	12	64	79	85	88	89	86	82	78	94
Spent Caustic Neutralisation Package Z-5660	3	64	79	85	88	89	86	82	78	94
Air Compressor Package Z-3500	4	79	84	86	88	88	85	79	72	94
Z-3520	8.5	72	80	90	93	87	85	77	62	96
Z-7301	6	71	77	80	84	83	82	76	78	89
Z-6950	1	59	74	80	83	84	81	77	73	89
Z-7320	1	64	79	85	88	89	86	82	78	94
Z-7710	1	67	79	85	88	89	86	82	78	94
Z-6421	1	64	79	85	88	89	86	82	78	94
Z-6451	1	64	79	85	88	89	86	82	78	94
Z-5461	1	64	79	85	88	89	86	82	78	94
Z-1650	1	72	80	90	93	87	85	77	62	96
Z-1470	1	64	79	85	88	89	86	82	78	94
Z-1150	1	64	79	85	88	89	86	82	78	94
Z-1200	1	64	79	85	88	89	86	82	78	94
Z-4500	1	64	79	85	88	89	86	82	78	94
Z-5020	16	76	82	85	89	88	87	81	83	94
Liquid Nitrogen Package Z-3750	12	79	84	86	88	88	85	79	72	94
Hydrogen Generation Package a Z-4300	6	79	84	86	88	88	85	79	72	94
Hydrogen Generation Package b Z-4300	6	79	84	86	88	88	85	79	72	94
Hydrogen Generation Package c Z-4300	6	79	84	86	88	88	85	79	72	94
Treatment Package Z-4510	4	64	79	85	88	89	86	82	78	94
Cooling Tower Z-4700 - Outlet x3	10.1	81	89	91	91	93	92	90	87	99
Cooling Tower Z-4700 – Casing x3	10	85	88	84	80	76	70	74	55	91
Cooling Tower Z-4700 – Inlet	6.5	76	85	88	95	99	101	102	100	107
Package Z-4760	3	60	69	67	73	78	75	69	58	81

Package Z-5000	1	64	79	85	88	89	86	82	78	94
Dosing System Z-5050	1	59	74	80	83	84	81	77	73	89
HP Boiler 1 NF (Z-5100)	4.4	60	75	81	85	91	97	94	85	100
HP Boiler 1 SF (Z-5100)	4.4	60	75	81	85	91	97	94	85	100
HP Boiler 1 WF (Z-5100)	4.4	60	75	81	85	91	97	94	85	100
HP Boiler 1 EF (Z-5100)	4.4	60	75	81	85	91	97	94	85	100
Boiler Package Z-5100 Stack 1	23	53	68	74	78	84	90	87	78	93
HP Boiler 2 NF (Z-5100)	4.4	60	75	81	85	91	97	94	85	100
HP Boiler 2 SF (Z-5100)	4.4	60	75	81	85	91	97	94	85	100
HP Boiler 2 WF (Z-5100)	4.4	60	75	81	85	91	97	94	85	100
HP Boiler 2 EF (Z-5100)	4.4	60	75	81	85	91	97	94	85	100
Boiler Package Z-5100 Stack 2	23	53	68	74	78	84	90	87	78	93
MP Electric Boiler NF (Z-5200)	4.4	82	87	86	84	87	92	89	82	96
MP Electric Boiler SF (Z-5200)	4.4	82	87	86	84	87	92	89	82	96
MP Electric Boiler WF (Z-5200)	4.4	82	87	86	84	87	92	89	82	96
MP Electric Boiler EF (Z-5200)	4.4	82	87	86	84	87	92	89	82	96
DS-5210	1	76	82	85	89	88	87	81	83	94
DS-5300	1	76	82	85	89	88	87	81	83	94
Package Z-7450	4	79	84	86	88	88	85	79	72	94
Ground Package Z-7460 Flare Burners 238m ² area (emergency)	2	89	96	104	113	110	110	111	117	120
Ground Package Z-7460 Flare Top 238m ² area (emergency)	20	84	90	99	107	105	104	106	111	115
Emergency Diesel Gen1 (A15)	4	83	90	102	101	103	100	91	80	108
Emergency Diesel Gen2 (A17)	4	83	90	102	101	103	100	91	80	108
Emergency Diesel Gen3 (A18)	4	83	90	102	101	103	100	91	80	108

Compressor Enclosure R (J-2280)	6.1	76	81	83	85	85	82	76	69	91
Compressor Enclosure N (J-2280)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure W (J-2280)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure S (J-2280)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure E (J-2280)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure R (J-2250)	6.1	76	81	83	85	85	82	76	69	91
Compressor Enclosure N (J-2250)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure W (J-2250)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure S (J-2250)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure E (J-2250)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure R (J-1400)	6.1	76	81	83	85	85	82	76	69	91
Compressor Enclosure N (J-1400)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure W (J-1400)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure S (J-1400)	6.0	78	83	85	87	87	84	78	71	93
Compressor Enclosure E (J-1400)	6.0	78	83	85	87	87	84	78	71	93
Propane Refrigeration Compressor a R (Z-3000)	6.1	70	75	77	79	79	76	70	63	85
Propane Refrigeration Compressor a N (Z-3000)	6.0	72	77	79	81	81	78	72	65	87
Propane Refrigeration Compressor a E (Z-3000)	6.0	76	81	83	85	85	82	76	69	91
Propane Refrigeration Compressor a S (Z-3000)	6.0	72	77	79	81	81	78	72	65	87
Propane Refrigeration Compressor a W (Z-3000)	6.0	76	81	83	85	85	82	76	69	91
Propane Refrigeration Compressor b R (Z-3000)	6.1	70	75	77	79	79	76	70	63	85
Propane Refrigeration Compressor b N (Z-3000)	6.0	72	77	79	81	81	78	72	65	87
Propane Refrigeration Compressor b E (Z-3000)	6.0	76	81	83	85	85	82	76	69	91

Propane Refrigeration Compressor b S (Z-3000)	6.0	72	77	79	81	81	78	72	65	87
Propane Refrigeration Compressor b W (Z-3000)	6.0	76	81	83	85	85	82	76	69	91
xShip pumps (x6, levels per pump)	5	74	89	95	98	99	96	92	88	104

C.2 Noise Model Scenarios

Table C.3 – Daytime Modelled Scenarios (Worst Case 1hr period)

No	Details	All General Plant	Ground Flare	Diesel Generators	Ship Movement	HGVs	LGVs / Cars
1	Normal Operation (no ship movement)	On 100% (1no HP boiler)	Off	Off	No	4no, 20km/h on site	52no, 20km/h on site
1a	Normal Operation (with ship movement)	On 100% (1no HP boiler)	Off	Off	1no, 7km/h	4no, 20km/h on site	52no, 20km/h on site
2	Normal Operation (ship off-loading to site)	On 100% (1no HP boiler)	Off	Off	No, but 6no pumps on ship running at jetty	4no, 20km/h on site	52no, 20km/h on site
3	Start-up Flaring	On 100% (2no HP boilers)	Start-up Duty	Off	No	4no, 20km/h on site	52no, 20km/h on site
4	Emergency	On 100% (1no HP boiler)	Emergency Duty	Off	No	4no, 20km/h on site	52no, 20km/h on site
5	Back-up Generator Testing	On 100% (1no HP boiler)	Off	On 50% (30min test)	No	4no, 20km/h on site	52no, 20km/h on site

Table C.4 – Night-time Modelled Scenario (Worst Case 15min Period)

No	Details	All General Plant	Ground Flare	Diesel Generators	Ship Movement	HGVs	LGVs / Cars
1	Normal Operation (no ship movement)	On 100%	Off (1no HP boiler)	Off	No	1no, 20km/h on site	13no, 20km/h on site
1b	Normal Operation (with ship movement)	On 100%	Off (1no HP boiler)	Off	1no, 7km/h	1no, 20km/h on site	13no, 20km/h on site
2	Normal Operation (ship off-loading to site)	On 100%	Off (1no HP boiler)	Off	No, but 6no pumps on ship running at jetty	1no, 20km/h on site	13no, 20km/h on site
3	Start-up Flaring	On 100%	Start-up Duty (2no HP boilers)	Off	No	1no, 20km/h on site	13no, 20km/h on site
4	Emergency	On 100%	Emergency Duty (1no HP boiler)	Off	No	1no, 20km/h on site	13no, 20km/h on site

Note: Scenarios 1, 2, 3 & 4 are effectively the same for daytime and night-time as plant runs continuously and the expected vehicle movements over the daytime one-hour assessment period are divided by 4 for the night-time 15minute assessment period which is considered reasonable.

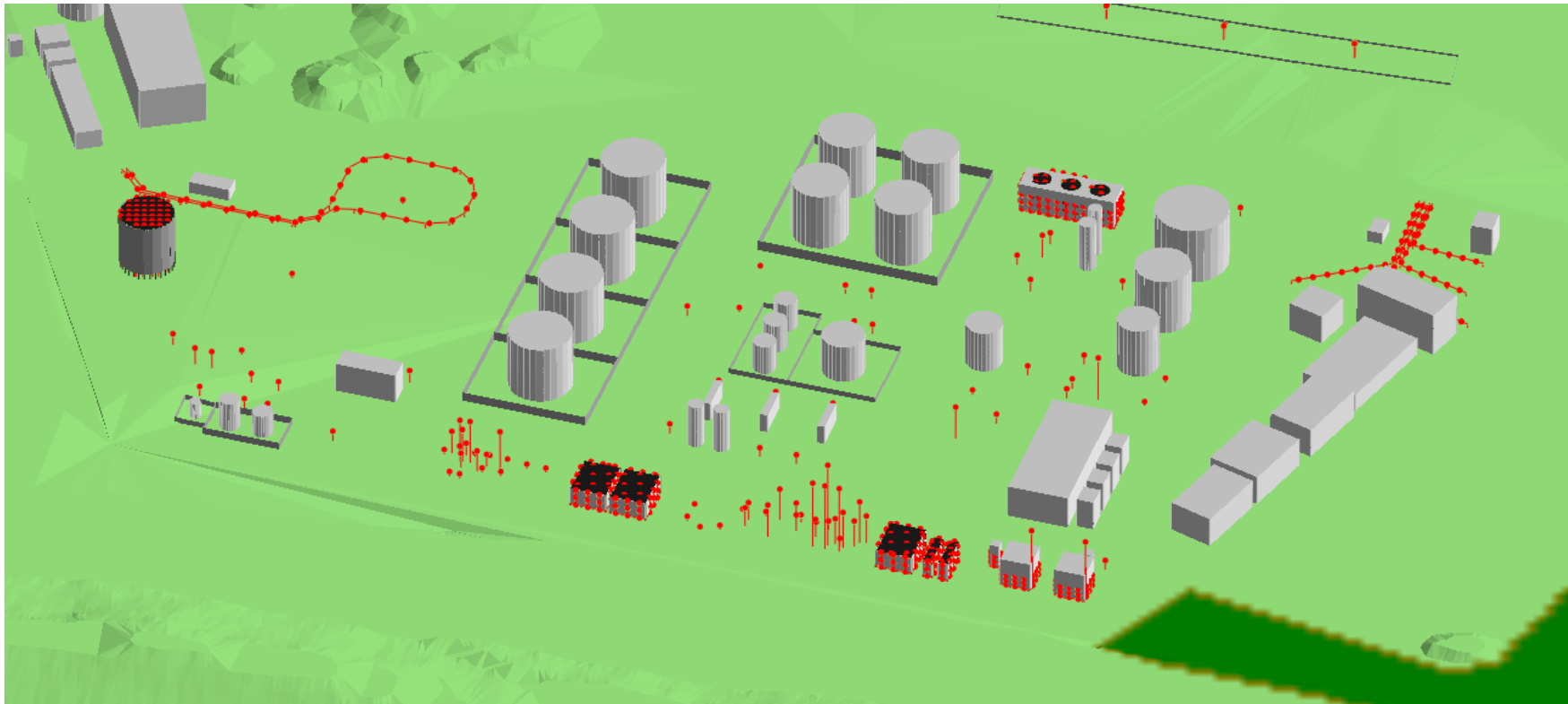
As the modelling software references a one-hour assessment period, the model input includes for 4no ship movements over an hour to equate to the 1no potential ship movement in a 15minute period shown in the scenario table above. For reference, only 2no two-way ship movements are anticipated per week.

C.3 Noise Model 3D Views

Figure C.1 – 3D Model of Proposed Site and Surrounding Area



Figure C.2 – 3D Model of Proposed Site



C.4 Noise Model Contour Plots

Figure C.3 – Scenario 1 Daytime/Night-time Noise Model $L_{Aeq,1hr}$ / $L_{Aeq,15mins}$ Contours at 4.5m Height (Typical Operation)

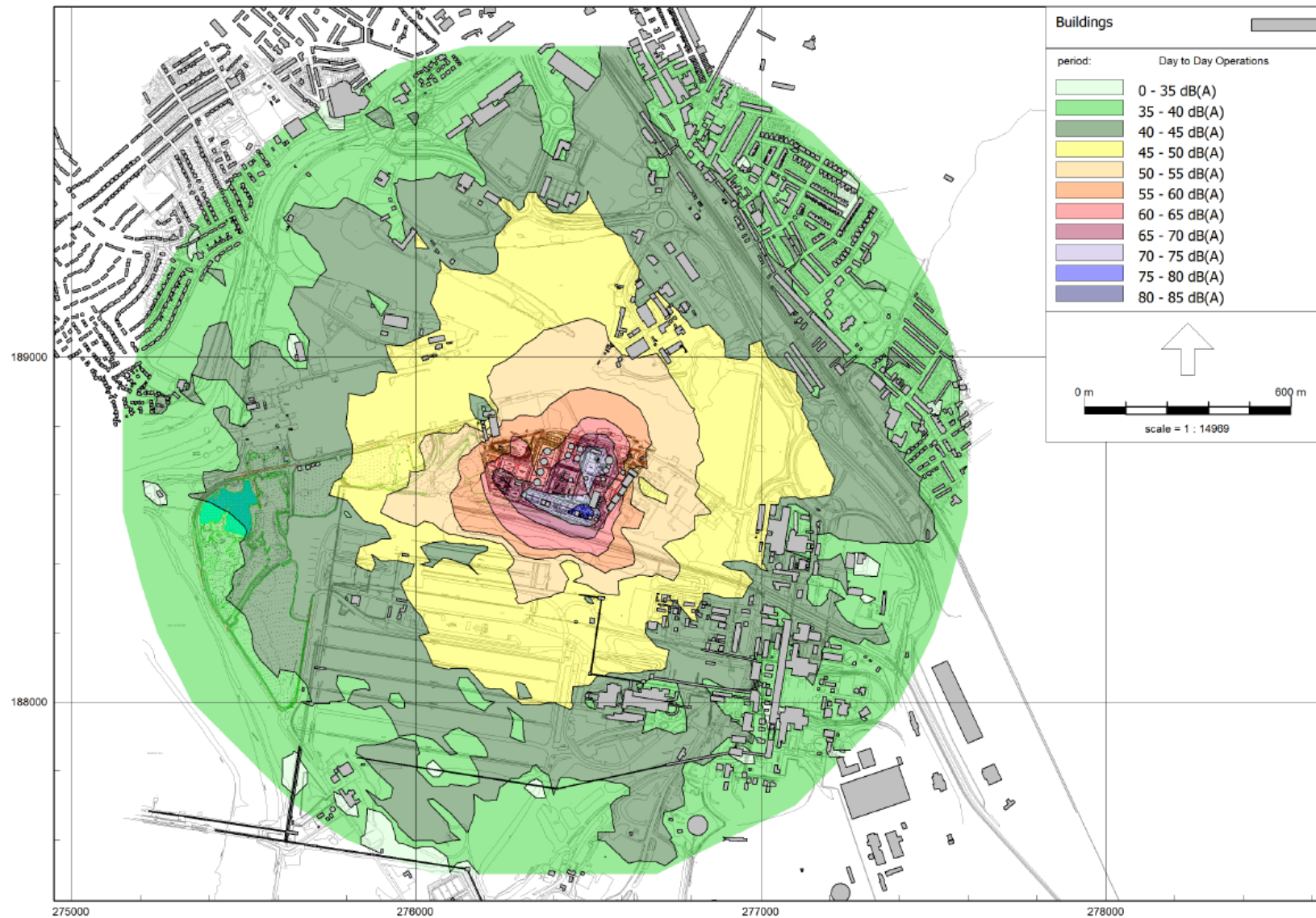


Figure C.4 – Scenario 1a Daytime Noise Model $L_{Aeq,1hr}$ Contours at 4.5m Height (with Ship Movement)

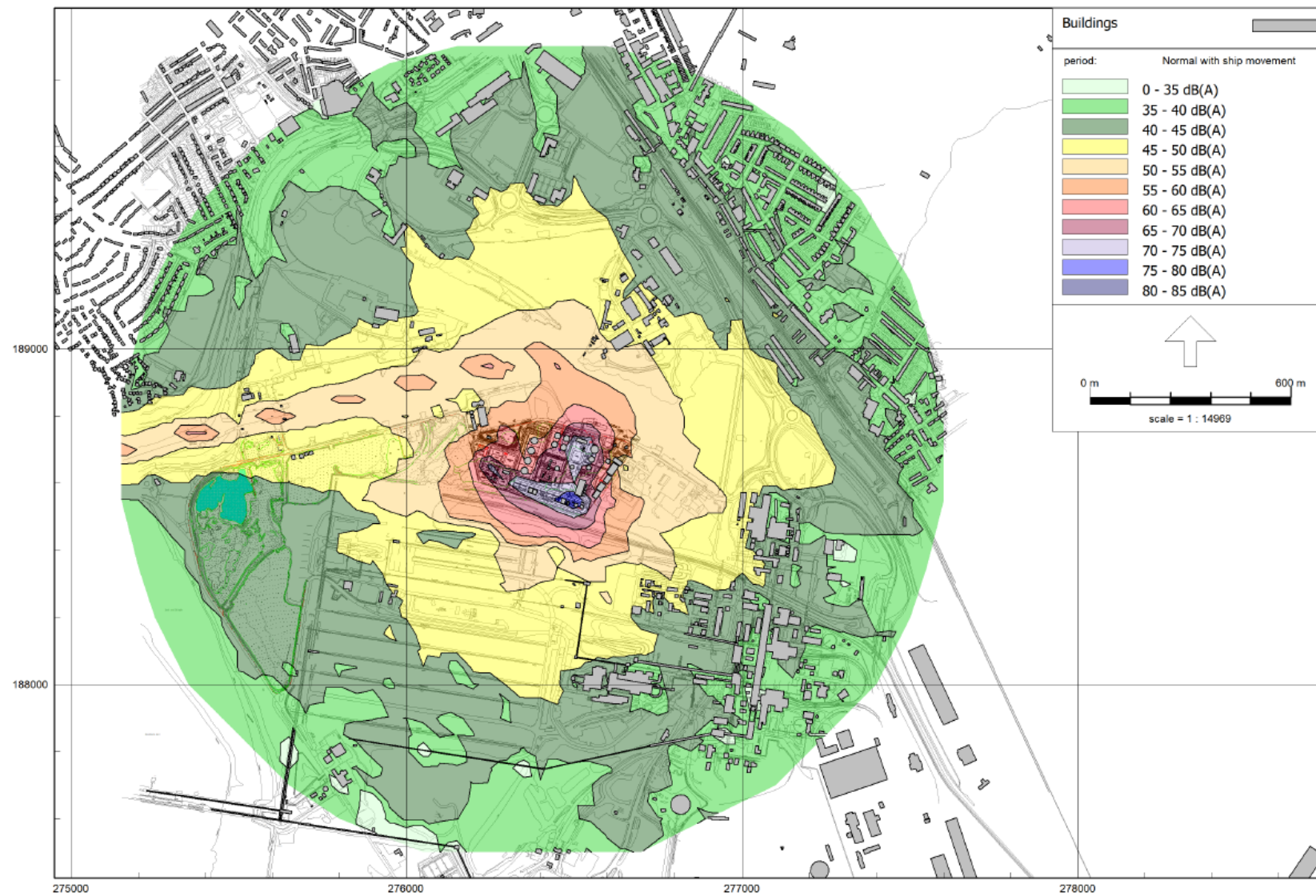


Figure C.5 – Scenario 2 Daytime/Night-time Noise Model $L_{Aeq,1hr}$ / $L_{Aeq,15mins}$ Contours at 4.5m Height (Ship Off-loading to Site)

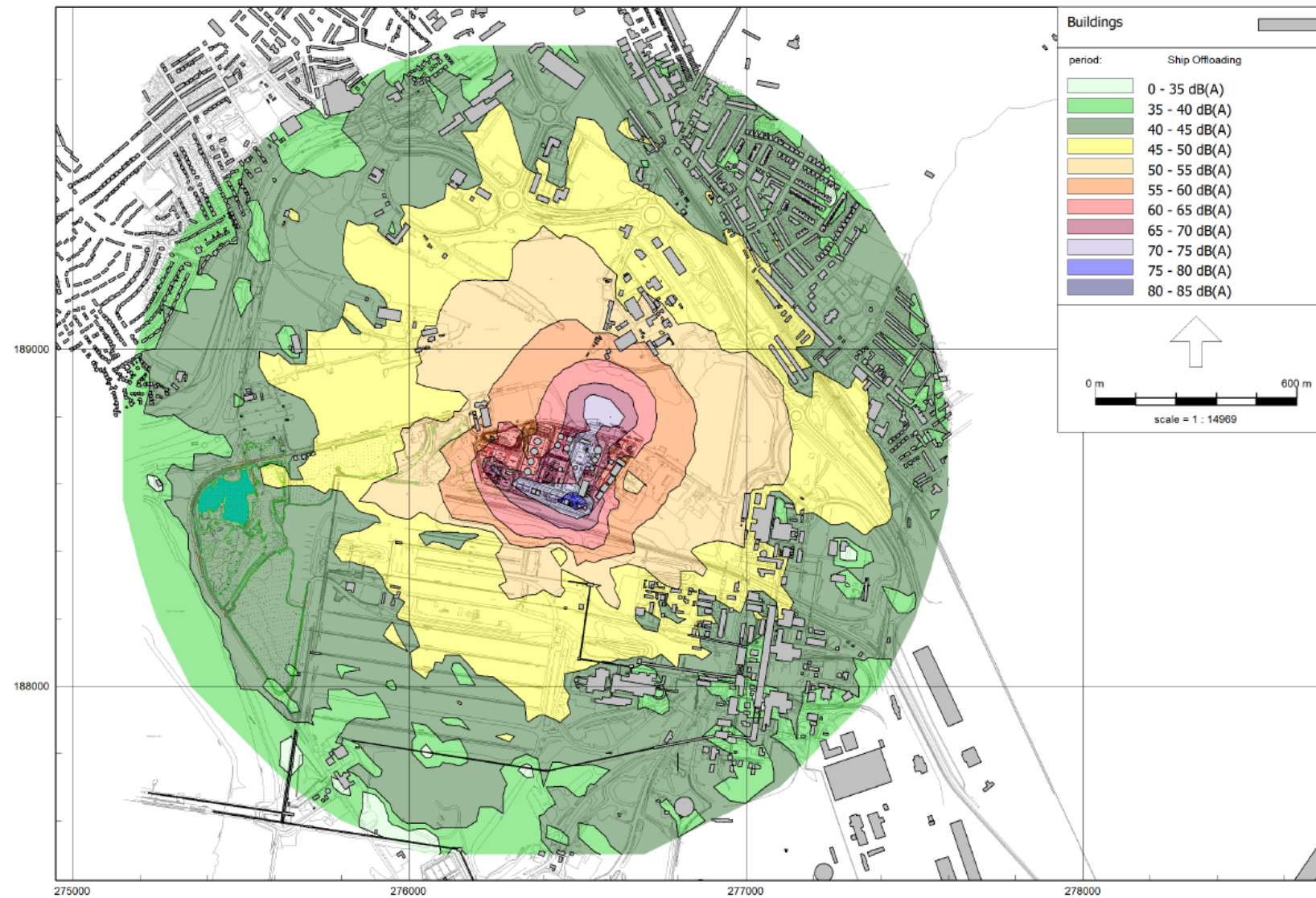


Figure C.6 – Scenario 3 Daytime/Night-time Noise Model $L_{Aeq,1hr}$ / $L_{Aeq,15mins}$ Contours at 4.5m Height (Start-up Flaring)

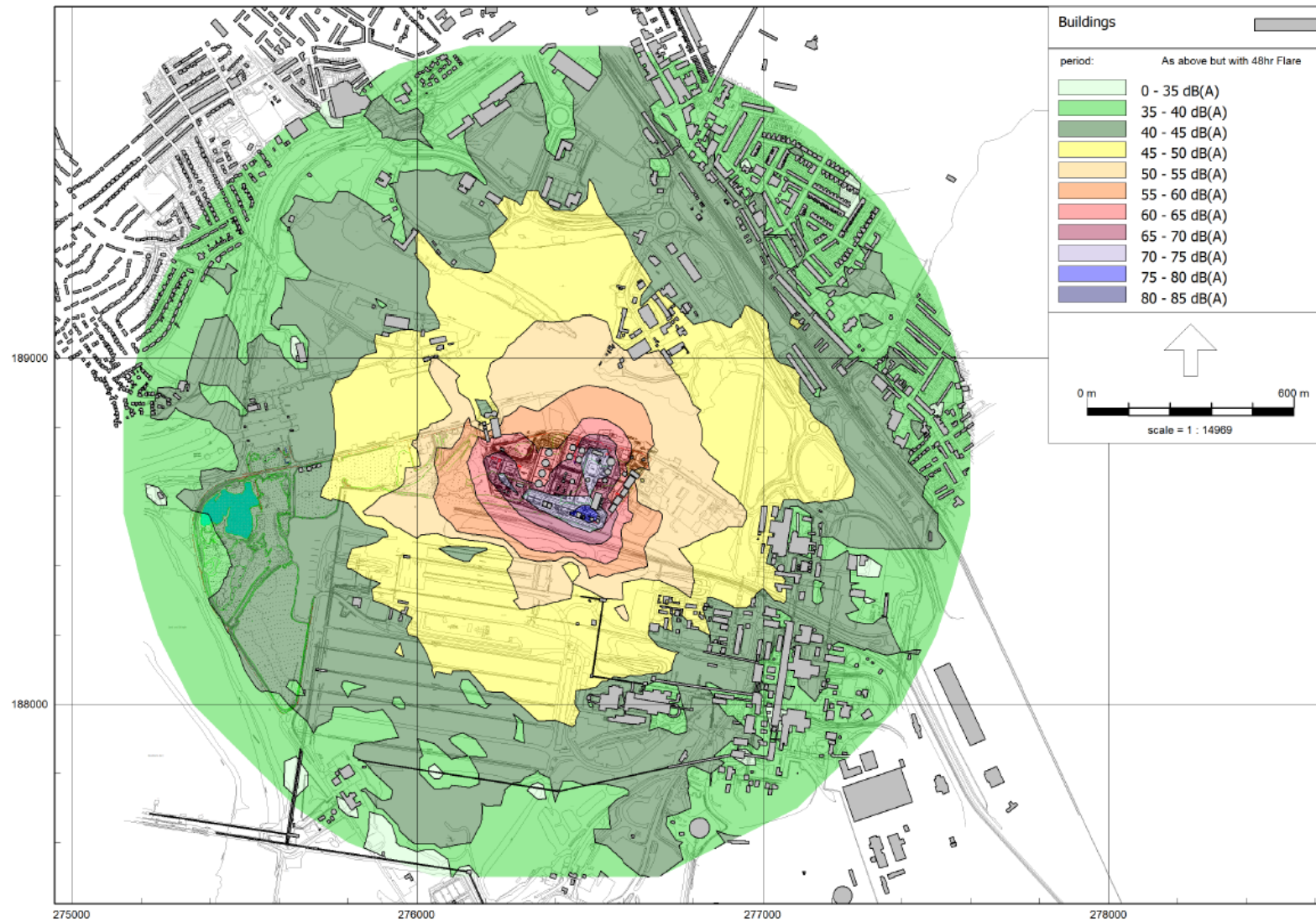


Figure C.7 – Scenario 4 Daytime/Night-time Noise Model $L_{Aeq,1hr}$ / $L_{Aeq,15mins}$ Contours at 4.5m Height (Emergency Flaring)

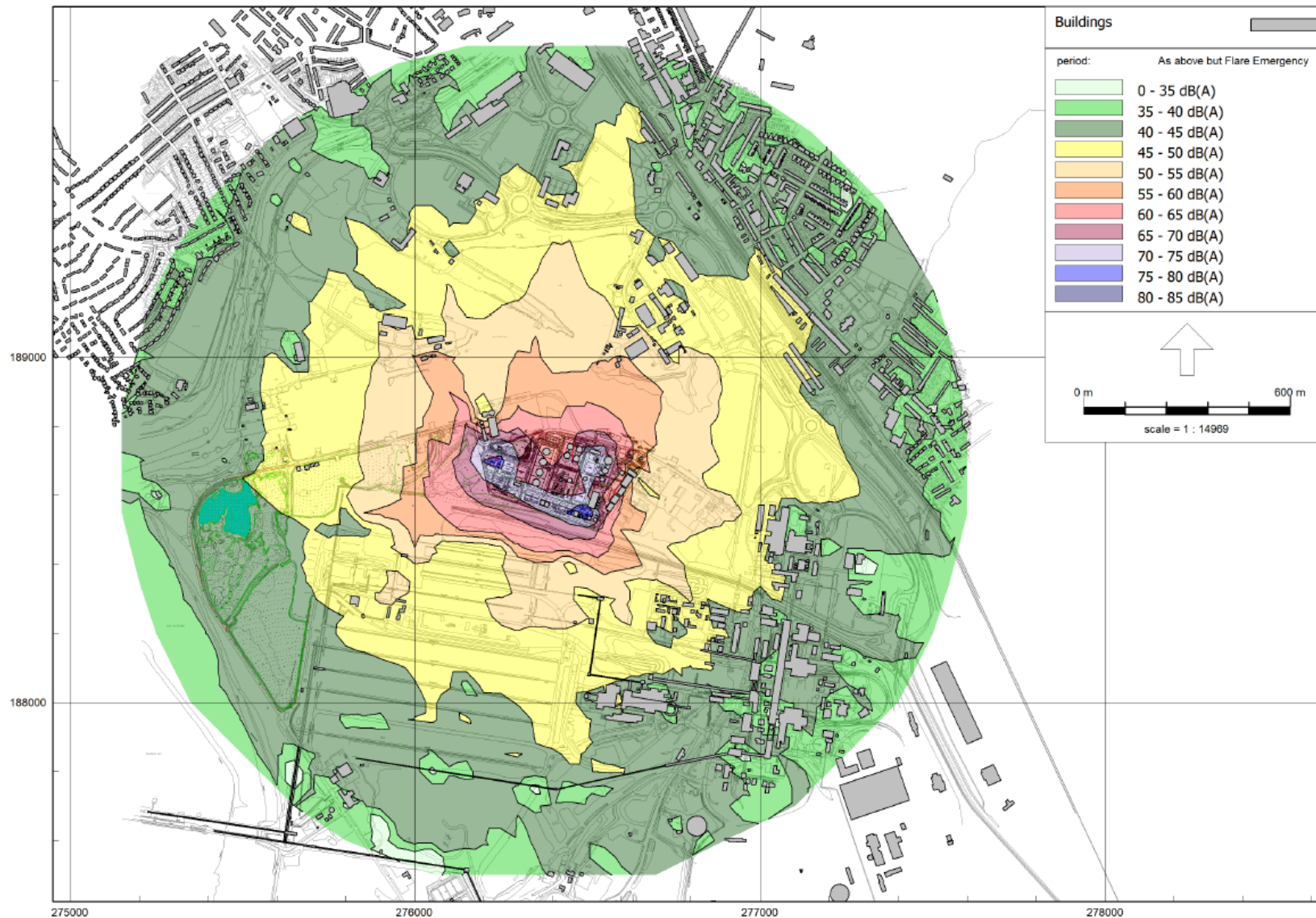


Figure C.8 – Scenario 5 Daytime Noise Model $L_{Aeq,1hr} / L_{Aeq,15mins}$ Contours at 4.5m Height (Back-up Generator Testing)

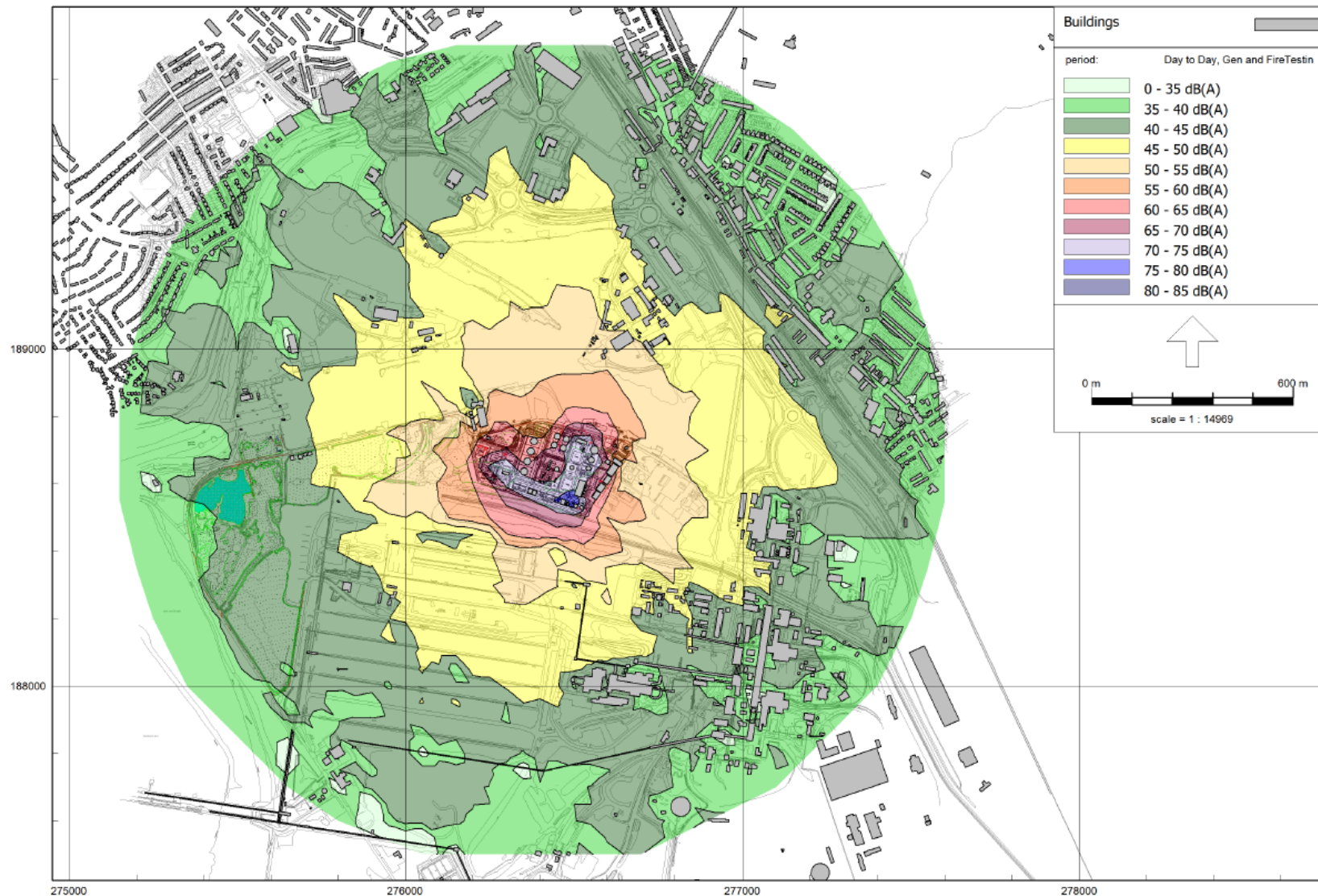
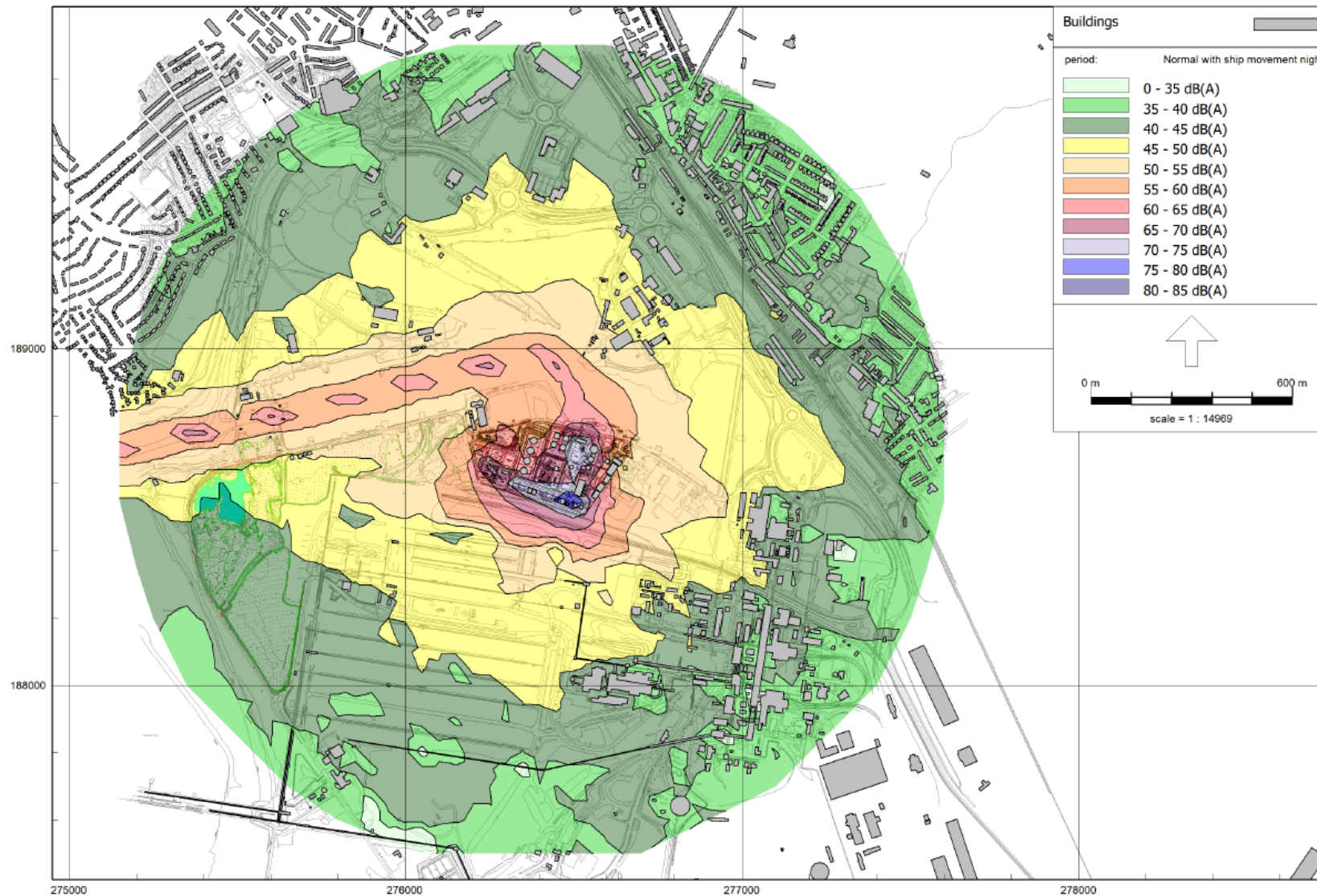


Figure C.9 – Scenario 1b Night-time Noise Model $L_{Aeq,15min}$ Contours at 4.5m Height (with Ship Movement)



APPENDIX D - DRAWING LISTS

The following drawings and documents have been used in our assessment;

Table D.1 – Technip Energies Drawing & Documents List

Drawing Title	Drawing Number	Rev	Date
Noise Source Schedule & Report	202947C-050-NM-6000-00001	1	11/10/2023
ATJ Unit Plot Plan (Process Area)	202947C-050-DW-0051-00001	2	11/05/2023

Table D.2 – Inspire Architects Drawing List

Drawing Title	Drawing Number	Rev	Date
Proposed PDZ Layout & Equipment List	2143.01-IA-ZZ-ST-DR-A-0215	P13	13/10/2023