

Ref **5164**

For **FM Conway**
c/o PDE Consulting Limited
6 Forbes Business Centre
Kempson Way
Bury St Edmunds
Suffolk
IP32 7AR

Imperial Wharf, Gravesend
Two Additional Bitumen Storage Tanks, Emulsion Plant, Load Out
Gantry and Alternative Car Parking
BS 4142 Noise Assessment

Date 30 May 2022

Author Dr Robert Storey

The Author

Robert Storey BEng PhD MIOA (Senior Consultant) obtained his degree in Mining Engineering from the University of Leeds in 1993 before going on to complete a PhD in “The Acoustic Response of Structures to Blast Induced Ground Vibration” in 1998. He joined WBM in 2007 after working in acoustic consultancy and environmental health since 1999. Robert is involved mainly in environmental noise, working on mineral extraction, waste and industrial projects, including surveys, routine noise monitoring and assessments. He is experienced in noise modelling using SoundPLAN for transportation, industrial and environmental sources.

WBM

WBM (the trading name of Walker Beak Mason Limited) is an established independent acoustic consultancy specialising in architectural & building acoustics, environmental noise, planning issues and expert work. WBM is a member of the Association of Noise Consultants and is also a Corporate Member of the Institute of Environmental Management & Assessment. The consultants are members of the Institute of Acoustics.

This report has been prepared with all reasonable skill, care and diligence as appropriate for an acoustic consultancy practice under the terms and brief agreed with our Client. The document is the copyright of WBM and no third party may rely upon this document without the prior and express written agreement of WBM.

Document Control

Revision	Description	Date	Prepared by	Checked by
-	Draft	28/04/2022	R Storey	S Large
1	2 nd Draft	12/05/2022	R Storey	S Large
2	Final	30/05/2022	R Storey	S Large

Contents

The Author.....	2
WBM.....	2
1 Introduction	5
2 Gravesham Borough Council.....	6
3 British Standard 4142: 2014+A1:2019	6
4 Description of Site and Noise Climate.....	8
5 Noise Surveys and Background Sound Levels (January and May 2022).....	10
6 Calculation of Site Noise Levels	12
7 Calculated Site Noise Levels in the Context of the Existing Noise Environment	13
8 BS 4142: 2014+A1:2019 Assessment	15
8.1 (a) Statement of Qualifications	15
8.2 (b) Source Being Assessed.....	15
8.3 (c) Subjective Impressions	16
8.4 (d) The Existing Context and Sensitivity of Receptor	16
8.5 (e) Measurement Locations and Justification	17
8.6 (f) Sound Measuring Systems, Including Calibrator / Pistonphone	17
8.7 (g) Operational Test.....	18
8.8 (h) Weather Conditions	18
8.9 (i) Date(s) and Time(s) of Measurements.....	19
8.10 (j) Measurement Time Intervals	19
8.11 (k) Reference Time Interval(s)	19
8.12 (l) Specific Sound Level.....	19
8.13 (m) Background Sound Level(s).....	22
8.14 (n) Rating Level(s).....	22
8.15 (o) Excess of the rating level(s) over background sound level(s)	23
8.16 (p) Conclusions of the assessment after taking context into account	24
8.17 (q) The potential impact of uncertainty	26
9 Summary and Conclusions	27
Appendix A – Glossary of Acoustic Terms	30
Appendix B – Plans Showing Existing/Proposed Site Layouts and Survey Locations	32
Appendix C – Instrumentation and Calibration Details	33
Appendix D – Noise Survey Data (Daytime Attended Samples)	35

Appendix E – Noise Survey Data (Night-time Attended Samples).....	36
Appendix F – SoundPLAN Noise Mapping Assumptions	37
Appendix G – SoundPLAN Noise Maps	38

Gravesham Borough Council

1 Introduction

FM Conway operate a site which comprises bitumen storage tanks and ancillary equipment including activated carbon filter unit and mixing plant at Imperial Wharf in Gravesend. This site is currently operated under a planning permission granted by Gravesham Borough Council dated 29 June 2018 (Application: 20160800).

The operator proposes the construction and use of two additional bitumen storage tanks, an emulsion plant, load out gantry and alternative car parking. The emulsion plant is located to the east of the Technology Centre, contained within the matrix of the already built development, with the load out gantry located to the west of The White House on Clifton Marine Parade. The two additional bitumen tanks will be located to the south of the existing facility land this is currently used as a car park.

This report sets out the calculated noise levels arising from the operation of the existing and proposed facilities, for use in a BS 4142:2014+A1:2019 assessment for the nearest dwellings to the site.

The calculated noise levels are compared with representative background sound levels at the nearest dwellings. These have been determined from attended noise surveys in January and May 2022.

This comparison of the calculated noise levels arising from the operation of the expanded facility with the background sound levels established in January and May 2022 forms the basis for the BS 4142:2014+A1:2019 assessment method for the nearest dwellings to the site.

To aid comprehension, a glossary of acoustic terms is presented in Appendix A.

A site plan showing the current and proposed site layouts and the survey/assessment locations used is presented in Appendix B.

The details of the noise surveys and the instrumentation used are presented in Appendix C.

The results of the attended daytime noise surveys are presented in Appendix D.

The results of the attended night-time noise surveys are presented in Appendix E.

The assumptions included in the creation of the SoundPLAN noise model for the calculations are in detailed Appendix F.

SoundPLAN noise calculation plots for the existing and proposed layouts are presented in Appendix G.

2 Gravesham Borough Council

The site is currently operated under a planning permission granted by Gravesham Borough Council dated 29 June 2018 (Application: 20160800), which includes the following condition relating to noise:

"5. The background (LA90) noise level in the absence of the ancillary equipment operations including activated carbon filter unit and mixing plant shall not be exceeded at the boundary of any noise sensitive receptor by more than 3dB. Any measurement carried out shall be made with reference to BS4142:2014."

The methods outlined in BS4142 are appropriate for the noise assessment of the proposed additional bitumen tanks and associated infrastructure.

3 British Standard 4142: 2014+A1:2019

British Standard (BS) 4142:2014+A1:2019 *"Methods for rating and assessing industrial and commercial sound"* describes methods for assessing the likely effects of sound of an industrial and/or commercial nature on residential properties. It includes the assessment of sound from industrial and manufacturing processes, M&E plant and equipment, loading and unloading of goods and materials, and mobile plant/vehicles on the site. It can be used to assess sound from proposed, new, modified or additional industrial / commercial sources, at existing or new premises used for residential purposes.

The standard describes methods to measure and determine ambient, background and residual sound levels, and the rating levels of industrial / commercial sound.

BS 4142:2014+A1:2019 is not intended to be used for the derivation or assessment of internal sound levels, or for the assessment of non-industrial / commercial sources such as recreational activities, motorsport, music and entertainment, shooting grounds, construction and demolition, domestic animals, people, and public address systems for speech.

Ambient sound is defined in BS 4142: 2014+A1:2019 as *"totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far"*. It comprises the residual sound and the specific sound when present.

Residual sound is defined in BS 4142: 2014+A1:2019 as *"ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound"*.

The background sound level is the $L_{A90, T}$ of the residual sound level, and is the underlying level of sound. Measurements of background sound level should be undertaken at the assessment location where possible or at a comparable location.

The measurement time interval should be sufficient to obtain a representative value (normally not less than 15 minutes) and the monitoring duration should reflect the range of background sound levels across the assessment period. The background sound level used for the assessment should be representative of the period being assessed.

The specific sound level is the L_{Aeq, T_r} of the sound source being assessed over the reference time interval, T_r . BS 4142:2014+A1:2019 advises that T_r should be 1 hour during the day and 15 minutes at night.

The rating level is the specific sound level plus any adjustment for the characteristics of the sound (tone, impulse, intermittent or other acoustic feature).

The standard describes subjective and objective methods to establish the appropriate adjustment. The adjustments for the different features and assessment methods are summarised in the table below.

Acoustic Feature	Adjustment for Acoustic Feature		
	Subjective Methods	Objective Methods	
Tonality	+2 dB if just perceptible	Third Octave Analysis	Narrow Band Analysis
	+4 dB if clearly perceptible +6 dB if highly perceptible	+6 dB if tones identified	Sliding scale of 0 to +6 dB depending on audibility of tone
Impulsivity	+3 dB if just perceptible +6 dB if clearly perceptible +9 dB if highly perceptible	Sliding scale of 0 to +9 dB depending on prominence of impulsive sound	

Intermittency	+ 3 dB if intermittency is readily distinctive	n/a
Other	+ 3 dB if neither tonal nor impulsive, but otherwise readily distinctive	n/a

Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant, it might be appropriate to apply a single correction. The rating level is equal to the specific sound level if there are no features present.

The level of impact is assessed by comparing the rating level of the specific sound source with the background sound level. Other factors that may require consideration include the absolute level of sound, the character and level of the residual sound compared to the specific sound, and the sensitivity of the receptor and scope for mitigation.

When the rating level is above the background sound level, a difference of around +5 dB is likely to indicate an adverse impact and a difference of around +10 dB or more is likely to indicate a significant adverse impact, depending on the context.

The lower the rating level with respect to the background sound level, the less likely it is that the specific sound source will have an 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.

4 Description of Site and Noise Climate

The Imperial Wharf site currently comprises bitumen storage tanks and ancillary equipment including activated carbon filter unit and mixing plant as well as offices and storage yard. The site is served by the wharf on the River Thames and road access is off Clifton Marine Parade to the south of the facility.

Immediately to the south of the site is a car park which is the location of the proposed additional bitumen tanks.

This area is surrounded by commercial premises to the south and east and immediately to the west. To the north are the FM Conway offices (The White House) and the existing facility.

Further to the north of the site over the River Thames is Tilbury Docks.

Beyond the commercial premises to the west are the nearest residential properties.

Ellandaye House/Warren Hastings Court are the nearest receptors to the existing site, located adjacent to The Shore and approximately 15 metres from the nearest boundary of the existing site (the yard and offices) and approximately 140 to 150 metres from the proposed bitumen storage tanks.

Warren Hastings Court comprises a number of residential dwellings at ground, first and second floor level. Ellandaye House is part of the same building complex and comprises two units at ground floor level which appear to be used for commercial purposes only.

The nearest dwellings along Pier Road are approximately 50 metres from the boundary of the existing site and approximately 160 to 180 metres from the proposed storage tanks. Two large commercial units are located in between the dwellings along Pier Road and the proposed storage tanks.

This BS4142 assessment concentrates on the nearest properties to the site described above, but the SoundPLAN noise maps include a visual representation of the calculated site noise levels across the area in the vicinity of the site.

The movement of ships and HGVs visiting the site are on the river and on the public highway, not within the application area and the nature of these visits will not change, this has not therefore been included in the noise assessment.

The existing site layout and the proposed new area as well as the baseline survey/assessment locations are shown on the plans in Appendix B.

The locations selected for site noise calculations in the BS4142 assessment are:

Position	Location Description
A	Ellandaye House/Warren Hastings Court
B	Pier Road

These locations were chosen for the purposes of this assessment as they are the closest residential properties to the site and were where baseline noise measurements were undertaken.

The daytime noise levels in the area are generally controlled by distant and local road traffic, local activity including commercial premises and some activity on and over the River Thames. During the attended baseline noise surveys, site activity was inaudible during all the measurements at all the survey locations.

The night-time noise levels in the area are generally controlled by industrial activity to the west, distant and local road traffic, some activity on and over the River Thames at Tilbury Docks. During the attended baseline noise surveys, site activity was noted as being only just audible at times during all the measurements at all the survey locations.

The working hours of the site are not restricted and therefore both daytime and night-time operations are considered in this assessment. With regard to BS 4142, the assessment period is therefore 1 hour for daytime (07:00 to 23:00 hours) and 15 minutes for night-time (23:00 to 07:00 hours).

5 Noise Surveys and Background Sound Levels (January and May 2022)

Daytime background sound data at the nearest dwellings was acquired by means of attended sample measurements at two locations to the west of the site.

Six 15-minute attended daytime sample measurements were taken over two separate days on 25 and 26 January 2022 at the nearest dwellings to the west of the site (four measurements in the vicinity of Ellandaye House/Warren Hastings Court and two in the vicinity of the nearest dwellings on Pier Road). Further baseline measurements could not be obtained at those locations due to the presence of temporary noisy local activity.

In order to obtain comprehensive data for the night-time period, a data logging sound level meter was installed outside the second storey window of the FM Conway offices in The White House.

However, the background sound levels measured by the installed sound level meter were controlled by local site and commercial noise sources and were higher than the daytime background sound levels measured at the nearest dwellings.

The data from the installed meter was therefore not used in the assessment and an additional attended night-time survey was undertaken at the nearest residences in the early hours of Friday 06 May 2022.

An additional six 15-minute attended night-time sample measurements were taken between 00:45 and 02:40 hours on Friday 06 May 2022 at the nearest dwellings as described above.

The detailed results of the attended baseline noise surveys are presented in tabular form in Appendices D and E.

The following table is a summary of the ambient ($L_{Aeq,15\text{ min}}$) and background ($L_{A90,15\text{ min}}$) noise levels at each of the noise survey positions used during the surveys in January and May 2022.

The values shown are the average sound levels and the range of background sound levels.

The noise monitoring measurement locations were chosen at the time of the initial daytime survey and were selected as being those closest to the site.

Location	Measured Noise Levels (dB)		
	Average Ambient Sound Level $L_{Aeq,T}$	Average Background Sound Level $L_{A90,T}$	Range of Samples of $L_{A90,T}$
Sample Measurements (Daytime)			
1. Ellandaye House/ Warren Hastings Court	60	46	42 to 51
2. Pier Road	49	44	42 to 46
Sample Measurements (Night-time)			
1. Ellandaye House/ Warren Hastings Court	52	39	39 to 39
2. Pier Road	40	38	38 to 39

It is noted during the survey work that the existing site operations were inaudible throughout the daytime measurements and only just audible at times during the night-time measurements.

For the noise monitoring measurements, the sample duration (T) was 15 minutes.

The following table presents representative daytime ambient ($L_{Aeq,T}$) and background ($L_{A90,T}$) noise levels at the two assessment locations:

Position	Location Description	Average dB $L_{Aeq,T}$	Average dB $L_{A90,T}$
A	Ellandaye House/Warren Hastings Court	60	46

Position	Location Description	Average dB $L_{Aeq, T}$	Average dB $L_{A90, T}$
B	Pier Road	49	44

The following table presents representative night-time ambient ($L_{Aeq, T}$) and background ($L_{A90, T}$) noise levels at the two assessment locations:

Position	Location Description	Average dB $L_{Aeq, T}$	Average dB $L_{A90, T}$
A	Ellandaye House/Warren Hastings Court	52	39
B	Pier Road	40	38

6 Calculation of Site Noise Levels

Site noise calculations for both the existing site operations and existing plus proposed site operations were undertaken using SoundPLAN noise mapping software.

A digital ground model (DGM) was created using local ground heights to cover the area including both the site and the nearest residential properties to the west (and south-west) of the site).

The following scenarios were modelled:

- Existing Operations (daytime);
- Existing Operations (night-time);
- Existing plus Proposed Operations (daytime); and
- Existing plus Proposed Operations (night-time).

The daytime calculations were undertaken for the one hour assessment period and therefore included loading of a tanker for 40 minutes (67%) during which time the burner intensity is reduced and the pump is operational. For the remainder of the one hour assessment period, the burner is operating at full intensity.

For the night-time calculations, the assessment period is 15 minutes and therefore the calculations include loading/pumping and the use of the burner at reduced intensity for 100% of the assessment period.

A second burner is included in the calculations for the proposed new infrastructure and the 'on-time' used is the same for both.

The calculations assume that the area under consideration is 100% hard ground.

The calculations also include existing commercial buildings, which provide some barrier attenuation, as well as existing and proposed walls around the existing and proposed tanks.

7 Calculated Site Noise Levels in the Context of the Existing Noise Environment

For the BS4142 assessment, the two receiver locations representative of the nearest residential properties to the site have been used for site noise calculations.

The noise monitoring and assessment locations are shown on the plans in Appendix B.

A comparison of the calculated daytime noise levels at the two selected assessment locations closest to the site with the representative daytime background and residual sound levels at those locations is as follows.

Receiver Location	Floor	Calculated Site Noise Level dB $L_{Aeq,1 \text{ hour}}$		Background Sound Level dB $L_{A90,15 \text{ min}}$	Residual Sound Level dB $L_{Aeq,15 \text{ min}}$
		Existing	Existing and Proposed		
A. Ellandaye House/ Warren Hastings Court	Ground	33	39	46	60
	First	32	38		
B. Pier Road	Ground	34	37	44	49
	First	36	40		
	Second	38	40		

The overall calculated daytime site noise levels are below the representative daytime background sound levels by 7 dB(A) at Ellandaye House/Warren Hastings Court and by at least 4 dB(A) at the nearest dwellings on Pier Road.

The overall calculated daytime site noise levels at Ellandaye House/Warren Hastings Court and Pier Road will therefore meet the current noise condition for the site as the background sound level (L_{A90}) will not be exceeded by more than 3dB.

The overall calculated daytime site noise levels are below the representative daytime residual sound levels by 21 dB(A) at Ellandaye House/Warren Hastings Court and by at least 9 dB(A) at the nearest dwellings on Pier Road. The baseline daytime residual levels at these locations are 49 to 60 dB $L_{Aeq,T}$. The daytime noise climate at these dwellings will continue to be controlled by distant and local road traffic, local commercial activity, occasional river traffic and some activity at Tilbury Docks to the north.

A comparison of the calculated night-time noise levels at the two selected assessment locations closest to the site with the representative night-time background and residual sound levels at those locations is as follows.

Receiver Location	Floor	Calculated Site Noise Level dB $L_{Aeq,15 \text{ minutes}}$		Background Sound Level dB $L_{A90,15 \text{ min}}$	Residual Sound Level dB $L_{Aeq,15 \text{ min}}$
		Existing	Existing and Proposed		
A. Ellandaye House/ Warren Hastings Court	Ground	32	39	39	52
	First	31	36		
B. Pier Road	Ground	33	36	38	40
	First	36	39		
	Second	37	40		

The overall calculated night-time site noise levels are no more than the representative night-time background sound levels at Ellandaye House/Warren Hastings Court and above the representative night-time background sound levels by no more than 2 dB(A) at the nearest dwellings on Pier Road.

The overall calculated night time site noise levels at Ellandaye House/Warren Hastings Court and Pier Road will therefore meet the current noise condition for the site as the background sound level (L_{A90}) will not be exceeded by more than 3 dB.

The overall calculated night-time site noise levels are below the representative night-time residual sound levels by 13 dB(A) at Ellandaye House/Warren Hastings Court and are no more than the representative night-time residual sound levels at the nearest dwellings on Pier Road.

The baseline night-time residual levels in the vicinity of these locations were in the region of 40 to 55 dB $L_{Aeq,T}$. The night-time noise climate at these dwellings will continue to be controlled by distant and local road traffic, occasional river traffic and some activity at Tilbury Docks to the north with some site activity possibly just audible at times.

An assessment has been undertaken in accordance with BS 4142:2014+A1:2019 "*Methods for Rating and assessing industrial and commercial sound*" for the nearest dwellings to the site operations as examined above.

8 BS 4142: 2014+A1:2019 Assessment

The information to be reported, as specified in Section 12 of BS 4142:2014+A1:2019, is set out below where relevant.

8.1 (a) Statement of Qualifications

See details about The Author on page 2 of this report.

8.2 (b) Source Being Assessed

1) Description of the main sound sources and of the specific sound

The source under investigation is the additional infrastructure to the south of the existing site including two bitumen tanks emulsion plant and load out gantry. The main noise sources are listed in Section 6 and would give rise to the specific sound levels at the off-site receiver locations.

2) Hours of operation

The hours of operation are not restricted and can take place at any time.

3) Mode of operation (e.g. continuous, twice a day, only in hot weather)

The facility could operate at any time day or night. The burner is in continual 24 hour use and the pumping/loading of material into tankers will only occur when a tanker is present. Loading of a tanker takes approximately 40 minutes and during loading, the burner reduces in intensity and noise level.

4) Statement of operational rates of the main sound sources (e.g. maximum load setting, 50% max rate, low load setting)

The measurements and assessment have been based on a “maximum load setting” i.e. with all components of the material handling and placement operations taking place simultaneously. The loading is including as taking place for 67% of each hour for daytime (equivalent to 40 minutes loading time). The burner is included as operating for 33% of the hour at full intensity and 67% at reduced intensity (for the loading period).

For the night-time assessment, the loading process could take place for the entire 15 minutes and therefore the pumping/loading and the burner at reduced intensity are both included as taking place for 100% of the 15 minute period to represent a worst case scenario.

The calculations allow for the use of two pumps (paired) at both the existing and the proposed bitumen tanks. There are currently 4 pairs of pumps with two further pairs to be installed, however, only two pumps would be in use at any one time and therefore the calculated site noise levels for the proposed layout is likely to represent an over-estimate.

5) *Description of premises in which the main sound sources are situated (if applicable).*

The additional bitumen tanks will be located to the south of the existing facility on the southern side of Clifton Marine Parade and will be surrounded by a 4.5 metre high wall.

The emulsion plant is to be located to the east of the Technology Centre, contained within the matrix of the already built development, with the load out gantry located to the west of The White House on Clifton Marine Parade.

A plan of the existing and proposed site layout is provided in Appendix B.

8.3 (c) Subjective Impressions

1) *Dominance or audibility of the specific sound*

The specific source is not yet in place but it is expected that the specific sound is likely to be generally inaudible at the nearest dwellings to the site.

2) *Main sources contributing to the residual sound.*

The noise climate in the area during the surveys in January and May 2022 was affected by road traffic noise, local commercial activity and occasional audible activity from the River Thames and Tilbury Docks.

8.4 (d) The Existing Context and Sensitivity of Receptor

The noise climate during the daytime at the chosen assessment locations is characterised by road traffic noise, birdsong, local commercial activity, occasional river traffic and occasional audible activity at Tilbury Docks. With regard to sensitivity, the receptor locations are residential properties and are therefore considered to be of “High” sensitivity.

The noise climate during the night-time at the chosen assessment locations is characterised by industrial activity to the west as well as distant and local road traffic, aircraft movements, breeze in the trees. Site activity was only just audible occasionally during the night-time survey.

8.5 (e) Measurement Locations and Justification

Measurement locations, their distance from the specific sound source, the topography of the intervening ground and any reflecting surface other than the ground, including a photograph, or a dimensioned sketch with a north marker. A justification for the choice of measurement locations should also be included.

The measurement locations used for the consideration of the baseline noise data were near to existing residential properties. The data were used to determine the acoustic environment and to measure residual (ambient) and background sound levels in the vicinity of the dwellings.

The receptor locations selected for this assessment are representative of the two closest residential areas to the site.

8.6 (f) Sound Measuring Systems, Including Calibrator / Pistonphone

Precision Sound Level Meter

- 1) Type 140 (samples)
- 2) Manufacturer Norsonic (samples)
- 3) Serial numbers 1404819 (daytime) and 1403138 (night-time).
- 4) Details of the latest verification test including dates

Noise surveys were completed on 25 & 26 January 2022 and 06 May 2022 for the purpose of establishing daytime and night-time baseline noise conditions at the nearest dwellings to the site.

The Norsonic 140 sound level meter used for the daytime survey and the associated calibrator underwent external traceable calibration by Campbell Associates on 08 December 2021 (Calibration Certificates no's 39683, 39684 & 39685).

The Norsonic 140 sound level meter used for the night-time survey and the associated calibrator underwent external traceable calibration by Campbell Associates on 04 March 2022 (Calibration Certificates no's 40377, 40378 & 40379).

8.7 (g) Operational Test

- 1) *Reference level(s) of calibrator, multi-function calibrator or pistonphone;*
113.8 dB(A) for Norsonic 140 s/n 1404819, 114.0 dB(A) for Norsonic 140 s/n 1403138
- 2) *Meter reading(s) before and after measurements with calibrator, multi-function calibrator or pistonphone applied.*

Norsonic 140 (daytime):

25 January 2022: Before 113.9 dB(A) and after 113.8 dB(A); and
26 January 2022: Before 113.9 dB(A) and after 114.0 dB(A).

Norsonic 140 (night-time):

26 January 2022: Before 114.0 dB(A) and after 114.1 dB(A).

8.8 (h) Weather Conditions

- 1) *Wind speed(s) and direction(s)*
25 January 2022: 0-1 m/s NW;
26 January 2022: ~2 m/s WSW; and
06 May 2022: ~2 m/s SW.
- 2) *Presence of conditions likely to lead to temperature inversion (e.g. calm nights with little cloud cover)* None.
- 3) *Precipitation* None.
- 4) *Fog* None.
- 5) *Wet ground* None.
- 6) *Frozen ground or snow coverage* None.
- 7) *Temperature*
25 January 2022: ~5°C;
26 January 2022: 5-8°C; and
06 May 2022: ~13°C.
- 8) *Cloud Cover*
25 January 2022: 100%;
26 January 2022: 100%; and
06 May 2022: 10%.

8.9 (i) Date(s) and Time(s) of Measurements

Daytime Samples:

25 January 2022: 12:10 to 13:10: and

26 January 2022: 09:30 to 10:25.

Night-time Samples:

06 May 2022: 00:45 to 02:40.

8.10 (j) Measurement Time Intervals

15 minutes.

8.11 (k) Reference Time Interval(s)

The reference time interval is 1 hour for the daytime assessment between 07:00 to 23:00 hours and 15 minutes for the night-time assessment between 23:00 and 07:00 hours.

As the site activities are not restricted, a 1 hour assessment period is used for daytime and a 15 minute assessment period is used for night-time.

8.12 (l) Specific Sound Level

1) *Measured sound level(s)*

The specific sound level could not be measured but has been determined from calculation based on measurements of similar items at the existing facility.

2) *Residual sound level(s) and method of determination*

The average residual sound levels (daytime and night-time) were determined from the attended noise surveys at the two locations at which measurements were taken in January and May 2022

The average daytime residual noise levels were as follows:

Ellandaye House/Warren Hastings Court: 60 dB $L_{Aeq,15 \text{ min, free field}}$

Pier Road: 49 dB $L_{Aeq,15 \text{ min, free field}}$

The average night-time residual noise levels were as follows:

Ellandaye House/Warren Hastings Court:	52 dB $L_{Aeq,15 \text{ min, free field}}$
Pier Road:	40 dB $L_{Aeq,15 \text{ min, free field}}$

3) *Ambient sound level(s) and method of determination*

The average residual sound levels (daytime) were determined from the attended noise surveys at the two locations at which measurements were taken in January 2022

The average residual sound levels (night-time) were determined from the attended noise surveys at the two locations at which measurements were taken in May 2022

The average daytime ambient noise levels were as follows:

Ellandaye House/Warren Hastings Court:	60 dB $L_{Aeq,15 \text{ min, free field}}$
Pier Road:	49 dB $L_{Aeq,15 \text{ min, free field}}$

The average night-time ambient noise levels were as follows:

Ellandaye House/Warren Hastings Court:	52 dB $L_{Aeq,15 \text{ min, free field}}$
Pier Road:	40 dB $L_{Aeq,15 \text{ min, free field}}$

For the daytime sample measurements at the two survey locations the following “Comments” were made:

Ellandaye House/Warren Hastings Court:	Distant and local road traffic, birdsong, activity at nearby commercial premises, some river traffic, occasional audible activity at Tilbury Docks;
Pier Road:	Distant and local road traffic, birdsong, local activity, some commercial activity to west and east, occasional audible activity towards river and Tilbury Docks.

For the night-time sample measurements at the two survey locations the following “Comments” were made:

Ellandaye House/Warren Hastings Court: Industrial activity from west, distant road traffic, distant large aircraft, rustling leaves nearby, occasional passing vehicles, river, distant alarm to west, distant dog barking, distant train to SW, some activity at Tilbury Docks. Site just audible;

Pier Road: Industrial activity from west, distant road traffic, distant large aircraft, rustling leaves nearby, occasional passing vehicles, river, distant alarm to west, distant dog barking, distant train to SW, some activity at Tilbury Docks, cargo ship on Thames. Site only just audible at times.

4) *Specific sound level(s) and method of determination*

The highest calculated specific sound levels (including the existing facility) for the two assessment locations have been determined from calculation as:

Daytime (07:00 to 23:00):

39 dB $L_{Aeq,1 \text{ hour, free field}}$ for Ellandaye House/Warren Hastings Court; and

40 dB $L_{Aeq,1 \text{ hour, free field}}$ for Pier Road

Night-time (23:00 to 07:00):

39 dB $L_{Aeq,15 \text{ minutes, free field}}$ for Ellandaye House/Warren Hastings Court; and

40 dB $L_{Aeq,15 \text{ minutes, free field}}$ for Pier Road.

5) *Justification of methods*

Calculation used as the proposed new infrastructure is not yet in place and therefore cannot be measured at the nearest dwellings.

6) *Details of any corrections applied*

See the Potential Impact of Uncertainty section.

8.13 (m) Background Sound Level(s)

Background sound level(s) and measurement time interval(s) and, in the case of measurements taken at an equivalent location, the reasons for presuming it to be equivalent.

The 15-minute attended sample measurements undertaken at the two survey locations gave daytime background sound levels of:

Ellandaye House/Warren Hastings Court:	42 to 51 dB $L_{A90,15 \text{ min, free field}}$;
Pier Road:	42 to 46 dB $L_{A90,15 \text{ min, free field}}$.

The 15-minute attended sample measurements undertaken at the two survey locations gave night-time background sound levels of:

Ellandaye House/Warren Hastings Court:	39 to 39 dB $L_{A90,15 \text{ min, free field}}$;
Pier Road:	38 to 39 dB $L_{A90,15 \text{ min, free field}}$.

The 15-minute attended sample measurements undertaken at the two survey locations gave average daytime background sound levels of:

Ellandaye House/Warren Hastings Court:	46 dB $L_{A90,15 \text{ min, free field}}$;
Pier Road:	44 dB $L_{A90,15 \text{ min, free field}}$.

The 15-minute attended sample measurements undertaken at the two survey locations gave average night-time background sound levels of:

Ellandaye House/Warren Hastings Court:	39 dB $L_{A90,15 \text{ min, free field}}$;
Pier Road:	38 dB $L_{A90,15 \text{ min, free field}}$.

8.14 (n) Rating Level(s)

1) Specific sound level(s)

The specific sound level(s) stated in 8.12 are:

Daytime:

39 dB $L_{Aeq,1 \text{ hour, free field}}$ for Ellandaye House/Warren Hastings Court; and

40 dB $L_{Aeq,1 \text{ hour, free field}}$ for Pier Road

Night-time:

39 dB $L_{Aeq,15 \text{ minutes, free field}}$ for Ellandaye House/Warren Hastings Court; and

40 dB $L_{Aeq,15 \text{ minutes, free field}}$ for Pier Road

2) Any acoustic features of the specific sound

The potential adjustments for the different features and assessment methods are summarised in the table in Section 3 of this report.

At a separation distance of at least 115 metres from the proposed new tanks to the nearest of the two receiver locations and considering the intervening structures and the inaudibility of the existing site operations, no requirement for a penalty for tonality, impulsivity or intermittency is expected for the site operations at any of the receiver locations.

3) Rating level(s)

The rating levels for daytime are therefore 0 dB above the specific noise levels stated above resulting in the following rating levels determined in accordance with BS 4142:2014+A1:2019:

39 dB $L_{Ar, Tr}$ for Ellandaye House/Warren Hastings Court;

40 dB $L_{Ar, Tr}$ for Pier Road

The rating levels for night-time are therefore also 0 dB above the specific noise levels stated above resulting in the following rating levels determined in accordance with BS 4142:2014+A1:2019:

39 dB $L_{Ar, Tr}$ for Ellandaye House/Warren Hastings Court;

40 dB $L_{Ar, Tr}$ for Pier Road.

8.15 (o) Excess of the rating level(s) over background sound level(s)

Excess of the rating level(s) over the measured background sound level(s) and the initial estimate of the impacts

The rating levels, the background sound levels and the excess of the rating levels over the background sound levels for the daytime period are presented in the following table:

Receiver Location	Rating Level dB $L_{Ar, Tr}$	Average Background Sound Level dB $L_{A90,15 \text{ min}}$	Excess of Rating Level over Background Sound Level

A. Ellandaye House/Warren Hastings Court	39	46	-7
B. Pier Road	40	44	-4

When the rating level is above the background sound level, a difference of around +5 dB is likely to indicate an adverse impact and a difference of around +10 dB or more is likely to indicate a significant adverse impact, depending on the context.

The rating levels, the background sound levels and the excess of the rating levels over the background sound levels for the night-time period are presented in the following table:

Receiver Location	Rating Level dB $L_{Ar, Tr}$	Average Background Sound Level dB $L_{A90, 15 \text{ min}}$	Excess of Rating Level over Background Sound Level
A. Ellandaye House/Warren Hastings Court	39	39	0
B. Pier Road	40	38	+2

When the rating level is above the background sound level, a difference of around +5 dB is likely to indicate an adverse impact and a difference of around +10 dB or more is likely to indicate a significant adverse impact, depending on the context.

8.16 (p) Conclusions of the assessment after taking context into account

Ellandaye House/Warren Hastings Court:

The daytime baseline measurements and assessment demonstrate a rating level of 39 dB $L_{Ar, Tr}$ at Ellandaye House/Warren Hastings Court which is 7 dB below the average background sound level of 46 dB $L_{A90, T}$ for Ellandaye House/Warren Hastings Court and 3 dB below the lowest measured background sound level of 42 dB $L_{A90, T}$ for Ellandaye House/Warren Hastings Court. The daytime residual level at Ellandaye House/Warren Hastings Court is 60 dB $L_{Aeq, T}$.

The conclusion is that the assessment indicates no adverse impact at Ellandaye House/Warren Hastings Court during the daytime.

The daytime soundscape for Ellandaye House/Warren Hastings Court will continue to be affected by distant and local road traffic noise, birdsong, local commercial activity, occasional river traffic and occasionally audible activity at Tilbury Docks to the north.

It is expected that the site will remain inaudible at this location during the daytime.

The night-time representative sound levels and assessment demonstrate a rating level of 39 dB $L_{Ar, Tr}$ at Ellandaye House/Warren Hastings Court which is no more than the representative background sound level of 39 dB $L_{A90, T}$ for Ellandaye House/Warren Hastings Court, which was also the lowest measured background sound level at that location. The representative night-time residual level at Ellandaye House/Warren Hastings Court is 52 dB $L_{Aeq, T}$.

The conclusion is that the assessment indicates no adverse impact at Ellandaye House/Warren Hastings Court during the night-time.

It is expected that the site may still be just audible at times at this location during the night-time.

Pier Road:

The baseline measurements and assessment demonstrate a rating level of 40 dB $L_{Ar, Tr}$ at the nearest dwellings on Pier Road which is 4 dB below the average daytime background sound level of 44 dB $L_{A90, T}$ for Pier Road and 2 dB below the lowest measured background sound level of 42 dB $L_{A90, T}$ for Pier Road. The daytime residual level at Pier Road is 49 dB $L_{Aeq, T}$.

The conclusion is that the assessment indicates no adverse impact at the nearest dwellings on Pier Road.

The daytime soundscape for Pier Road will continue to be controlled by distant and local road traffic noise, birdsong, local commercial activity, occasional river traffic and occasionally audible activity at Tilbury Docks to the north.

It is expected that the site will remain inaudible at this location during the daytime.

The night-time representative sound levels and assessment demonstrate a rating level of 40 dB $L_{Ar, Tr}$ at the nearest dwellings on Pier Road which is no more than 2 dB above the representative background sound level of 38 dB $L_{A90, T}$ for Pier Road, which was also the lowest measured background sound level at that location. The representative night-time residual level at Pier Road Court is 40 dB $L_{Aeq, T}$.

The conclusion is that the assessment indicates no adverse impact at the nearest dwellings on Pier Road during the night-time.

It is expected that the site may still be only just audible at times at this location during the night-time.

8.17 (q) The potential impact of uncertainty

Section 10 of BS 4142:2014+A1:2019 states: *“Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty. Report the level and potential effects of uncertainty.”*

One of the largest levels of uncertainty is whether the proposed activity gives rise to the calculated noise level at the two receiver locations considered.

The measurements and assessment have been based on a realistic worst case scenario during daytime and night-time periods.

The measurements and assessment have been based on a “*maximum load setting*” i.e. with all components of the operations taking place simultaneously. The loading is included as taking place for 67% of each hour for daytime (equivalent to 40 minutes loading time). The burner is included as operating for 33% of the hour at full intensity and 67% at reduced intensity (for the loading period).

For the night-time assessment, the loading process could take place for the entire 15 minutes and therefore the pumping/loading and the burner at reduced intensity are both included as taking place for 100% of the 15 minute period to represent a worst case scenario.

For the majority of the time, the scenario as modelled will not occur.

For the purposes of the modelling, the paired pumps moving the bitumen to the load out point have been included rather than the paired pumps for the movement of bitumen between tanks (which may be marginally closer to the residences) to represent a worst case scenario when a tanker is being loaded.

The calculations also include the use of paired sets of pumps at both the existing and the proposed bitumen tanks. In practice, only one pair of pumps will be in use at any one time

and therefore the calculated site noise levels for the proposed layout represent an over-estimate of pumping noise levels.

The site noise calculations do not include any allowance for air absorption.

The highest calculated site noise level has been used for the nearest dwellings on Pier Road, i.e. that calculated at second storey level to again put forward the worst case in terms of noise impact.

The operation must be considered in the context of the existing ambient noise levels at the assessment locations which includes noise generated by the ongoing commercial activities in the vicinity of the site and the fact that the current operation is generally inaudible at the nearest dwellings.

9 Summary and Conclusions

FM Conway operate a site which comprises bitumen storage tanks and ancillary equipment including activated carbon filter unit and mixing plant at Imperial Wharf in Gravesend. This site is currently operated under a planning permission granted by Gravesham Borough Council dated 29 June 2018 (Application: 20160800).

The operator proposes the construction and use of two additional bitumen storage tanks, an emulsion plant, load out gantry and alternative car parking. The emulsion plant is located to the east of the Technology Centre, contained within the matrix of the already built development, with the load out gantry located to the west of The White House on Clifton Marine Parade. The two additional bitumen tanks will be located to the south of the existing facility land this is currently used as a car park.

This report sets out the calculated noise levels arising from the operation of the existing and proposed facilities, for use in a BS 4142:2014+A1:2019 assessment for the nearest dwellings to the site.

The calculated site noise levels are compared with background sound levels at the nearest existing dwellings, as measured during the noise surveys undertaken in January 2022.

This comparison of the calculated noise levels arising from the operation of the site including the new infrastructure with the background sound levels forms the basis for the BS 4142:2014+A1:2019 assessment method for the nearest dwellings to Imperial Wharf.

The calculated site noise levels presented for comparison also include the existing site operations. The movement of ships and HGVs visiting the site are on the river and on the public highway, not within the application area and the nature of these visits will not change, this has not therefore been included in the noise assessment.

The baseline measurements and assessment demonstrate a worst case rating level of 39 dB $L_{A_{r, T}}$ which is 7 dB below the average daytime background sound level of 46 dB $L_{A_{90, T}}$ for Ellandaye House/Warren Hastings Court and 3 dB below the lowest measured daytime background sound level at Ellandaye House/Warren Hastings Court.

It is expected that the site will remain inaudible at Ellandaye House/Warren Hastings Court during the daytime.

The night-time representative sound levels and assessment demonstrate a rating level of 39 dB $L_{A_{r, T}}$ at Ellandaye House/Warren Hastings Court which is no more than the representative background sound level of 39 dB $L_{A_{90, T}}$ for Ellandaye House/Warren Hastings Court. The representative night-time residual level at Ellandaye House/Warren Hastings Court is 52 dB $L_{A_{eq, T}}$.

It is expected that the site may still be just audible at times at Ellandaye House/Warren Hastings Court during the night-time.

The baseline measurements and assessment demonstrate a worst case rating level of 40 dB $L_{A_{r, T}}$ which is 4 dB below the average daytime background sound level of 44 dB $L_{A_{90, T}}$ for the nearest dwellings on Pier Road and 2 dB below the lowest measured daytime background sound level at Pier Road.

It is expected that the site will remain inaudible at the nearest dwellings on Pier Road during the daytime.

The night-time representative sound levels and assessment demonstrate a rating level of 40 dB $L_{A_{r, T}}$ at the nearest dwellings on Pier Road which is 2 dB above the representative background sound level of 38 dB $L_{A_{90, T}}$ for Pier Road. The representative night-time residual level at Pier Road Court is 40 dB $L_{A_{eq, T}}$.

It is expected that the site may still be only just audible at times at the nearest dwellings on Pier Road during the night-time.

The conclusion is that the assessment indicates no adverse impact at any of the nearest dwellings to the site.

The assessment also indicates that the current noise condition for the site will be met as the background sound level (L_{A90}) will not be exceeded at the boundary of any noise sensitive receptor by more than 3 dB during both daytime and night-time operations.

The daytime soundscape for the two receiver locations considered will continue to be affected by distant and local road traffic noise, other local commercial activity, occasional river traffic and some audible activity at Tilbury Docks.

The night-time noise climate at these dwellings is likely to continue to be controlled by distant and local road traffic, occasional river traffic and some activity at Tilbury Docks to the north with some site activity possibly just audible at times.

Robert Storey

BEng PhD MIOA

Senior Consultant

(This document has been generated electronically and therefore bears no signature)

Appendix A – Glossary of Acoustic Terms

General Noise and Acoustics

The following section describes some of the parameters that are used to quantify noise.

Decibels dB

Noise levels are measured in decibels. The decibel is the logarithmic ratio of the sound pressure to a reference pressure (2×10^{-5} Pascals). The decibel scale gives a reasonable approximation to the human perception of relative loudness. In terms of human hearing, audible sounds range from the threshold of hearing (0 dB) to the threshold of pain (140 dB).

A-weighted Decibels dB(A)

The 'A'-weighting filter emulates human hearing response for low levels of sound. The filter network is incorporated electronically into sound level meters. Sound pressure levels measured using an 'A'-weighting filter have units of dB(A) which is a single figure value to represent the overall noise level for the entire frequency range.

A change of 3 dB(A) is the smallest change in noise level that is perceptible under normal listening conditions. A change of 10 dB(A) corresponds to a doubling or halving of loudness of the sound. The background noise level in a quiet bedroom may be around 20 –30 dB(A); normal speech conversation around 60 dB(A) at 1 m; noise from a very busy road around 70-80 dB(A) at 10m; the level near a pneumatic drill around 100 dB(A).

Façade Noise Level

Façade noise measurements are those undertaken near to reflective surfaces such as walls, usually at a distance of 1m from the surface. Façade noise levels at 1m from a reflective surface are normally around 3 dB greater than those obtained under freefield conditions.

Freefield Noise Level

Freefield noise measurements are those undertaken away from any reflective surfaces other than the ground

Frequency Hz

The frequency of a noise is the number of pressure variations per second, and relates to the "pitch" of the sound. Hertz (Hz) is the unit of frequency and is the same as cycles per second. Normal, healthy human hearing can detect sounds from around 20 Hz to 20 kHz.

Octave and Third-Octave Bands

Two frequencies are said to be an octave apart if the frequency of one is twice the frequency of the other. The octave bandwidth increases as the centre frequency increases. Each bandwidth is 70% of the band centre frequency.

Two frequencies are said to be a third-octave apart if the frequency of one is 1.26 times the other. The third octave bandwidth is 23% of the band centre frequency.

There are recognised octave band and third octave band centre frequencies. The octave or third-octave band sound pressure level is determined from the energy of the sound which falls within the boundaries of that particular octave or third octave band.

Appendix A (continued)

Equivalent Continuous Sound Pressure Level $L_{Aeq,T}$

The 'A'-weighted equivalent continuous sound pressure level $L_{Aeq,T}$, is a notional steady level which has the same acoustic energy as the actual fluctuating noise over the same time period T . The $L_{Aeq,T}$ unit is dominated by higher noise levels, for example, the $L_{Aeq,T}$ average of two equal time periods at, for example, 70 dB(A) and 50 dB(A) is not 60 dB(A) but 67 dB(A).

The L_{Aeq} is the chosen unit of BS 7445-1:2003 "Description and Measurement of Environmental noise".

Maximum Sound Pressure Level L_{Amax}

The L_{Amax} value describes the overall maximum 'A'-weighted sound pressure level over the measurement interval. Maximum levels are measured with either a fast or slow time weighted, denoted as $L_{Amax,f}$ or $L_{Amax,s}$ respectively.

Noise Rating NR

The noise rating level is a single figure index obtained from an octave band analysis of a noise. The NR level is obtained by comparing the octave band sound pressure levels to a set of reference curves and the highest NR curve that is intersected by the sound pressure levels gives the NR level.

Sound Exposure Level L_{AE} or SEL

The sound exposure level is a notional level which contains the same acoustic energy in 1 second as a varying 'A'-weighted noise level over a given period of time. It is normally used to quantify short duration noise events such as aircraft flyover or train passes.

Statistical Parameters L_N

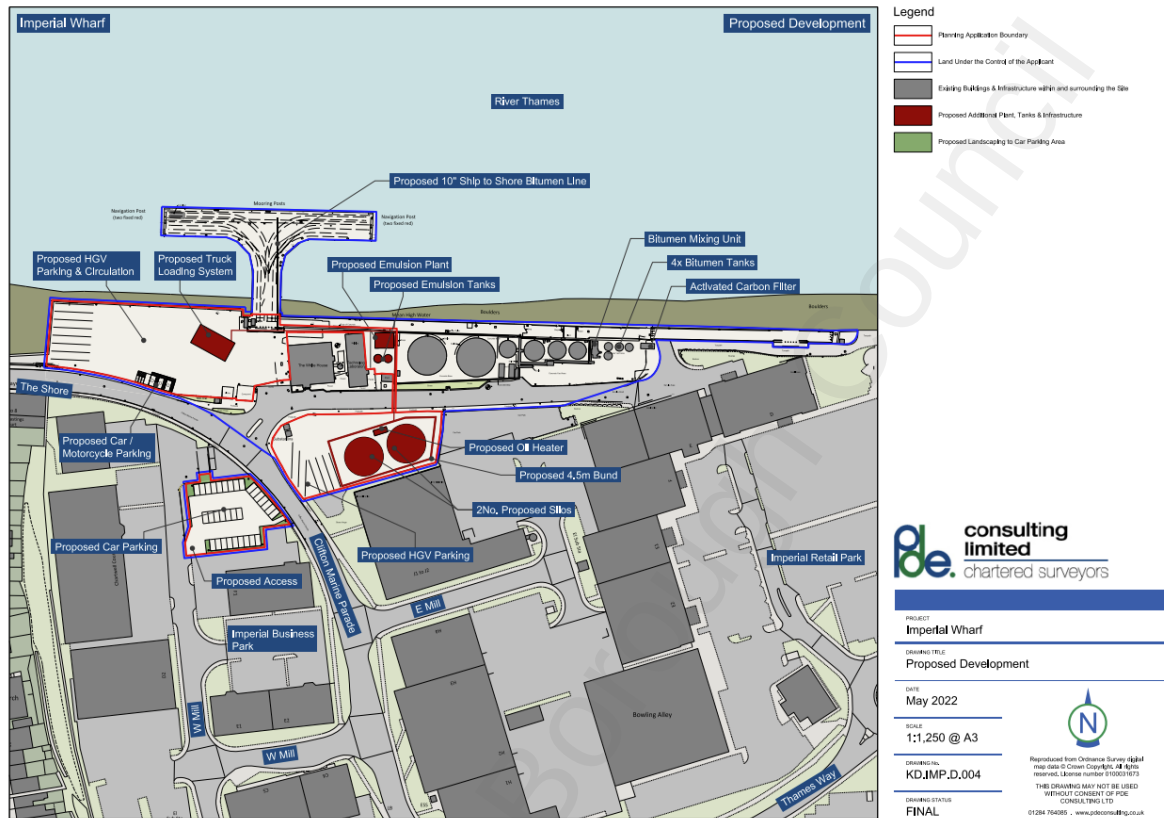
In order to cover the time variability aspects, noise can be analysed into various statistical parameters, i.e. the sound level which is exceeded for $N\%$ of the time. The most commonly used are the $L_{A01,T}$, $L_{A10,T}$ and the $L_{A90,T}$.

$L_{A01,T}$ is the 'A'-weighted level exceeded for 1% of the time interval T and is often used to give an indication of the upper maximum level of a fluctuating noise signal.

$L_{A10,T}$ is the 'A'-weighted level exceeded for 10% of the time interval T and is often used to describe road traffic noise. It gives an indication of the upper level of a fluctuating noise signal. For high volumes of continuous traffic, the $L_{A10,T}$ unit is typically 2–3 dB(A) above the $L_{Aeq,T}$ value over the same period.

$L_{A90,T}$ is the 'A'-weighted level exceeded for 90% of the time interval T , and is often used to describe the underlying background noise level.

Appendix B – Plans Showing Existing/Proposed Site Layouts and Survey Locations



● Approximate positions of baseline noise survey locations

Reference	Location	Description
1	Ellandaye House/Warren Hastings Court	On hard standing towards River Thames to north of property
2	Pier Road	On pavement to west of properties, immediately east of new townhouses on Pier Road

Appendix C – Instrumentation and Calibration Details

Date and Locations of Survey

Tuesday 25 January 2022 between 12:10 and 13:10

Wednesday 26 January 2022 between 09:30 and 10:25

Noise measurement locations as follows, See Appendix B for site plans.

Additional short duration measurements were also taken around the existing facility for the purpose of establishing sound power levels for the processes involved on site.

Location	Description
1	Ellandaye House/Warren Hastings Court, The Shore - On hard standing towards River Thames to north of property
2	Pier Road - On pavement to west of properties, immediately east of new townhouses on Pier Road

Survey carried out by

Dr Robert Storey

Weather Conditions

Date	Conditions
25 January 2022	~5°C, dry, cloudy NW breeze 0-1 m/s
26 January 2022	5-8°C, dry, cloudy, WSW breeze ~2 m/s

Instrumentation and calibration

The instrumentation used (including serial number in brackets) is tabulated below. The sensitivity of the meter was verified on site immediately before and after the survey using the field calibrator. The measured calibration levels were as follows:

Instrumentation	Survey Date	Start Cal	End Cal
Norsonic 140 Sound Level Meter (1404819)	Tuesday 25 January 2022	113.9 dB(A)	113.8 dB(A)
Norsonic 1251 Calibrator (33321)			
Norsonic 140 Sound Level Meter (1404819)	Wednesday 26 January 2022	113.9 dB(A)	114.0 dB(A)
Norsonic 1251 Calibrator (33321)			

The meter and calibrator are tested monthly against Norsonic Calibrators, type 1253 (serial number 22906) and type 1256 (serial number 125626100) both with UKAS approved laboratory certificates of calibration. In addition, the meter and calibrator undergo traceable calibration at an external laboratory every two years.

Appendix C (continued)

Date and Locations of Survey

Friday 06 May 2022 between 00:45 and 02:40

Noise measurement locations as follows, See Appendix B for site plans.

Location	Description
1	Ellandaye House/Warren Hastings Court, The Shore - On hard standing towards River Thames to north of property
2	Pier Road - On pavement to west of properties, immediately east of new townhouses on Pier Road

Survey carried out by

Jack Semple

Weather Conditions

Date	Conditions
06 May 2022	Dry, some cloud, ~13°C, light SW breeze ~2m/s

Instrumentation and calibration

The instrumentation used (including serial number in brackets) is tabulated below. The sensitivity of the meter was verified on site immediately before and after the survey using the field calibrator. The measured calibration levels were as follows:

Instrumentation	Survey Date	Start Cal	End Cal
Norsonic 140 Sound Level Meter (1403138)	Friday 06 May 2022	114.0 dB(A)	114.1 dB(A)
Norsonic 1251 Calibrator (31991)			

The meter and calibrator are tested monthly against Norsonic Calibrators, type 1253 (serial number 22906) and type 1256 (serial number 125626100) both with UKAS approved laboratory certificates of calibration. In addition, the meter and calibrator undergo traceable calibration at an external laboratory every two years.

Appendix D – Noise Survey Data (Daytime Attended Samples)

Tuesday 25 January 2022:

Location	Start Time	Results dB (T = 15 minutes)				Comments
		L _{Aeq,T}	L _{Amax,f}	L _{A10,T}	L _{A90,T}	
1. Ellandaye House/Warren Hastings Court	12:14	61	80	61	44	Distant river traffic, distant road traffic, some local traffic, voices, beeping at Ellandaye House, birds, river, passing boat, activity at other commercial premises, distant horn, distant alarm, aircraft
2. Pier Road	12:31	50	68	52	42	Distant and some local road traffic, birds, voices/activity at houses, other commercial activity, car start and tyre squeal, distant industrial activity to west
1. Ellandaye House/Warren Hastings Court	12:55	60	80	57	42	Distant and some local road traffic, birds, beeping at Ellandaye House, industrial noise from west, activity at other commercial premises, activity at Tilbury Docks, distant ship horn, river

Wednesday 26 January 2022:

Location	Start Time	Results dB (T = 15 minutes)				Comments
		L _{Aeq,T}	L _{Amax,f}	L _{A10,T}	L _{A90,T}	
1. Ellandaye House/Warren Hastings Court	09:34	59	79	60	51	Distant and local road traffic, birds, car idling by Ellandaye House, industrial activity to west, distant horn
2. Pier Road	09:51	49	62	51	46	Distant and some local road traffic, birds, industrial activity at site to west, activity at Tilbury Docks, other commercial activity, distant dog barking, reversing bleeper by Ellandaye House
1. Ellandaye House/Warren Hastings Court	10:09	60	79	60	47	Car idling by Ellandaye House, woman on phone, aircraft, birds, distant and some local road traffic, industrial activity to west, activity at Tilbury Docks, aircraft, beeping at Ellandaye House

Plant Measurements - Tuesday 25 January 2022 & Wednesday 26 January 2022:

Description	Distance (metres)	Results dB (T = 1 minute)	
		L _{Aeq,T}	L _{A90,T}
Burner	17	63.9	63.0
	17	63.2	62.4
Pair of Pumps	8	69.8	69.4
	8	69.7	69.3

Appendix E – Noise Survey Data (Night-time Attended Samples)

Friday 06 May 2022:

Location	Start Time	Results dB (T = 15 minutes)				Comments
		L _{Aeq,T}	L _{Amax,f}	L _{A10,T}	L _{A90,T}	
1. Ellandaye House/Warren Hastings Court	00:47	55	81	67	39	Industrial activity to west, distant road traffic, loud vehicle, aircraft, rustling leaves, very distant intermittent thuds from West, two passing vehicles, distant train to SW. Site just audible.
2. Pier Road	01:09	41	62	47	38	Breeze in trees, distant road traffic to west, distant train to SW, industrial activity to west, three passing vehicles on road, distant crash, large cargo ship on river. Site barely audible.
1. Ellandaye House/Warren Hastings Court	01:27	50	75	62	39	Waves on river, passing cars, distant loud exhaust noise to west, aircraft, tanker visiting site. Site just audible.
2. Pier Road	01:45	39	52	44	38	Distant dog barking, industrial activity to west, aircraft, faint some industrial activity from Tilbury Docks across the Thames.
1. Ellandaye House/Warren Hastings Court	02:03	40	48	44	39	Distant dog barking, industrial activity to west, waves on River, distant alarm from west, distant train, distant impact noise from Tilbury Docks across the Thames, distant loud motorbike to East. Site barely audible.
2. Pier Road	02:20	40	50	45	39	Industrial activity to west, impact noise from Tilbury Docks across the Thames, distant road traffic to south. Site audible on one occasion.

Appendix F – SoundPLAN Noise Mapping Assumptions

Calculations were undertaken using SoundPLAN 8.2 (updated 04 May 2022)

Noise calculations were made on a 1 metre grid at a calculation height of 1.5 metres above local ground level to represent ground floor level, at 4 metres above local ground height to represent the first floor level and 6.5 metres above local ground height to represent the second floor level.

The calculations assume 100% hard ground.

Barrier attenuation is included in the calculations due to that afforded by the existing and proposed buildings both on site and in the commercial area.

The wall around the existing bitumen storage tanks is included as 3 metres high.

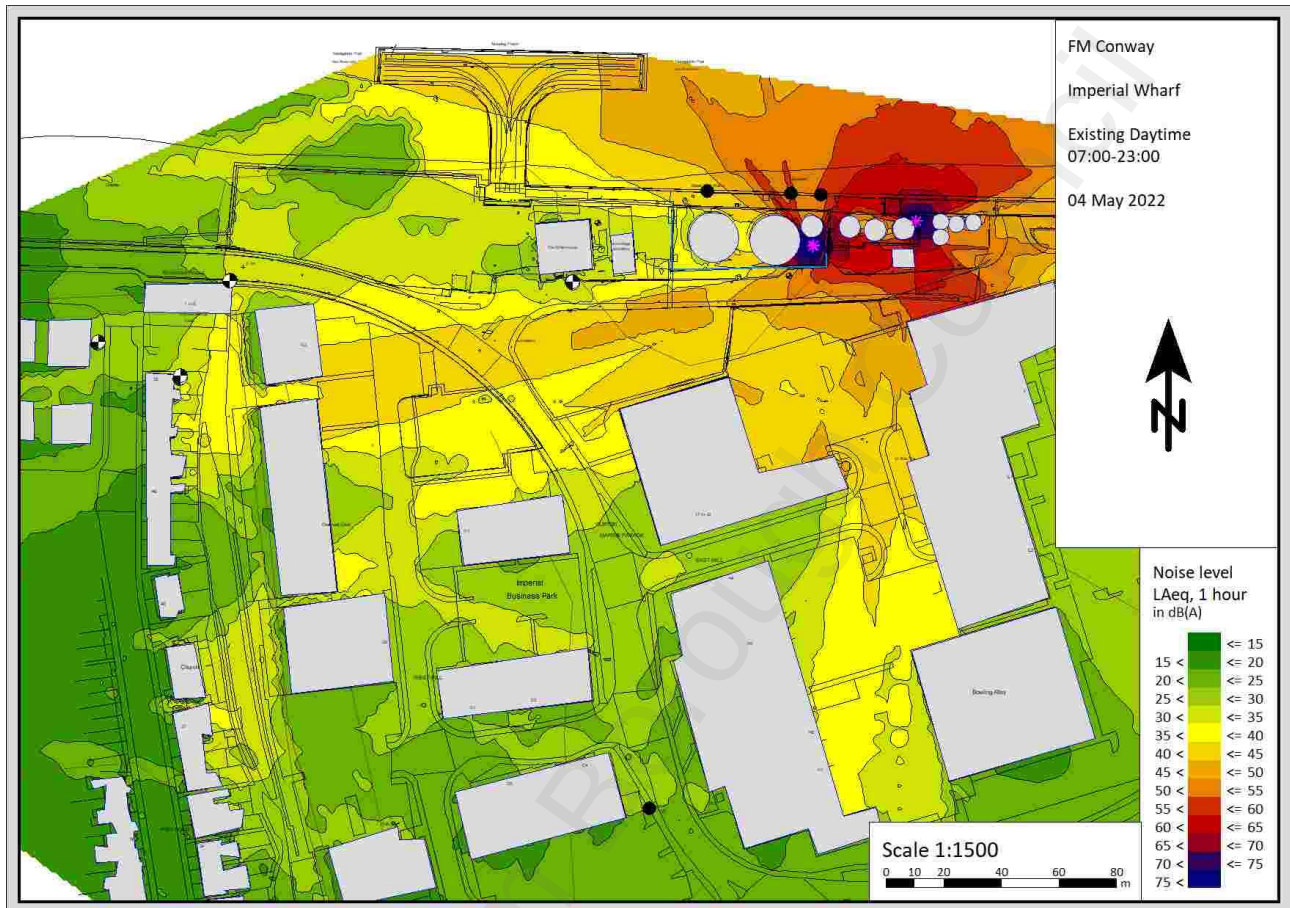
The proposed barrier around the proposed bitumen storage tanks is included as 4.5 metres high.

Sound Power Level data has been included based on measurements of the existing facility undertaken by WBM during the site visits on 25 and 26 January 2022.

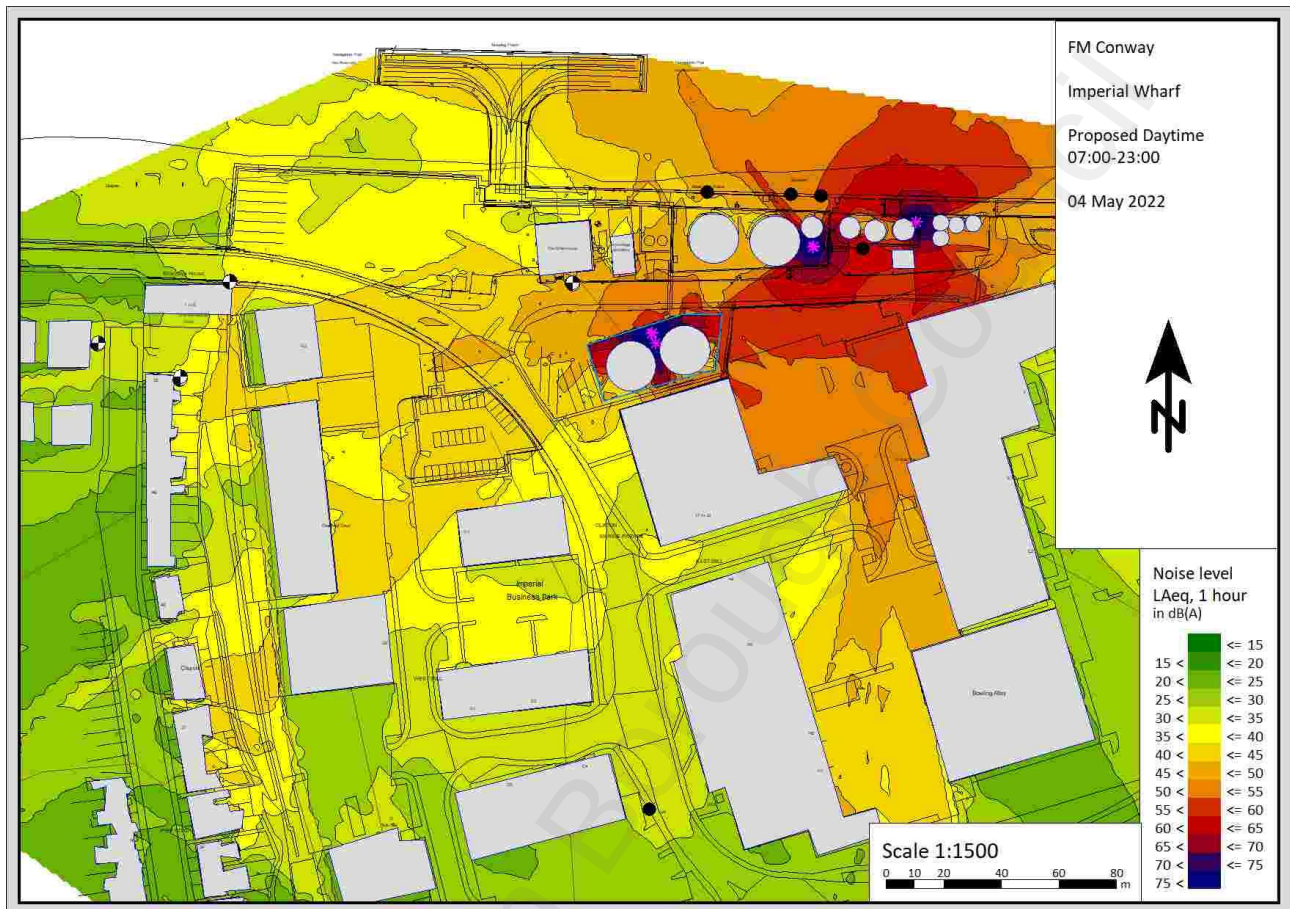
A summary of the data input into each of the SoundPLAN calculations is presented in the following table.

Plant Item	Sound Power Level dB L _{WA}	Source Height (m)	On time
Existing Facility			
Burner (full intensity)	95.6	1.5	33% (daytime) 0% (night-time)
Burner (while loading)	93.6	1.5	67% (daytime) 100% (night-time)
Pair of pumps	95.5	1.5	67% (daytime) 100% (night-time)
Proposed Facility			
Burner (full intensity)	95.6	1.5	33% (daytime) 0% (night-time)
Burner (while loading)	93.6	1.5	67% (daytime) 100% (night-time)
Pair of pumps	95.5	1.5	67% (daytime) 100% (night-time)

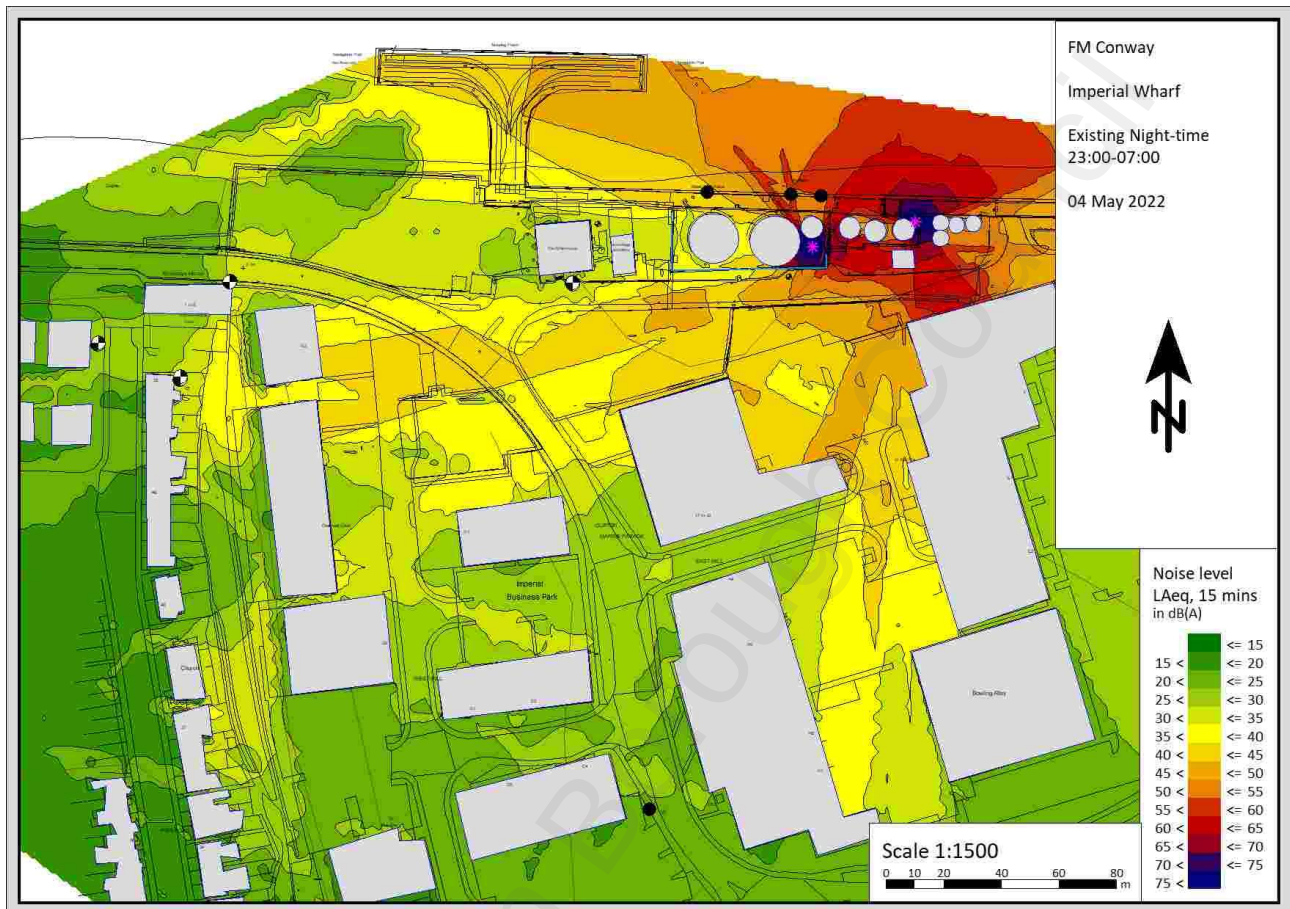
Appendix G – SoundPLAN Noise Maps



Appendix G (continued)



Appendix G (continued)



Appendix G (continued)

