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Morlais Project
Environmental Statement

Chapter 21: Noise and Vibration

Volume III

Applicant: Menter Môn Morlais Limited

Document Reference: PB5034-ES-021

Chapter 21: Noise and Vibration

Author: Royal HaskoningDHV

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Morlais Project
Environmental Statement

Appendix 21.1: Baseline Noise Survey

Volume I

Applicant: Menter Môn Morlais Limited

Document Reference: PB5034-ES-0211

Appendix 21.1: Baseline Noise Survey

Author: Royal HaskoningDHV

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GLOSSARY OF ABBREVIATIONS

BS	British Standard
ETG	Expert Topic Group
ISO	International Standards Organisation

GLOSSARY OF TERMINOLOGY

Applicant	Menter Môn Morlais Ltd.
Cable Route Joint Bays	Structures constructed at regular intervals along the cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Construction consolidation sites	Compounds which will contain laydown, storage and work areas for onshore construction works. The HDD construction compound will also be referred to as a construction consolidation site.
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.
$L_{A10,T}$	The A weighted noise level exceeded for 10% of the specified measurement period (T). L_{A10} is the index generally adopted to assess traffic noise.
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014 it is used to define the 'background' noise level.
$L_{Aeq,T}$	The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.
L_{Amax}	The maximum A-weighted sound pressure level recorded during a measurement.
Grid Connection Substation	The Grid Connection Substation at Orthios, (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed Project to the national electricity grid.
Landfall	Where the offshore cables come ashore at Abraham's Bosom.
Landfall substation	The Landfall Substation at Ty-Mawr (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed Project to the national electricity grid.
Mitigation areas	Areas captured within the Development Area specifically for mitigating expected or anticipated impacts.

Grid Substation location	The proposed location of the Grid Connection Substation.
Onshore cable route	This is the approximately 60m wide construction swathe within the 60m wide onshore cable corridor which would contain onshore cables as well as temporary ground required for construction.
Onshore cables	The cables which would bring electricity from landfall to the substation.
Onshore components	The combined name for all onshore infrastructure associated with the Project from landfall to grid connection.
Onshore Development Area	The landfall location at Abraham's Bosom, the short onshore cable route between landfall and the landfall substation infrastructure, and the onshore cable route to the Grid Connection Substation
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed Project from landfall to the connection to the national electricity grid.
Landfall substation location	The proposed location of the Landfall Substation for the proposed Project.
SoundPLAN	Noise Modelling Software used to predict noise impacts from Construction and Operational Phases associated with the Project.
Switchgear Building	The proposed building containing switchgear and metering annexe located at Parc Cybi.
Transition Pits	Underground structures that house the joints between the offshore export cables and the onshore cables within the landfall.

1. NOISE AND VIBRATION

1.1. INTRODUCTION

1. In order to characterise the existing noise climate within the Project area, a baseline noise survey was undertaken at agreed sensitive receptor locations in the vicinity of the site and across the onshore development area (shown on **Figure 21-1, Volume II**) between 28 and 29 March 2019.

1.2. MEASURED BASELINE NOISE DATA

2. Baseline noise measurements were conducted at agreed identified sensitive noise receptors within the following study areas:

- Landfall Substation;
- Onshore Cable Corridor; and
- Grid Connection Substation and Switchgear Building.

1.2.1. Landfall

3. Landfall measurement locations are detailed within **Table 1-1**, in **Chapter 21, Noise and Vibration**, and shown on **Figure 21-1 (Volume II)**.

Table 1-1 Baseline Noise Monitoring Locations - Landfall

Location identifier	Parish/location	X	Y	Nearest postcode
LF1	Ty-Mawr Farm	221685	381827	LL65 2NA
LF2	Porth-y-felin	221480	381703	LL65 2NA

4. **Table 1-1**, **Table 1-2** and **Table 1-3** contain a summary of the measured baseline noise data at landfall positions during both daytime and night-time.

Table 1-1 Baseline Noise Data Analysis – LF1 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 28/03/19 to 29/03/19	191	190	99.5	>=36.5 <37.5	36.6	34.2	39.0
Night 28/03/19 to 29/03/19	96	76	80	>=38.5 <39.5	38.8	37.6	39.7

Table 1-2 Baseline Noise Data – Landfall Zone DAYTIME

Location identifier	Date	Start Time	Duration	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
LF1	28-03-2019 – 29-03-2019	12:00	15:50	45.0	78.4	42.9	36.6
LF2	28-03-2019	15:47	1:01	49.1	86.3	47.7	41.8
	29-03-2019	09:40	1:52	46.4	86.6	45.4	40.0

Table 1-3 Baseline Noise Data – Landfall Zone NIGHT-TIME

Location identifier	Date	Start Time	Duration	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
LF1	28-03-2019 – 29-03-2019	23:00	8:00	44.5	73.7	45.3	39.0
LF2		23:31	0:15	47.4	76.0	47.4	43.7

1.2.2. Onshore Cable Corridor

5. The onshore cable corridor measurement locations are detailed within **Table 1-4** and shown on **Figure 21-1** (**Volume II**).

Table 1-4 Baseline Noise Monitoring Locations – Onshore Cable Corridor

Receptor identifier	Parish/location	X	Y	Nearest postcode
CC1	Blackthorn Farm	222618	380560	LL65 2LT
CC2	Mill Road	224485	380919	LL65 2YD
CC3	Ysgol Kingsland	225108	381290	LL65 2TG
CC4	Lon Towyn Capel	225947	380238	LL65 2TY

6. **Table 1-5**, **Table 1-6** and **Table 1-7** contain a summary of the measured baseline noise data at onshore cable corridor positions during both daytime and night-time.

Table 1-5 Baseline Noise Data Analysis – CC4 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 28/03/19 to 29/03/19	143	143	100	>=41.5 <42.5	42.1	39.9	44.4
Evening 28/03/19	227	227	100	>=42.5 <43.5	40.6	37.6	43.6
Night 28/03/19 to 29/03/19	384	384	100	>=45.5 <46.5	45.3	42.5	48.2

Table 1-6 Baseline Noise Data – Cable Corridor DAYTIME

Receptor identifier	Date	Start Time	Duration	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
CC1	28-03-2019	16:55	1:00	51.1	71.1	49.6	36.7
CC2	28-03-2019	18:00	1:00	47.9	73.4	43.6	36.1
CC3	29-03-2019	10:22	1:00	50.3	83.5	50.7	45.3
CC4	28-03-2019	13:54	1:02	70.6	87.8	53.6	46.2

Receptor identifier	Date	Start Time	Duration	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
CC4	28-03-2019	19:13	3:47	50.8	77.6	46.0	40.6

Table 1-7 Baseline Noise Data – Cable Corridor NIGHT-TIME

Receptor identifier	Date	Start Time	Duration	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
CC2	28-03-2019 – 29-03-2019	23:58	0:15	45.0	73.2	46.6	40.2
CC3	29-03-2019	00:17	0:15	53.0	82.0	53.2	41.9
CC4	29-03-2019	00:36	6:23	52.2	88.7	51.3	45.3

1.2.3. Grid Connection Substation and Switchgear Building

7. Grid Connection Substation and Switchgear Building measurement locations are detailed within **Table 1-8** and are shown on **Figure 21-1** (**Volume II**).

Table 1-8 Baseline Noise Monitoring Locations – Grid Connection Substation and Switchgear Building

Receptor identifier	Parish/location	X	Y	Nearest postcode
SS1	London Road	227039	381080	LL65 2JA
SS2	Lon Towyn Capel	225593	380859	LL65 2UQ

8. **Table 1-9**, **Table 1-10** and **Table 1-11** contain a summary of the measured baseline noise data at the Grid Connection Substation positions during both daytime and night-time.

Table 1-9 Baseline Noise Data Analysis – SS1 (LONG TERM)

Period	Total possible samples	Samples collected	% of potential samples	L_{A90} analytics (dB)			
				Mode	Average	Average – 1 standard deviation	Average + 1 standard deviation
Day 28/03/19 to 29/03/19	154	154	100	>=49.5 <50.5	49.0	47.3	50.8
Night 28/03/19 to 29/03/19	96	96	100	>=45.5 <46.5	45.4	43.3	47.5

Table 1-10 Baseline Noise Data – Grid Connection Substation DAYTIME

Receptor identifier	Date	Start Time	Duration	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
SS1	28-03-2019 - 29-03-2019	13:25	12:40	56.0	84.6	57.9	49.0
SS2	28-03-2019	15:02	0:31	57.1	82.9	55.5	41.3

Table 1-11 Baseline Noise Data – Grid Connection Substation NIGHT-TIME

Receptor identifier	Date	Start Time	Duration	L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
SS1	28-03-2019 - 29-03-2019	23:00	8:00	50.1	74.1	51.3	45.4

1.3. SUMMARY

9. In order to characterise the existing noise climate within the Morlais area a baseline noise survey was undertaken at agreed sensitive receptor locations in the vicinity of the site and across the onshore development area (see **Figure 21-1, Volume II**) between 28 and 29 March 2019.

10. Measured data were collated for each location with L_{Aeq}, L_{A90}, L_{A10}, L_{AFmax} levels determined from each specific measurement period. Background noise levels used in the assessment were obtained from the baseline measurements. The background noise levels for the unattended measurement periods were assessed using statistical analysis of the measured L_{A90} values.

11. Assessment values for receptor locations at the Landfall Substation, onshore cable corridor and Grid Connection Substation have been derived from long term and short-term measurements.

12. The baseline noise surveys were considered representative of the project study area and were undertaken at the landfall, along the onshore cable corridor and at the onshore project substation areas. The Grid Connection Substation and switchgear building receptor locations identified were also considered as being representative for the grid substation extension works.

1.4. REFERENCES

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Morlais Project
Environmental Statement

Appendix 21.2: Construction Phase Assessment

Volume III

Applicant: Menter Môn Morlais Limited

Document Reference: PB5034-ES-0212

Appendix 21.2: Construction Phase Assessment

Author: Royal HaskoningDHV

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GLOSSARY OF ABBREVIATIONS

BAT	Best Available Technology
BPM	Best Practicable Means
BS	British Standard
CoCP	Code of Construction Practice

GLOSSARY OF TERMINOLOGY

Applicant	Menter Môn Morlais Ltd.
Cable Route Joint Bays	Structures constructed at regular intervals along the cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Construction consolidation sites	Compounds which will contain laydown, storage and work areas for onshore construction works. The HDD construction compound will also be referred to as a construction consolidation site.
dB(A)	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
dB(Z) (or previously L_{Leq})	Decibels measured on a sound level meter incorporating a flat frequency weighting (Z weighting) across the frequency range.
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to the EIA and the information required to support HRA.
Grid Connection Substation	The grid connection substation at Orthios (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed Project to the national electricity grid.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.

$L_{A10,T}$	The A weighted noise level exceeded for 10% of the specified measurement period (T). L_{A10} is the index generally adopted to assess traffic noise.
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014 it is used to define the 'background' noise level.
$L_{Aeq,T}$	The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.
L_{Amax}	The maximum A-weighted sound pressure level recorded during a measurement.
Landfall	Where the offshore cables come ashore at Abraham's Bosom.
Landfall Substation	The landfall substation at Ty-Mawr (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed Project to the national electricity grid.
Mitigation areas	Areas captured within the Development Area specifically for mitigating expected or anticipated impacts.
Grid substation location	The proposed location of the grid connection substation.
Onshore cable route	This is the approximately 60m wide construction swathe within the 60m wide onshore cable corridor which would contain onshore cables as well as temporary ground required for construction.
Onshore cables	The cables which would bring electricity from landfall to the substation.
Onshore components	The combined name for all onshore infrastructure associated with the Project from landfall to grid connection.
Onshore Development area	The landfall location at Abraham's Bosom, the short onshore cable route between landfall and the landfall substation infrastructure, and the onshore cable route to the grid connection substation
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed Project from landfall to the connection to the national electricity grid.
Landfall substation location	The proposed location of the landfall substation for the proposed Project.
SoundPLAN	Noise Modelling Software used to predict noise impacts from Construction and Operational Phases associated with the Project.
Switchgear Building	The proposed building containing switchgear and metering annexe located at Parc Cybi.
Transition Pits	Underground structures that house the joints between the offshore export cables and the onshore cables within the landfall.

1. INTRODUCTION

1. This appendix to **Chapter 21, Noise and Vibration** details the results of the construction noise impact assessment modelling for Morlais Project.

2. The following section presents an overview of potential noise and vibration impacts associated with construction of the onshore infrastructure.

3. **Chapter 21, Noise and Vibration** details the methodology, assessment criteria and assumptions relevant to the assessment of construction phase noise impacts.

2. CONSTRUCTION NOISE MODELLING APPROACH

4. The construction phase was modelled using SoundPLAN noise modelling software. This package directly implements the calculation methods outlined in BS 5228 and other nationally and internationally recognised acoustic standards.

5. BS 5228 receptor categories have been derived from the measured baseline noise levels (**Appendix 21.1, Volume III**) using the 'ABC' assessment method (detailed in **section 21.8** of **Chapter 21, Noise and Vibration**).

6. Standard construction noise mitigation techniques which could be applied in order to reduce impacts by between 5dB(A) up to 10dB(A) are detailed within **section 21.10.6** of **Chapter 21, Noise and Vibration**.

7. For evening/weekends and night time reference periods in line with the conservative approach taken in the assessment, a 5dB(A) reduction only was applied to represent the effect of incorporating these mitigation measures (these will be delivered through the Code of Construction Practice (CoCP)). A 3.5m absorptive barrier was included at HDD works area, close to the equipment.

8. Where a residual impact remains following standard mitigation based on the worst-case construction phase assumptions, enhanced mitigation measures will be required at these receptors only (details of which are contained within **section 21.10.11** of **Chapter 21, Noise and Vibration**).

3. CONSTRUCTION NOISE MODELLING

3.1. LANDFALL STUDY AREA

9. **Table 3-1** to **Table 3-3** detail the results of the construction phase noise modelling at the landfall.

Table 3-1 Landfall – Cumulative HDD Construction Works Daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq,T}$ (dB)	BS5228 'ABC' Threshold	Impact Magnitude	Impact Significance
NSR 1	51.8	65 (A)	No impact	Negligible
NSR 2	49.6	65 (A)	No impact	Negligible
NSR 3	60.4	65 (A)	No impact	Negligible

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq,T}$ (dB)	BS5228 'ABC' Threshold	Impact Magnitude	Impact Significance
NSR 4	46.7	65 (A)	No impact	Negligible

Table 3-2 Landfall – HDD Works Evening and Weekends

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq,T}$ (dB)	BS5228 'ABC' Threshold	Impact Magnitude	Impact Significance
NSR 1	45.4	55 (A)	No impact	Negligible
NSR 2	39.9	55 (A)	No impact	Negligible
NSR 3	49.5	55 (A)	No impact	Negligible
NSR 4	37.5	55 (A)	No impact	Negligible

Table 3-3 Landfall – HDD Works Night Time

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq,T}$ (dB)	BS5228 'ABC' Threshold	Impact Magnitude	Impact Significance
NSR 1	45.4	50 (B)	No impact	Negligible
NSR 2	39.9	50 (B)	No impact	Negligible
NSR 3	49.5	50 (B)	No impact	Negligible
NSR 4	37.5	50 (B)	No impact	Negligible

3.2. GRID CONNECTION SUBSTATION AND SWITCHGEAR BUILDING STUDY AREA

10. **Table 3-4** to **Table 3-6**Table 3-5 detail the results of the daytime construction phase noise modelling at the Grid Connection Substation and Switchgear Building zone.

Table 3-4 Grid Connection Substation and Switchgear Building – Cumulative HDD Construction Works Daytime

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq,T}$ (dB)	BS5228 'ABC' Threshold	Impact Magnitude	Impact Significance
NSR 5	47.8	65 (A)	No impact	Negligible
NSR 6	47.8	65 (A)	No impact	Negligible
NSR 7	46.4	65 (A)	No impact	Negligible
NSR 8	49.6	65 (A)	No impact	Negligible
NSR 9	46.1	65 (A)	No impact	Negligible
NSR 10	46.9	65 (A)	No impact	Negligible

Table 3-5 Grid Connection Substation and Switchgear Building – HDD Works Evening and Weekends

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq,T}$ (dB)	BS5228 'ABC' Threshold	Impact Magnitude	Impact Significance
NSR 5	39.0	55 (A)	No impact	Negligible
NSR 6	41.4	55 (A)	No impact	Negligible
NSR 7	39.4	55 (A)	No impact	Negligible
NSR 8	40.7	55 (A)	No impact	Negligible
NSR 9	39.2	55 (A)	No impact	Negligible

NSR 10	37.0	55 (A)	No impact	Negligible

Table 3-6 Grid Connection Substation and Switchgear Building – HDD Works Night Time

Receptor	Predicted CoCP mitigated noise impact $L_{Aeq,T}$ (dB)	BS5228 'ABC' Threshold	Impact Magnitude	Impact Significance
NSR 5	39.0	55 (C)	No impact	Negligible
NSR 6	41.4	55 (C)	No impact	Negligible
NSR 7	39.4	55 (C)	No impact	Negligible
NSR 8	40.7	55 (C)	No impact	Negligible
NSR 9	39.2	55 (C)	No impact	Negligible
NSR 10	37.0	55 (C)	No impact	Negligible

4. PLATES

11. This section provides images referenced in **Chapter 21, Noise and Vibration**, covering the construction noise for Morlais. **Plate 5-1** to **Plate 5-4** show the outputs from the modelling software as part of the assessment undertaken.

5. CONCLUSION

12. For the assessed construction phases using SoundPLAN noise modelling:

- No impact magnitude is predicted at the assessed Landfall Substation receptors during the daytime, evening/weekends and night time reference periods when incorporating the specified mitigation measures (2m hoarding and 3.5m height absorptive barrier; therefore, at a medium sensitivity receptor, a Negligible impact significance.

- No impact magnitude is predicted at the assessed Grid Connection Substation/Switchgear Building receptors during the daytime, evening/weekends and night time reference periods incorporating the CoCP/BPM mitigation practices; therefore, at a medium sensitivity receptor, a Negligible impact significance.

13. For the activities calculated using the basic noise calculation method detailed in BS5228:2009+A1:2014:

- No impact magnitude is predicted at the assessed receptors during the daytime, evening/weekends and night time reference periods when the activity specific buffer zone/separation distance between the construction activity and the receptors is maintained. Through incorporating the BPM mitigation measures; the separation distance can be reduced between the construction activity and the receptors.

14. With the adoption of standard mitigation (outlined in **Chapter 21, Noise and Vibration**), enhanced mitigation measures and best practicable means, no residual impact is anticipated.

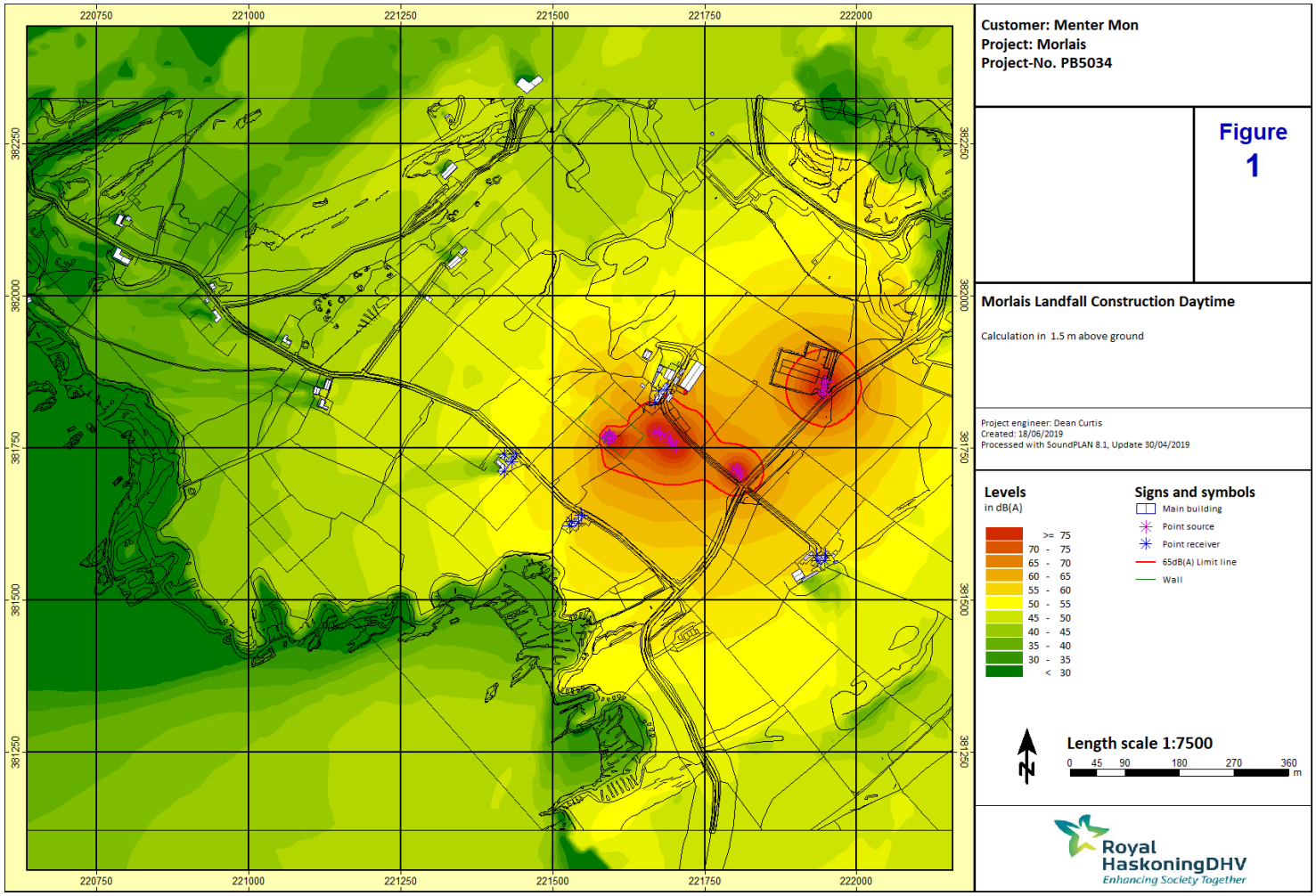

Plate 5-1 Cumulative Construction Landfall Substation Works Daytime

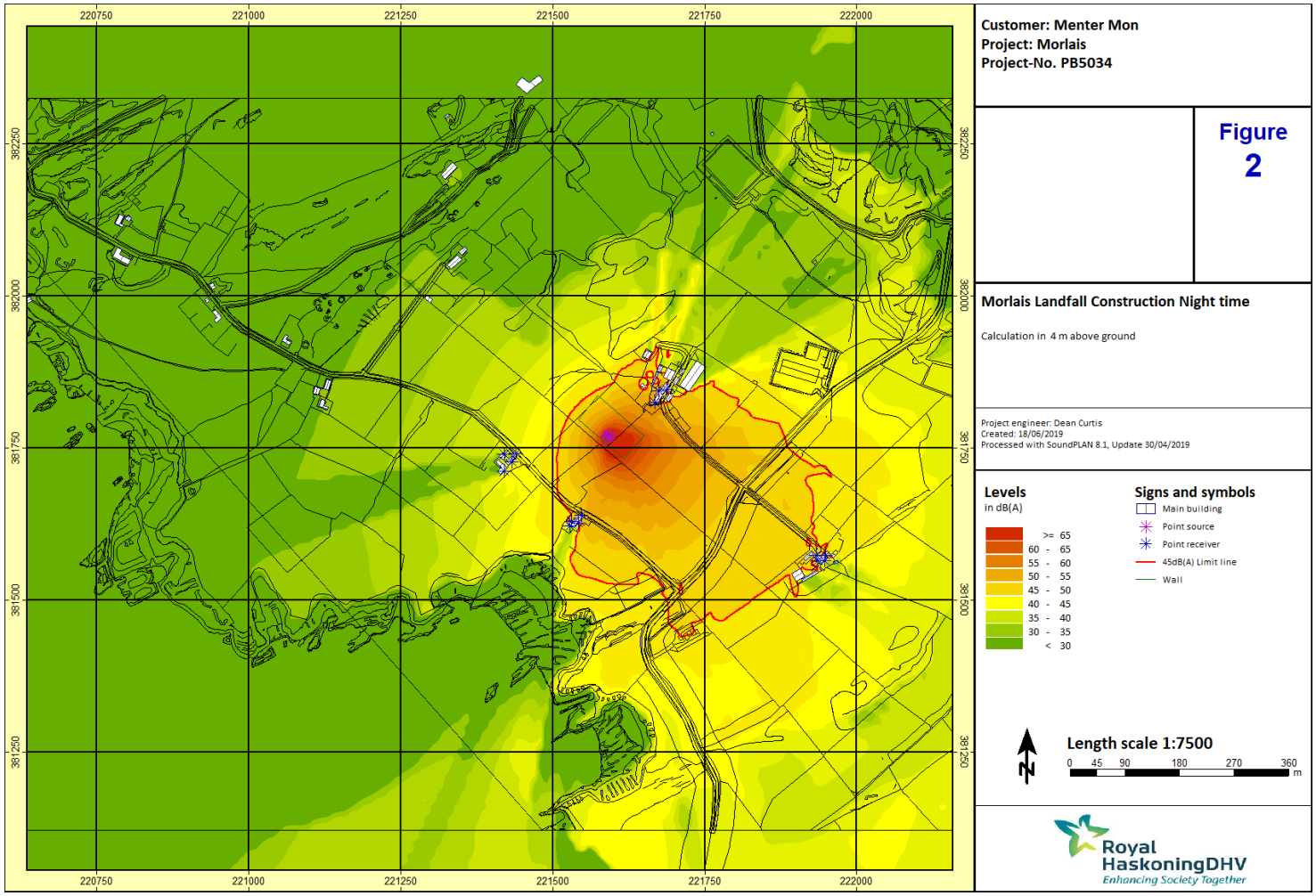

Plate 5-2 HDD Works Landfall Substation Night-Time

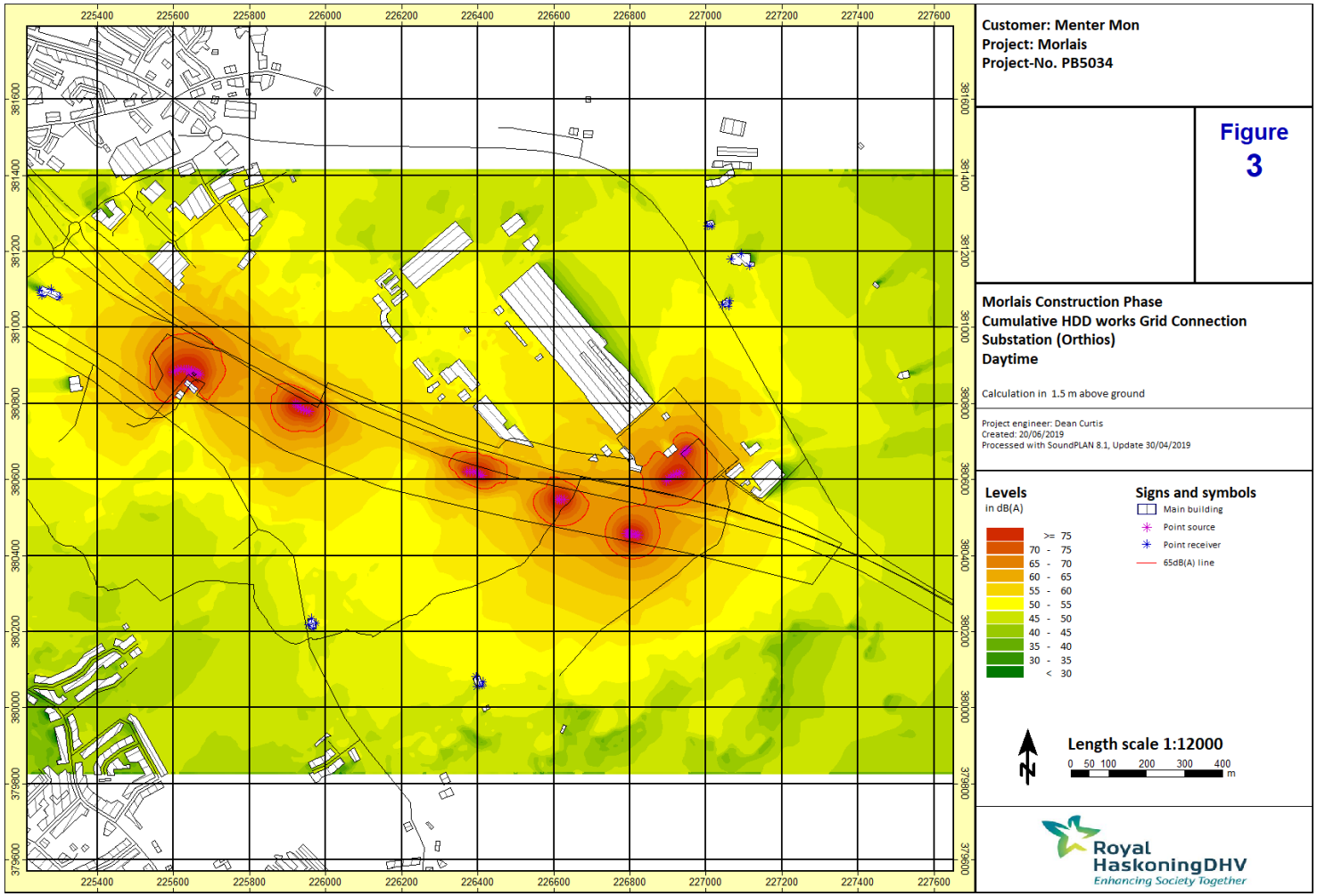

Plate 5-3 Cumulative Construction Grid Connection Substation and Switchgear Building Works Daytime

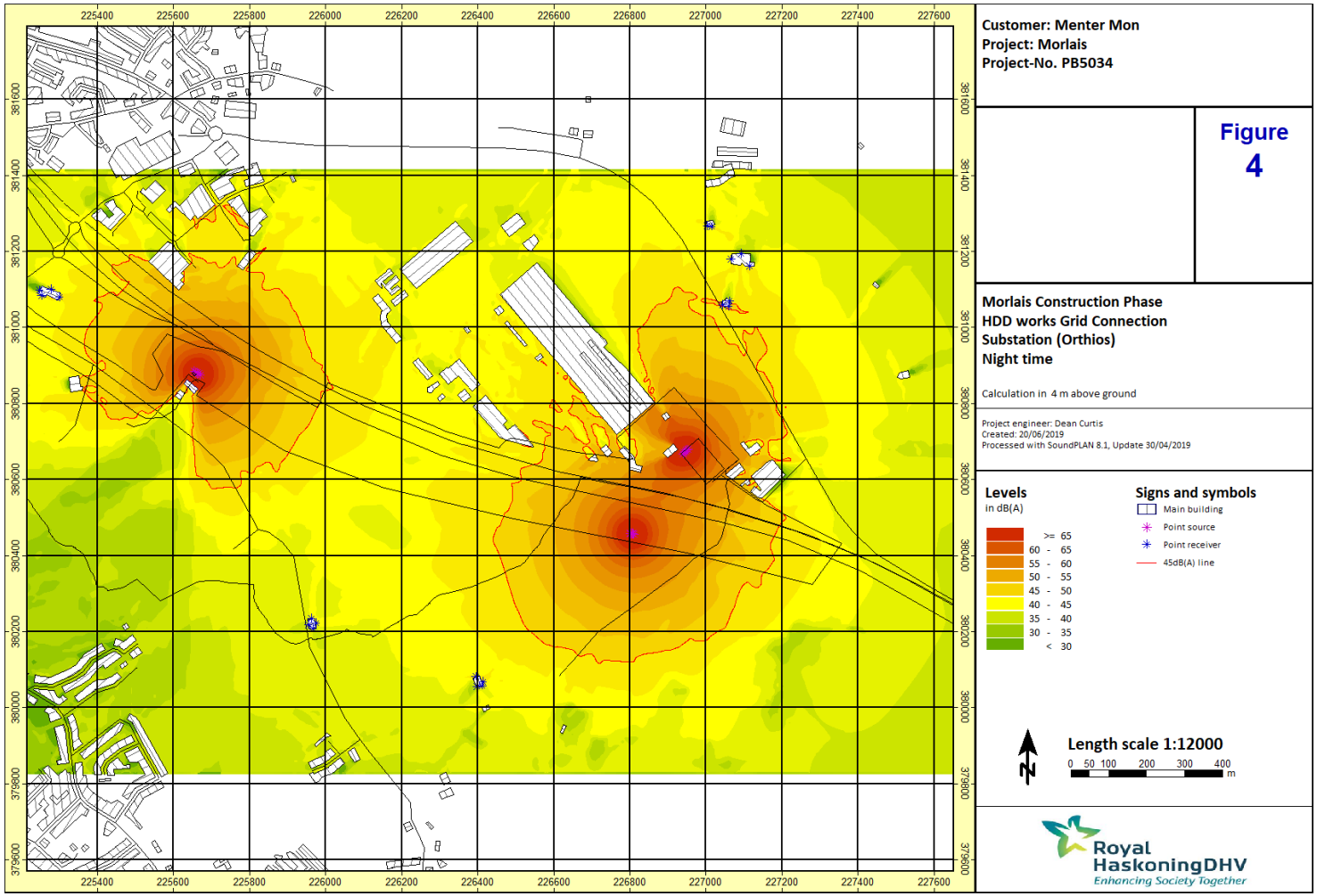

Plate 5-4 HDD Works Construction Grid Connection Substation and Switchgear Building Night-Time

6. REFERENCES

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BSI, (2014); British Standards Institution [BS] 5228-2: 2009+A1:2014 “Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration”.

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Morlais Project
Environmental Statement

Appendix 21.3: Operational Phase Assessment

Volume III

Applicant: Menter Môn Morlais Limited

Document Reference: PB5034-ES-0213

Appendix 21.3: Operational Phase Assessment

Author: Royal HaskoningDHV

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GLOSSARY OF ABBREVIATIONS

BAT	Best Available Technology
BPM	Best Practicable Means
BS	British Standard
CoCP	Code of Construction Practice

GLOSSARY OF TERMINOLOGY

dB(A)	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.
Grid Connection Substation	The grid connection substation at Orthios (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed Project to the national electricity grid.
Landfall	Where the offshore cables come ashore at Abraham's Bosom.
Landfall Substation	The landfall substation at Ty-Mawr (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed Project to the national electricity grid.
Grid substation location	The proposed location of the grid connection substation.
Onshore components	The combined name for all onshore infrastructure associated with the project from landfall to grid connection.
Onshore Development area	The landfall location at Abraham's Bosom, the short onshore cable route between landfall and the landfall substation infrastructure, and the onshore cable route to the grid connection substation
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed Morlais project from landfall to the connection to the national electricity grid.

Landfall substation location	The proposed location of the landfall substation for the proposed Project.
Rw	The weighted sound reduction index, Rw, is a single figure description of sound reduction index which is defined in BS EN ISO 717-1: 1997. The Rw is calculated from measurements in an acoustic laboratory to BS EN ISO 140-3:1997 and ratings to BS EN ISO 717-1:1997. Sound insulation ratings derived from site (which are invariably lower than the laboratory figures) are referred to as the R'w ratings (apparent weighted sound reduction index) and measured to BS EN ISO 140-4:1998
Switchgear Building	The proposed building containing switchgear and metering annexe located at Parc Cybi.

1. INTRODUCTION

1. This appendix to **Chapter 21, Noise and Vibration** details the results of the operational noise impact assessment modelling for the Project.

2. **Chapter 21, Noise and Vibration** details the methodology, assessment criteria and assumptions relevant to the assessment of operational phase noise impacts.

2. OPERATIONAL PHASE NOISE MODELLING

3. The operational phase was modelled using SoundPLAN noise modelling software. This package directly implements the calculation methods outlined in ISO9613-2 (International Organization for Standardization, 1996) and other nationally and internationally recognised acoustic standards.

3. PLATES

4. This section provides images referenced in **Chapter 21, Noise and Vibration**, covering the indicative Landfall Substation, Switchgear Building and Grid Connection Substation for the Project (**Plate 3-1** to **Plate 3-3)**. **Plate 3-4** to **Plate 3-7** show the outputs from the modelling software as part of the operational phase assessment undertaken.

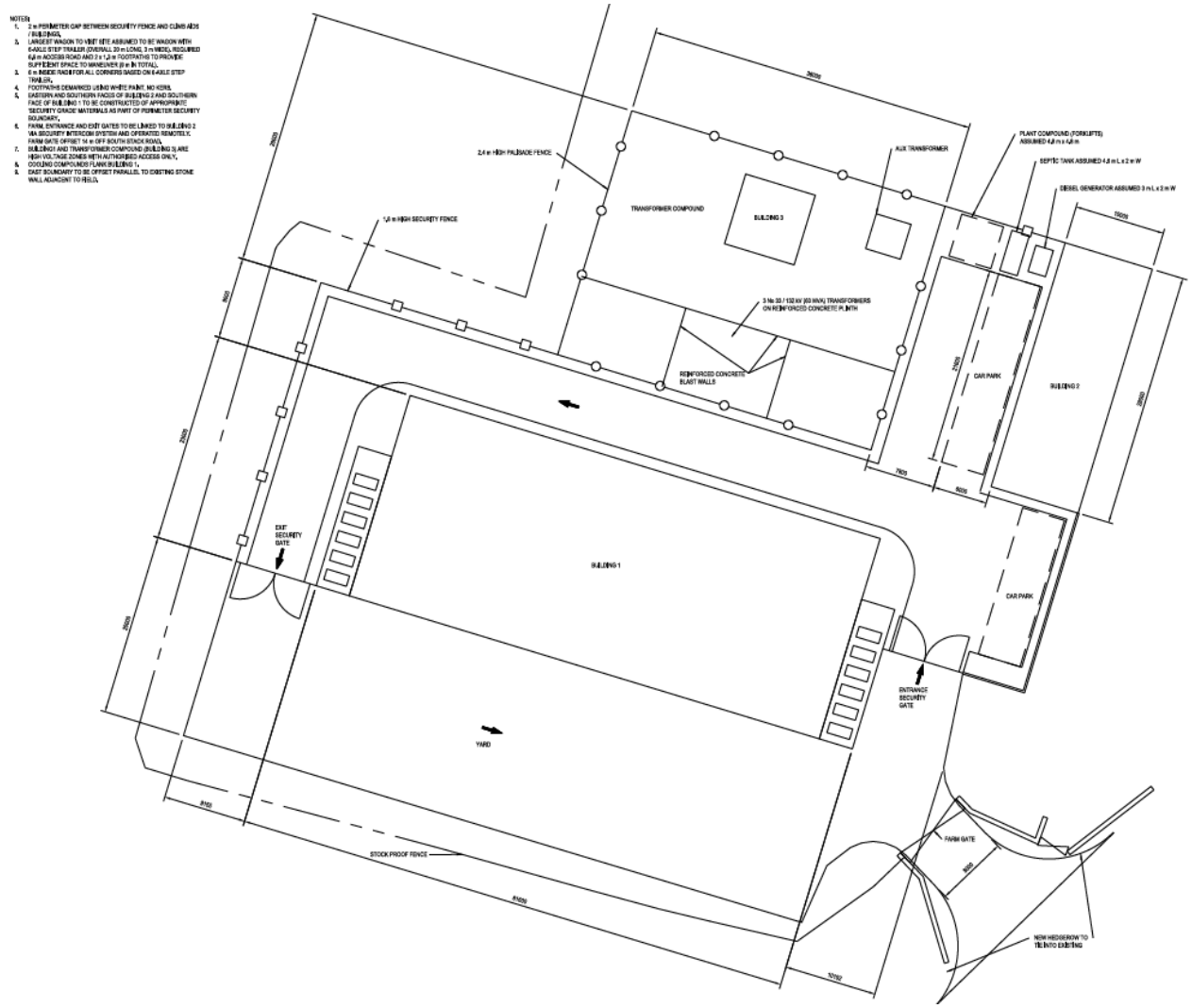

Plate 3-1 Indicative Landfall Substation Layout

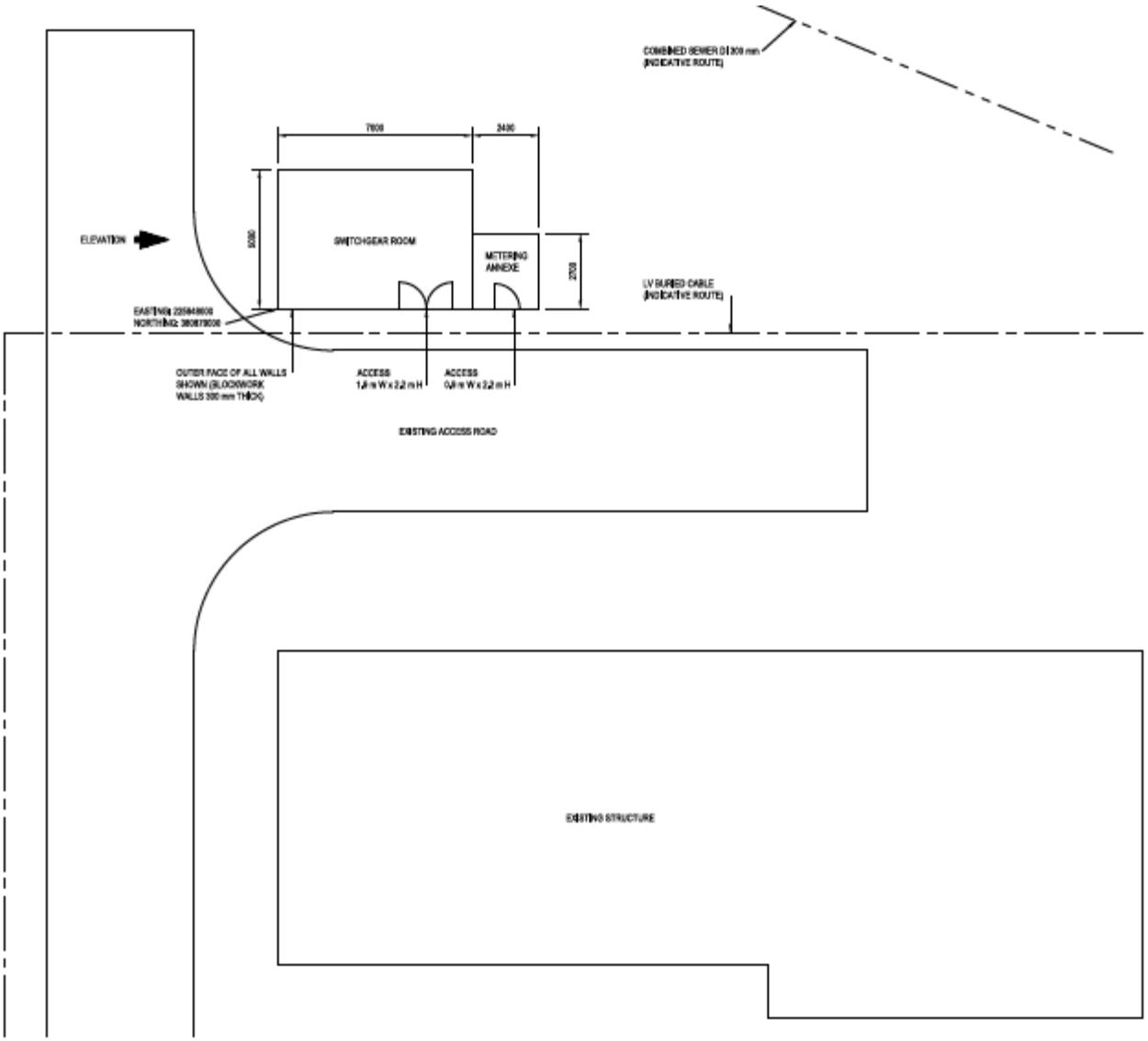

Plate 3-2 Indicative Switchgear Building (Parc Cybi) Layout

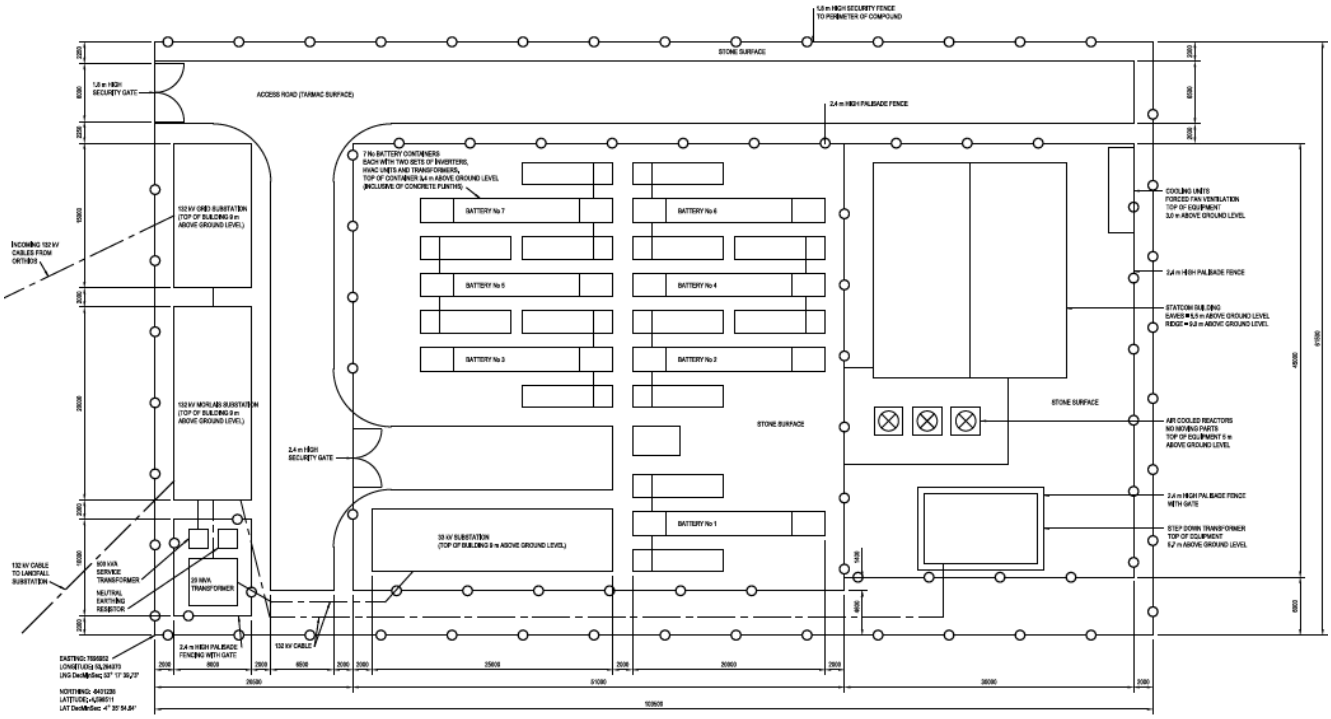

Plate 3-3 Indicative Grid Connection Substation (Orthios) Layout

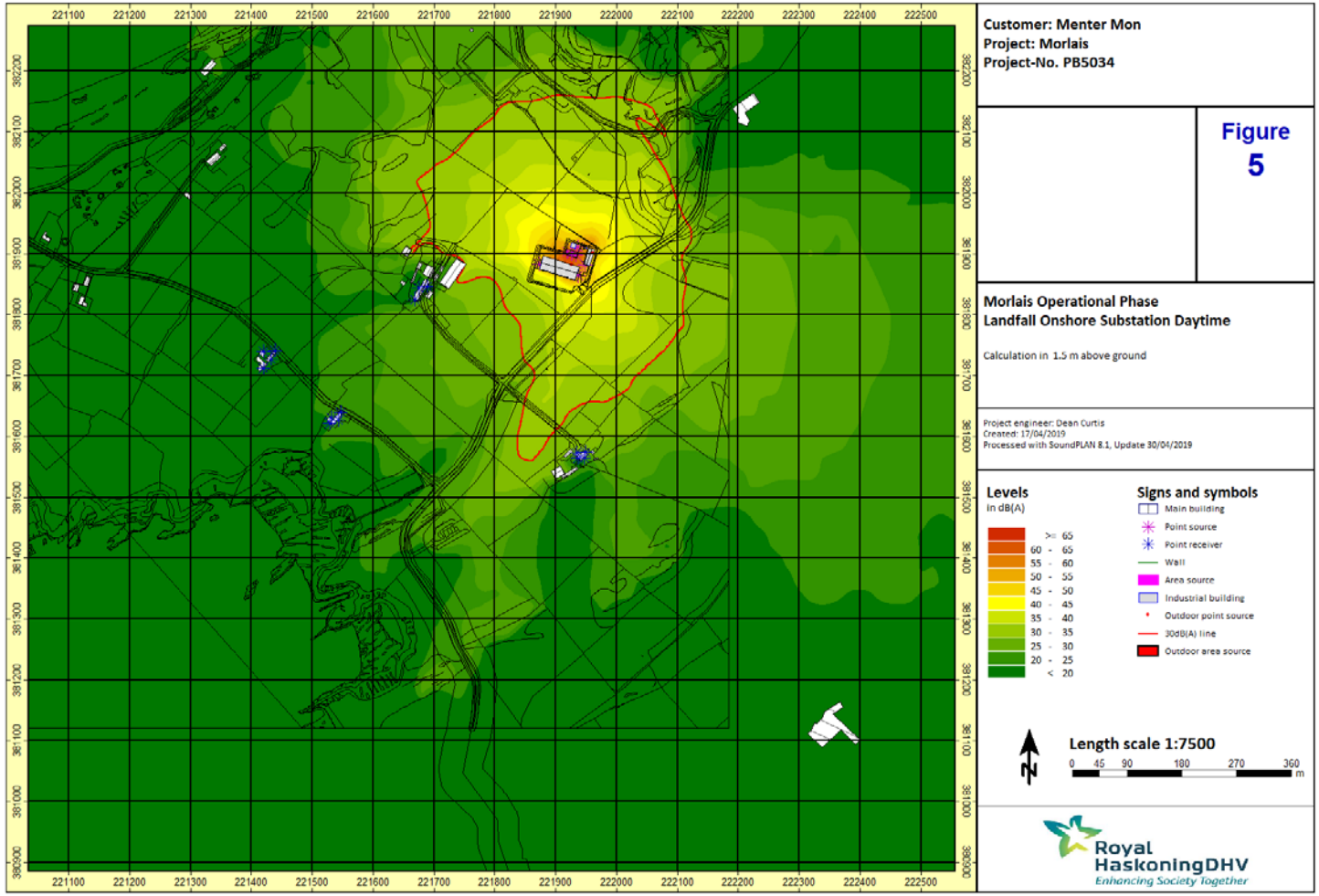

Plate 3-4 Operational Phase Landfall Substation Daytime

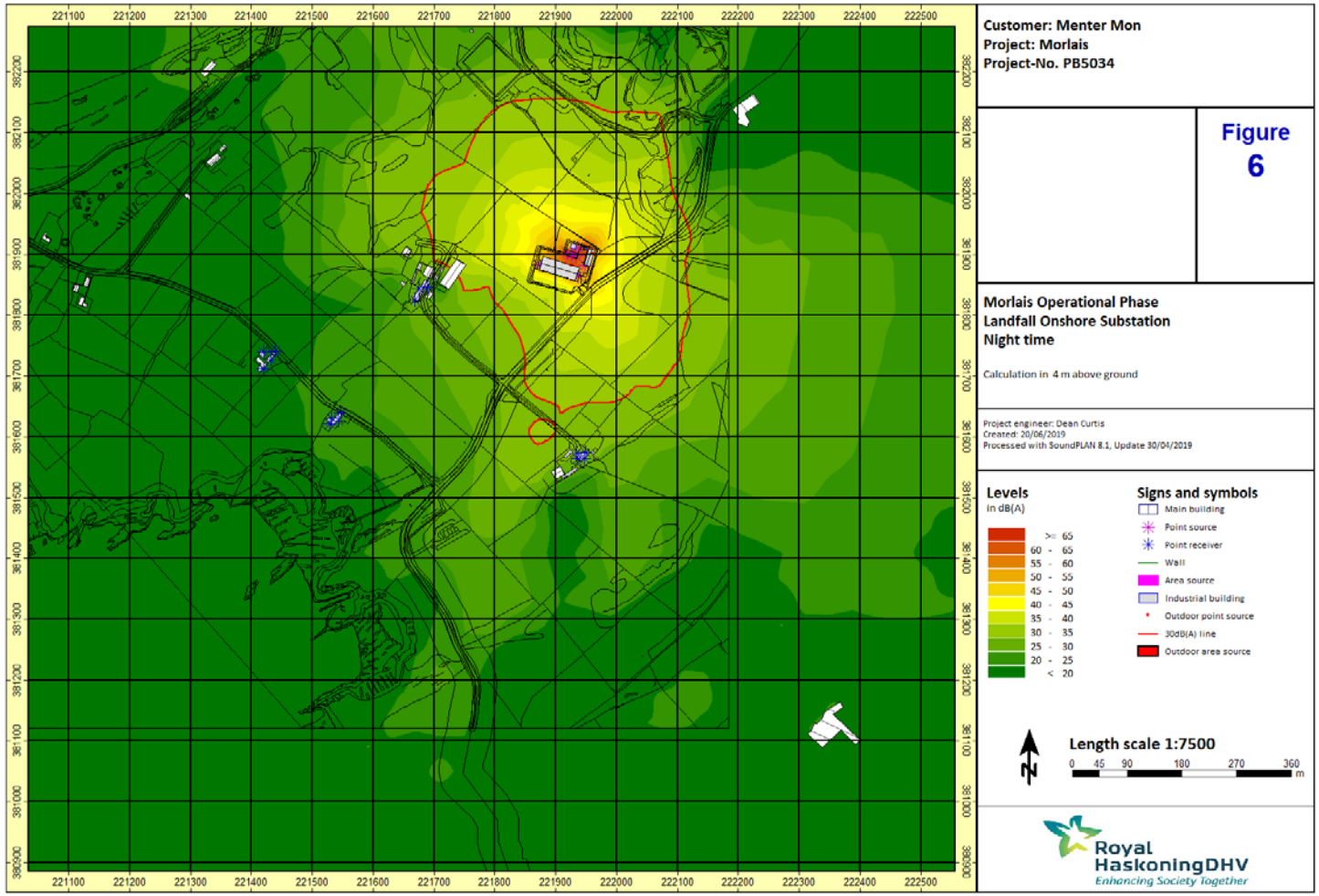

Plate 3-5 Operational Landfall Substation Night-Time

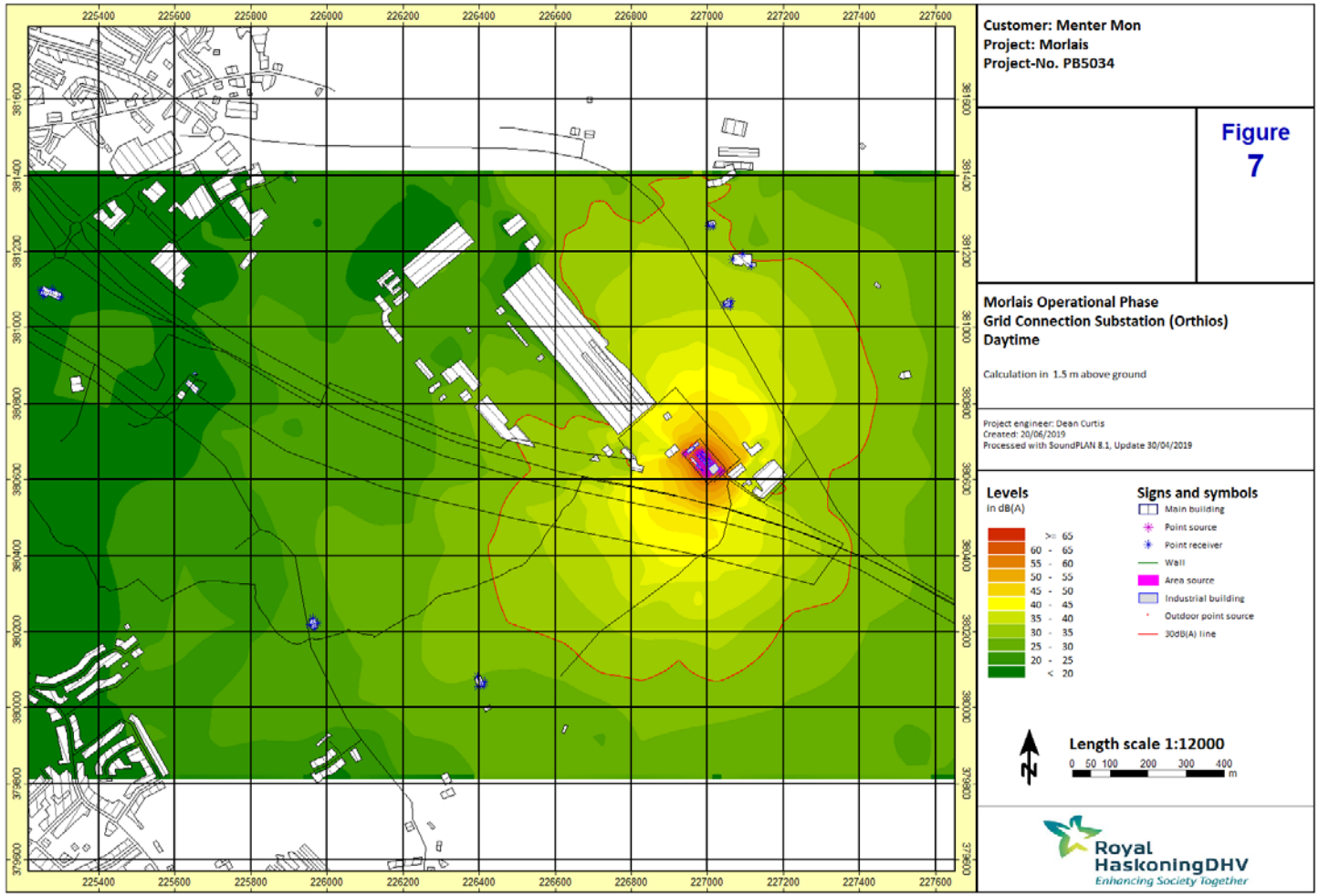

Plate 3-6 Operational Grid Connection Substation and Switchgear Building Daytime

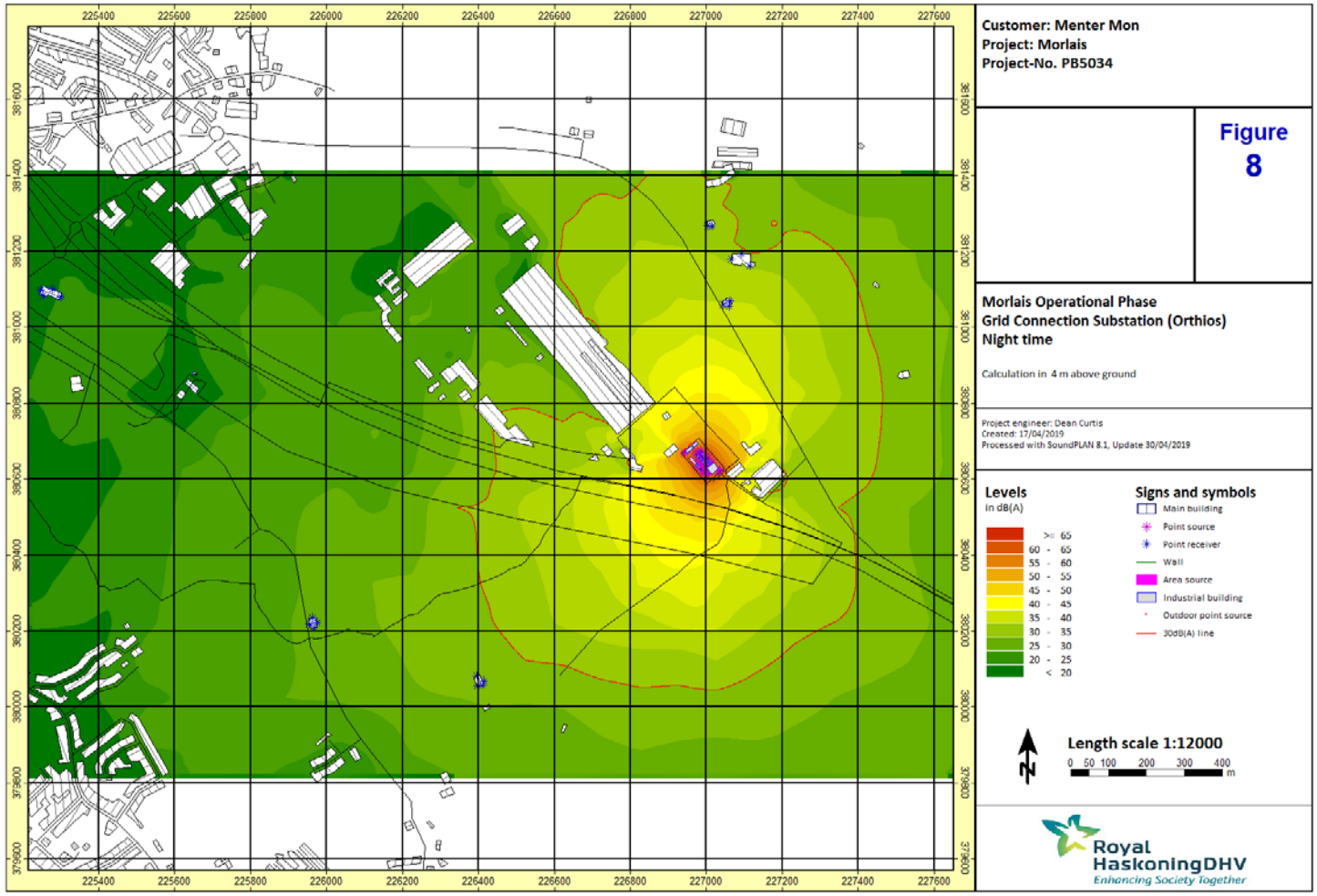

Plate 3-7 Operational Grid Connection Substation and Switchgear Building Night-Time

4. REFERENCES

International Organization for Standardization (1996). ISO9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation. ISO, Switzerland.

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Morlais Project
Environmental Statement

Appendix 21.4: Noise and Vibration Consultation Responses

Volume III

Applicant: Menter Môn Morlais Limited

Document Reference: PB5034-ES-0214

Appendix 21.4: Noise and Vibration Consultation Responses

Author: Royal HaskoningDHV

Morlais Document No.:	Status:	Version No:	Date:
MOR/RHDHV/APP/0048	Final	F3.0	July 2019

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GLOSSARY OF ABBREVIATIONS

EIA	Environmental Impact Assessment
ES	Environmental Statement

GLOSSARY OF TERMINOLOGY

Applicant	Menter Môn Morlais Ltd.
Cable Route Joint Bays	Structures constructed at regular intervals along the cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Construction consolidation sites	Compounds which will contain laydown, storage and work areas for onshore construction works. The HDD construction compound will also be referred to as a construction consolidation site.
dB(A)	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
dB(Z) (or previously L_{Leq})	Decibels measured on a sound level meter incorporating a flat frequency weighting (Z weighting) across the frequency range.
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.
Evidence Plan Process	A voluntary consultation process with specialist stakeholders to agree the approach to the EIA and the information required to support HRA.
Grid Connection Substation	The grid connection substation at Orthios (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed Project to the national electricity grid.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.

$L_{A10,T}$	The A weighted noise level exceeded for 10% of the specified measurement period (T). L_{A10} is the index generally adopted to assess traffic noise.
$L_{A90,T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014 it is used to define the 'background' noise level.
$L_{Aeq,T}$	The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.
L_{Amax}	The maximum A-weighted sound pressure level recorded during a measurement.
Landfall	Where the offshore cables come ashore at Abraham's Bosom.
Landfall Substation	The landfall substation at Ty-Mawr (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed Project to the national electricity grid.
Mitigation areas	Areas captured within the Development Area specifically for mitigating expected or anticipated impacts.
Grid substation location	The proposed location of the Grid substation.
Onshore cable route	This is the approximately 60m wide construction swathe within the 60m wide onshore cable corridor which would contain onshore cables as well as temporary ground required for construction.
Onshore cables	The cables which would bring electricity from landfall to the substation.
Onshore components	The combined name for all onshore infrastructure associated with the project from landfall to grid connection.
Onshore Development area	The landfall location at Abraham's Bosom, the short onshore cable route between landfall and the landfall substation infrastructure, and the onshore cable route to the grid connection substation
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed Morlais project from landfall to the connection to the national electricity grid.
Landfall substation location	The proposed location of the landfall substation for the proposed Project.
SoundPLAN	Noise Modelling Software used to predict noise impacts from Construction and Operational Phases associated with the project.
Switchgear Building	The proposed building containing switchgear and metering annexe located at Parc Cybi.
Transition Pits	Underground structures that house the joints between the offshore export cables and the onshore cables within the landfall.

1. INTRODUCTION

1. Consultation is a key driver of the Environmental Impact Assessment (EIA) process, and throughout the lifecycle of the Project, from the initial stages through to consent and post-consent.

2. CONSULTATION RESPONSES

2. **Table 2-1** summarises the consultation that has been undertaken for the Project that is relevant to and has informed the development of **Chapter 21, Noise and Vibration** of the Environmental Statement (ES) and provides details of how it has been taken into consideration.

Table 2-1 Consultation Responses

Consultee	Date/Document	Comment	Response
IoACC - EHO	25 March 2019 Telephone call between Royal HaskoningDHV and IoACC	Telephone conversation to discuss baseline measurement survey and assessment approach.	N/A
IoACC - EHO	25 March 2019 Email sent to Royal HaskoningDHV from IoAAC	Email follow up from Major Consents Planning Manager to Royal HaskoningDHV stating the relevant EHO will be in contact 26 March 2019.	N/A
IoACC - EHO	26 March 2019 Email sent to Royal HaskoningDHV from IoAAC	Email follow up from EHO providing contact details.	N/A
IoACC - EHO	26 March 2019 Email sent from Royal HaskoningDHV to IoAAC	Email follow to EHO providing baseline measurement survey and assessment approach.	N/A
IoACC - EHO	26 March 2019 Email sent to Royal HaskoningDHV from IoAAC	Email follow up from EHO providing comments. Approval of methodology BS4142:2014 and BS5228:2009+A1:2014. Highlight the use of TAN11. Increase measurement period from 30 minutes to 1 hour at the 4 cable corridor locations. Use of 1/3rd Octave Band measurements.	Consultation with the Environmental Health Officers at Isle of Anglesey County Council was undertaken. Details provided in **Appendix 21.4**. A baseline noise survey was undertaken at various locations representative of the nearest sensitive receptors as agreed with the relevant local authorities. Full details in **Appendix 21.2** (**Volume III**).
Planning Inspectorate	2018 Scoping	"Site-specific survey and noise sensitive receptors: It is recommended that the baseline survey and assessment methodology and choice of NSRs	Consultation with the Environmental Health Officers at Isle of Anglesey County Council was undertaken. Details

Consultee	Date/Document	Comment	Response
		should be agreed with the relevant Environmental Health Officers. The choice of receptors and assessment of impacts arising during construction and operation should be based on a justified worst case scenario."	provided in **Appendix 21.4** (**Volume III**). A baseline noise survey was undertaken at various locations representative of the nearest sensitive receptors as agreed with the relevant local authorities. Full details in **Appendix 21.2** (**Volume III**) and **Chapter 21, Noise and Vibration**.
Planning Inspectorate	2018 Scoping	"Operational impacts: With the exception of noise arising from activities at Holyhead Harbour, Table 9-8 of the Scoping Report does not consider noise during operation. It is agreed that operational noise from movement of the offshore TECs would be unlikely to result in significant effects to onshore receptors. Similarly, having regard to the characteristics of the Proposed Works, operation of the electrical connection is unlikely to result in significant effects. However, in absence of a defined location for the substation(s) and potential switch gear facility, it is considered that the ES should assess potential operational noise and vibration impacts from the substation. It is also noted that Section 9.12 (Health) of the Scoping Report proposes to assess noise disturbance from operation of the substation and Grid infrastructure."	Refer to **Chapter 21, Noise and Vibration**.
Planning Inspectorate	2018 Scoping	"Noise generating activities: The ES should provide a description of the noise generating elements of the Proposed Works during both the construction and operation stages. Any distinctive tonal, impulsive or low frequency characteristics of the noise should be identified and assessed"	Refer to **Chapter 21, Noise and Vibration**. for Construction. Refer to **Chapter 21, Noise and Vibration**. for Operational.
Planning Inspectorate	2018 Scoping	"Impacts to ecological receptors: The results of the noise and vibration assessment should be used to inform the assessment of impacts on ecological receptors."	Not covered in this Chapter. Refer to **Chapter 19, Onshore Ecology**.
NRW	2018 Scoping	We currently have no comments to make on this topic.	N/A

2.1. CONSULTATION COMMUNICATION

3. Consultation that has been undertaken with Isle of Anglesey County Council (IoACC) for the Project is detailed below.

2.1.1. Email Sent to IoACC from Royal HaskoningDHV, 13/03/2019 09:59

"We have been appointed as the noise consultants for a Proposed Development, Environmental Impact Assessment (EIA), to be carried out for the Morlais tidal energy project, on behalf of Menter Môn. The development is a proposed tidal energy scheme with associated infrastructure.

We are planning to carry out a baseline noise survey within the coming fortnight to establish the noise climate at existing identified noise sensitive receptors and to inform the impact to existing residential receptors from proposed construction and operation of the development. Please find the attached file outlining the study area and the proposed noise monitoring locations and advise if these are suitable.

We propose the following approach:

Baseline Noise Assessment:

Unattended weekday noise survey for up to 24 hours covering the daytime (07:00 to 23:00), and night time (23:00 to 07:00) periods at the landfall and substation locations in order to obtain a representative background soundscape. If the site is secure, measurements would be obtained by installing equipment at locations representative of the nearest sensitive receptors as shown using the pins on the attached file (LF1, LF2 and SS1). If the site is not secure where necessary, attended measurements would be obtained for 2 non-consecutive 1-hour measurements during the daytime and 2 non-consecutive 15min-measurements during the night-time at the proposed positions. Night time measurements would be ideally after midnight to ensure the quietest period for background. Qualitative observations will be taken throughout the survey and particular attention will be given to any activities in the vicinity of the site. These measurements will inform the assessments for construction and operational phases.

We propose to undertake attended noise monitoring along the proposed cable route (CC1, CC2, CC3 and CC4) for 30 minutes during the daytime and 15 minutes during the night-time at each location. These measurements will inform the noise impact assessment during the construction phase.

All measured data will be screened to ensure it is compliant with BS7445 i.e. windspeeds < 5m/s, no precipitation. Weather data will be measured in-situ, using an installed weather station at one of the proposed locations.

Construction Phase Assessment:
The assessment will outline offset distances between the proposed works and the receptors for the employed construction processes in accordance with BS5228-2009+A1:2014.

Operational On-site Noise Assessment
Noise modelling using SoundPlan software will be to assess the potential noise impact at the nearby receptors in accordance with BS4142:2014.

Please can you confirm that the approach is acceptable?

If you require any further information, please do not hesitate to contact me. If it would be helpful, a call can be arranged with Menter Môn and ourselves to discuss the proposals further and provide clarifications."

2.1.2. Email Received from IoACC to Royal HaskoningDHV, 25/03/2019 16:19

"*Mr Chesney*

Further to our earlier telephone conversation (16.00 hrs) I have discussed the matter with Mr Mick Goodfellow (Environmental Health Officer) who advises that he is familiar with the matter and will contact you tomorrow to discuss the issue in Mr Huw Thomas's absence.

I have also copied the Project Management Office into this exchange in order that they are kept conversant of matters.

*Mick- Mr Chesney can also be contacted on 011** 600****

Kind regards

Mr Steven Owen."

2.1.3. Email Received from IoACC to Royal HaskoningDHV, 26/03/2019 10:08

"*Hello Mr Chesney,*

I'm led to believe this matter relates to an approval for a noise methodology assessment relating to the Morlais Tidal Array.

Unfortunately, ……, but in the meantime and to avoid any project delays please use me as your noise contact.

Therefore, If you are able to send me any proposal details you may have or report findings etc. by e-mail as soon as possible then I shall begin working through the document straight away and try and get a decision back to you directly this week.

Kind regards,

Mick

Mick Goodfellow."

2.1.4. Email Sent to IoACC from Royal HaskoningDHV, 26/03/2019 10:25

"Dear Mick,

The following was sent to PMO and Huw Thomas.

We have been appointed as the noise consultants for a Proposed Development, Environmental Impact Assessment (EIA), to be carried out for the Morlais tidal energy project, on behalf of Menter Môn. The development is a proposed tidal energy scheme with associated infrastructure.

We are planning to carry out a baseline noise survey within the coming fortnight to establish the noise climate at existing identified noise sensitive receptors and to inform the impact to existing residential receptors from proposed construction and operation of the development. Please find the attached file outlining the study area and the proposed noise monitoring locations and advise if these are suitable.

We propose the following approach:

Baseline Noise Assessment:

Unattended weekday noise survey for up to 24 hours covering the daytime (07:00 to 23:00), and night time (23:00 to 07:00) periods at the landfall and substation locations in order to obtain a representative background soundscape. If the site is secure, measurements would be obtained by installing equipment at locations representative of the nearest sensitive receptors as shown using the pins on the attached file (LF1, LF2 and SS1). If the site is not secure where necessary, attended measurements would be obtained for 2 non-consecutive 1-hour measurements during the daytime and 2 non-consecutive 15min-measurements during the night-time at the proposed positions. Night time measurements would be ideally after midnight to ensure the quietest period for background. Qualitative observations will be taken throughout the survey and particular attention will be given to any activities in the vicinity of the site. These measurements will inform the assessments for construction and operational phases.

We propose to undertake attended noise monitoring along the proposed cable route (CC1, CC2, CC3 and CC4) for 30 minutes during the daytime and 15 minutes during the night-time at each location. These measurements will inform the noise impact assessment during the construction phase.

All measured data will be screened to ensure it is compliant with BS7445 i.e. windspeeds < 5m/s, no precipitation. Weather data will be measured in-situ, using an installed weather station at one of the proposed locations.

Construction Phase Assessment:
The assessment will outline offset distances between the proposed works and the receptors for the employed construction processes in accordance with BS5228-2009+A1:2014.

Operational On-site Noise Assessment
Noise modelling using SoundPlan software will be to assess the potential noise impact at the nearby receptors in accordance with BS4142:2014.

Please can you confirm that the approach is acceptable?

If you require any further information, please do not hesitate to contact me. If it would be helpful, a call can be arranged with Menter Môn and ourselves to discuss the proposals further and provide clarifications."

2.1.5. Email Received from IoACC to Royal HaskoningDHV, 26/03/2019 11:41

"Hello Sebastian,

Thank you sending the methodology and location map through.

Overall, I would approve of the methodology incorporating BS4142:2014 Methods for rating and assessing industrial and commercial sound and BS 5228-2009+A1:2014 Code of practice

for noise and vibration control on construction and open sites. Although you may also need to add Technical Advise Note 11 (TAN11 https://gov.wales/technical-advice-note-tan-11-noise) into your assessment methodology when looking at any potential noise impacts upon residential receptors (for example monitoring locations CC2 and CC3) as this guidance is pertinent in Wales.

With regards to the monitoring periods, I would consider one-hourly LAeq's (rather than 30 minute LAeq's) may be more conducive for your modelling requirements for each of the 4 monitoring cable corridor locations. I add this from local knowledge due to the Holyhead Port ferry road traffic that may significantly impact on your results at CC3 and CC4. The ferry timetable is available on-line at https://www.stenaline.co.uk/routes/holyhead-dublin/timetable

Likewise aircraft noise from the nearby RAF Valley training facility for both fixed wing (Hawk T2 jet and Texan T6C propeller aircraft) and also rotary aircraft (Griffin HR2) may also significantly impact upon these four cable corridor locations. Details can be found on the at RAF Valley website https://www.raf.mod.uk/our-organisation/stations/raf-valley/ also night-flying dates are published on-line https://www.raf.mod.uk/our-organisation/stations/raf-valley/flying-info/

With regards to monitoring your sub-station site SS1, may I suggest you monitor this location using 1/3 octave for post processing analysis. The rationale for suggesting this is that a nearby EPR permitted installation Alpoco (https://amg-s.com/aluminum-powders/) produces aluminium powder and has a large stack operational 24/7 and which potentially could be audible at your location.

Please feel free to contact me directly at any time if you need any further information or even if you wish for me to accompany you during your monitoring exercise.

Kind regards,

Mick."

3. REFERENCES

Royal HaskoningDHV (2015). Morlais Tidal Demonstration Array Scoping Report Morlais Final Report v1 PB2735. April 2015.

Royal HaskoningDHV (2016). Morlais Tidal Demonstration Zone Onshore Scoping Report Version Menter Môn 1.3 PB5034. December 2016.

Royal HaskoningDHV (2018). Morlais Tidal Array Scoping Report Version 0.1 Final I&BPB5034R001F0.1. March 2018.