Onshore Noise Impact Assessment in Relation to an Environmental Impact Assessment (EIA)

As per ERA requirements for PA/04448/22

Report

Onshore Noise Impact Assessment in Relation to an Environmental Impact Assessment (EIA)

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DISCLAIMER

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1 INTRODUCTION

A noise impact assessment (NIA) is presented in relation to the noise levels emitted from the construction phases of the Malta onshore cable route, which is part of the second electrical interconnector between Sicily and Malta (the IC2 cable link). It is considered that an operational noise assessment is not required where no significant noise-generating activity is associated with the underground cable once installed.

It is understood that the NIA would be included as part of an Environmental Impact Assessment (EIA) for the IC2 development.

The proposed onshore development, herein after referred to as the "Onshore Scheme" involves the underground onshore cable route connection which will link the submarine cable entry point to the inland Maghtab Terminal. The onshore construction will comprise trenching works along the cable route and horizontal directional drilling (HDD) works to run the cable from the submarine entry point and passing under the N1 Freeway.

The assessment has been required to provide a noise impact assessment from onshore construction in conjunction with the requirements of the Environment and Resources Authority (ERA). It is understood that there has been no formal request for a full noise and vibration impact assessment on human receptors, therefore the onshore assessment has been based on ecological aspects of the terms of reference (ToRs) provided by the ERA for the project which states the following:

'*A prediction of the potential impacts of the proposed project on the ecology of the site and its surroundings, including loss, damage or alteration of habitats and species populations (including potential increases in ambient noise levels in the marine environment) including alteration in the habitats and species' condition/state of health as measured through indicators used/specified for assessment of status in relevant EU policy'.*

This assessment considers:

- the impact of noise from construction activities associated with the Onshore Scheme upon identified ecological receptors.

This assessment is based on predicted noise emissions from proposed construction activities as impacting defined ecological receptors, with reference to recommended fixed noise limits following AQTAG09 *Guidance on the effects of industrial noise on wildlife*.

To provide further context, reference has been made to previously measured baseline environmental sound levels as representative of the site, from the Maghtab Energy to Waste Facility noise impact assessment [document ref: PA/03012/20 VERSION 1, dated 15/05/2020].

Whilst reasonable effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, a glossary of terminology is provided in **Appendix A.**

2 SITE DESCRIPTION

2.1 LOCATION AND CABLE ROUTE

The Onshore construction of the IC2 cable route comprises three main elements of construction activity: the site preparation for the horizontal directional drilling (HDD) compound, the horizontal drilling activity itself (covering the trenchless shore approach connecting the submarine cable entry point and running underneath the N1 carriageway) and the overground trenching construction works following the cable route to the Maghtab Terminal.

The Malta side geographical location of the Onshore Scheme lies in the north-eastern territory, indicated in red in Figure 1.

FIGURE 1: ONSHORE PROJECT LOCATION

The proposed onshore cable route map is indicated in red in Figure 2 below.

FIGURE 2: ONSHORE CABLE ROUTE MAP

2.2 ECOLOGICAL RECEPTORS

The identified ecological receptor locations are described in Table 1 below and annotated approximately in Figure 3 further below.

TABLE 1: NOISE SENSITIVE RECEPTORS

NOISE-SENSITIVE RECEPTOR	DESCRIPTION OF RECEPTOR	DISTANCE TO SITE BOUNDARY, M (APPROX.)
NSR1	The Ghadira s-Safra Nature Reserve to the east of the preferred cable route; and	300
NSR2	Blata tal-Ghallis SPA located off-shore to the north-east of the preferred cable route.	600

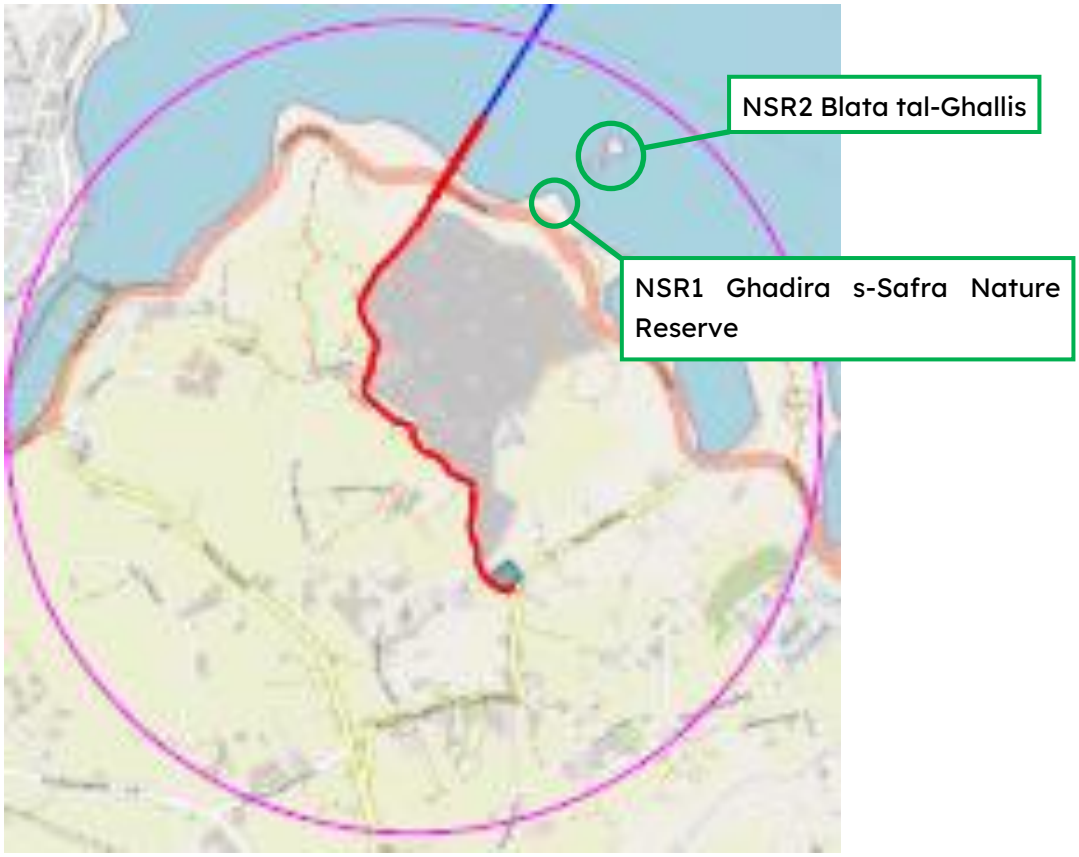

FIGURE 3: ECOLOGICAL RECEPTORS

3 TERMS OF REFERENCE

This assessment has been conducted in accordance with the onshore ecological aspects of the Terms of Reference (ToR) as published by the Environment and Resources Authority (ERA) in July 2022 '*for the preparation of an environmental impact assessment*', reference *EA-00018_21*.

The description from section 3.4 of the ToR in relation to noise is reproduced below:

3.4 Ecology (including Terrestrial Ecology, Avifauna & Marine Ecology)

5. A prediction of the potential impacts of the proposed project on the ecology of the site and its surroundings, including loss, damage or alteration of habitats and species populations (including potential increases in ambient noise levels in the marine environment) including alteration in the habitats and species' condition/state of health as measured through indicators used/specified for assessment of status in relevant EU policy;

The described ecological receptors described in Section 2.2 have been established as relevant to this assessment.

4 CONSULTATION AND METHODOLOGY, GUIDANCE AND STANDARDS

4.1 CONSULTATION AND METHODOLOGY

The proposed assessment methodology was approved by the Environment and Resources Authority (ERA) in January 2023.

A summary of the agreed assessment methodology is provided below.

- noise levels generated by the construction of the underground cable route, including any HDD operations would be predicted at the nearest ecological receptors to the Site.
- The predicted noise levels would be assessed in accordance with the absolute limits contained in AQTAG09 Guidance on the effects of industrial noise on wildlife; and
- The predicted levels would also be compared to the ambient levels measured as part of the Maghtab Waste to Energy assessment to determine whether construction operations would cause a significant change/increase in the ambient noise climate.

The results of the assessment would then indicate whether any noise mitigation measures would be required to reduce any identified impacts, which would be included as part of the assessment if deemed necessary.

4.2 GUIDANCE AND STANDARDS

The construction noise levels have been predicted in conjunction with the most appropriate guidance, in this case calculation algorithms contained in BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.*

As previously stated the predicted noise levels have then been assessed in conjunction with the absolute limits contained in AQTAG09 Guidance on the effects of industrial noise on wildlife.

A summary of the guidance documents referenced above is provided below.

4.2.1 British Standard 5228-1:2009+A1:2014 (BS 5228)

Construction noise levels have been calculated in accordance with BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*. This standard sets out a methodology for predicting noise levels arising from a wide variety of open site activities and contains tables of sound power levels generated by a wide variety of mobile and fixed plant equipment.

Noise levels generated by open site construction operations and experienced at local receptors will depend upon a number of variables. The most significant of which are likely to be the amount of noise generated by plant and equipment being used during the construction phases, generally expressed as a sound power level:

- The periods of operation of the plant, known as the "on-time";
- The distance between the noise source and the receptor, known as the "stand-off";
- The attenuation due to ground absorption or barrier screening effects;
- Reflections of noise due to the presence of hard vertical faces such as walls.

4.2.2 Air Quality Technical Advisory Group 09 Guidance on the effects of industrial noise on wildlife (ATAG09)

Air Quality Technical Advisory Group 09 *Guidance on the effects of industrial noise on wildlife* (ATAG09), provides guidance to assist planning and/or licensing officials handling pollution prevention and control applications for industrial installations on relevant noise emissions and relates these to the requirements of the Habitats Regulations.

The HABITATS DIRECTIVE (92/43/EEC) specifies that, where specific noise from industry (and in this case construction activity), measured at the habitat / nest site is below the levels in Table 2, it is considered unlikely that it will have an adverse impact on designated species. Where noise levels are exceeded further, more detailed assessment will be required.

TABLE 2: SPECIFIC NOISE LEVELS AT HABITAT / NEST SITES

PARAMETER	NOISE LEVEL, DB
$L_{Aeq, 1hr}$	55
L_{Amax}	80

5 ASSESSMENT CRITERIA

In this section the sensitivity criteria, impact magnitude and the level of effect have been described. A summary of the significance of impact will be put forward in terms of whether the impact is considered not significant, of minor significance, of moderate significance, or of major significance.

5.1 RECEPTOR SENSITIVITY

The level of significance is determined in relation to the magnitude of impact together with the sensitivity of the receptor. Different noise-sensitive receptors (NSRs) can be classified in levels of sensitivity: High, Medium, Low and negligible as described in Table 3 below.

TABLE 3: LEVEL OF SENSITIVITY ASSOCIATED WITH VARIOUS NSRS

SENSITIVITY	DESCRIPTION OF NSRS
High	Residential properties (night-time), Schools and healthcare building (daytime)
Medium	Residential properties (daytime), SAC, SPA, SSSI (or similar areas of special interest)
Low	Offices and other non-noise producing employment areas
Negligible	Industrial areas

5.2 AQTAG LIMITS

The HABITATS DIRECTIVE (92/43/EEC) specifies that, where specific noise from industry, measured at the habitat/nest site is below the levels in Table 3, it is considered unlikely that it will have an adverse impact on designated species. Where noise levels are exceeded, more detailed assessment may be required. For the purposes of this assessment, the AQTAG daytime limit of 55 dB $L_{Aeq,\ 1\ hr}$ will be used. Although a detailed analysis of the maxima sound pressure levels in terms of $L_{Amax,F}$ is outside of the cope of this assessment, it is considered that the maxima event levels are unlikely to be exceeded at the receptor locations as a result of construction noise, based on the standoff distances and the construction activities involved.

TABLE 4: SPECIFIC NOISE LEVEL LIMITS AT ECOLOGICAL HABITATS

PARAMETER	NOISE LEVEL, DB
$L_{Aeq,\ 1hr}$	55
L_{Amax}	80

5.3 IMPACT MAGNITUDE

Based on the above guidance limits, the impact magnitude of the proposed development during the construction phase is defined in Table 5 and Table 6.

TABLE 5: IMPACT MAGNITUDE - AQTAG

MAGNITUDE	DESCRIPTION
Major	Limit value exceeded by more than 5dB
Moderate	Limit value exceeded between 3.0 and 4.9dB
Minor	Limit value exceeded between 1.0 and 2.9dB
Negligible	Limit value exceeded between 0.1 and 0.9dB

TABLE 6: IMPACT MAGNITUDE – EXISTING AMBIENT LEVELS

MAGNITUDE	DESCRIPTION
Major	Greater than 10 dB L_{Aeq} change in sound level at a noise-sensitive receptor
Moderate	A 5 to 9.9 dB L_{Aeq} change in sound level at a noise-sensitive receptor
Minor	A 3 to 4.9 dB L_{Aeq} change in sound level at a noise sensitive receptor
Negligible	Less than 2.9 dB L_{Aeq} change in sound level at a noise-sensitive receptor (inaudible change under normal conditions)

5.4 LEVEL OF EFFECT

The different levels of effect relating the magnitude of impact with a medium sensitivity for ecological receptors are defined in Table 7.

TABLE 7: LEVEL OF EFFECT

MAGNITUDE OF ADVERSE IMPACT	LEVEL OF EFFECT RELATIVE TO ECOLOGICAL RECEPTOR OF MEDIUM SENSITIVITY
Major	Substantial
Moderate	Moderate
Minor	Minor

MAGNITUDE OF ADVERSE IMPACT	LEVEL OF EFFECT RELATIVE TO ECOLOGICAL RECEPTOR OF MEDIUM SENSITIVITY
Negligible/no change	Minor/Neutral

Note: Effects of 'moderate' significance or greater are defined as significant with regards to the EIA Regulations 2017.

6 BASELINE CONDITIONS

6.1 BASELINE SOUND SURVEY

The assessment is based on the fixed noise limit guidelines established for the identified ecological receptors. For additional context, reference is made to a previous baseline sound survey for the Maghtab Waste to Energy Facility carried out in early 2020, which describes the existing sound climate about the development area (document Ref: PA/03012/20 VERSION 1, dated 15/05/2020).

Baseline sound measurements were undertaken during both daytime and night-time periods at four locations as indicated in Figure 4.

- P1: Next to two residential units along the northernmost part of Triq ir-Ramla;
- P2: Next to residential units along the southernmost part of Triq ir-Ramla;
- P3: Inside Salini nature reserve, also to include Hotel Salini;
- P4: Next to a popular bathing area just off Tul il-Kosta.

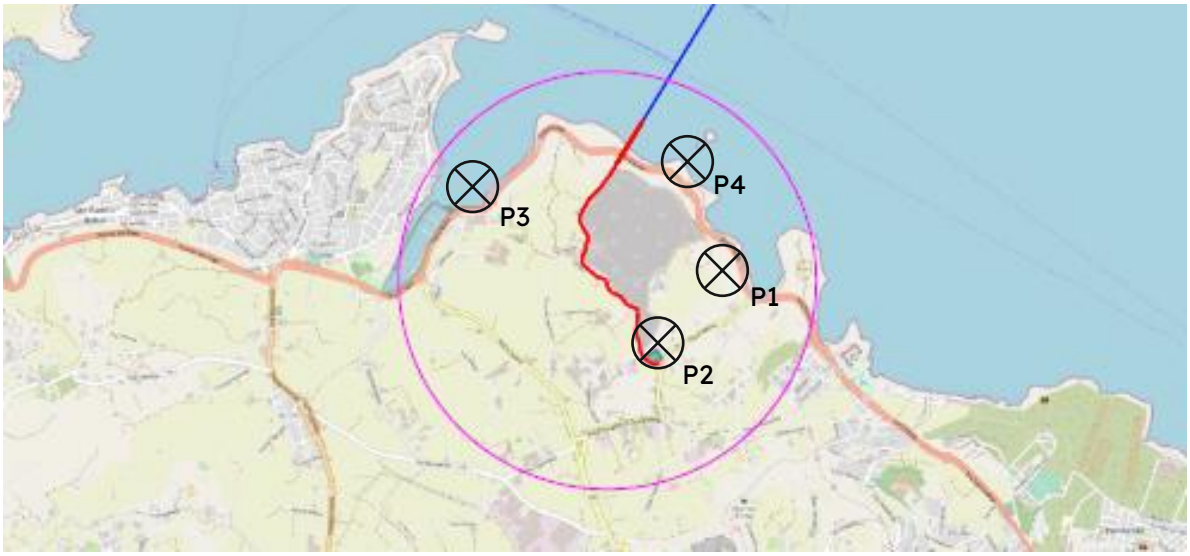

FIGURE 4: NOISE MONITORING LOCATIONS

The results of the sound survey are summarised in Table 8 including the median background sound level (L_{A90}), median L_{A10} and the ambient noise level (L_{Aeq}) and the highest L_{AFmax} values. The daytime period is taken between 07:00 and 23:00 hours and the night-time between 23:00 and 07:00 hours

TABLE 8: SOUND SURVEY SUMMARY

LOCATION	TIME PERIOD	L_{AEQ}	L_{A90}	L_{A10}	L_{AFMAX}
P1	Daytime	58.9	41.3	60.1	83.6
	Night-time	46.9	35.9	40.8	75.7
P2	Daytime	70.0	47.7	72.0	95.5
	Night-time	54.7	36.9	45.9	80.6
P3	Daytime	71.7	55.7	75.3	90.1
	Night-time	66.3	42.1	66.2	86.5
P4	Daytime	57.7	54.1	58.8	84.4

Measurement location P4 is representative of the prevailing sound climate at the identified ecological receptors and has been considered most relevant to this assessment in context. The measured daytime level has been summarised as 58 dB $L_{Aeq,16\ hour}$ rounded to the nearest decibel.

7 IMPACT ASSESSMENT

7.1 CONSTRUCTION PHASE NOISE EFFECTS

An assessment of construction noise has been completed with reference to BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites*, as an applicable working methodology to assess construction noise.

The BS 5228 calculation methods allow $L_{Aeq,T}$ noise levels to be determined for various site activities. The value of any such prediction is necessarily limited by the number of assumptions that must be made regarding the number and type of plant to be utilised, their location and detailed operating arrangements. Some of this information will be clarified as the project design progresses, but other information (such as exactly where the plant operates and for how long) will remain uncertain, even after works have commenced.

A schedule of construction plant has been agreed with the client as a preliminary selection of likely plant associated with the phases of activity assessed. The available information in BS 5228 Part 1 is considered sufficient to perform a generic noise assessment, focussing on key activities, along with SLR reference sound data for horizontal directional drilling plant.

An eight-month construction programme overview has been provided by the client; this assessment will consider the likely worst-case scenarios for the relevant phases of construction including site preparation, horizontal directional drilling, and cable route trenching works. All onshore construction works have been considered for daytime operation.

The following construction phases are considered:

- Phase 1 – Site Preparation: Preparing the land and access for the site compound.
- Phase 2 – Horizontal Directional Drilling (HDD) and Trenching. HDD compound located at sub marine cable entry point, routing cable under the N1 carriageway. The HDD will comprise a temporary construction compound with an approximate area 2,800 m^2. Trenching and laying of underground cable route will run to the Maghtab Terminal.

For each working phase, the items of plant and equipment which could be utilised have been considered, and with reference to Annex C of BS 5228:2009+A1:2014 and SLR reference data as agreed with the client. The corresponding sound power levels (L_{WA}) have been determined for each plant/activity, along with the assumed percentage (%) on-time for each item of plant and/or equipment per phase. This is detailed in Table 9.

It is acknowledged that there are likely to be other sub-phases of the construction work required; however, the main phases identified are considered to give a reasonable indication of the likely impact during the construction programme. The HDD and Trenching route activities have been considered under a single phase (Phase 2) as potential concurrent activity and tending toward a worst-case.

TABLE 9: CONSTRUCTION PLANT DETAILS – PHASE 1 SITE PREPARATION

WORKING PHASE	PLANT	SOUND POWER LEVEL, DB LWA	NO. PLANT	PERCENTAGE ON-TIME	DATA SOURCE
Phase 1 site preparation	20T Dumper	109	3	100	BS 5228
	Smooth Drum vibro road roller	103	1	100	BS 5228
	21T excavator	106	2	100	BS 5228
	5T Forward Tipping Dumper	106	1	100	BS 5228
	Loading shovel	108	1	100	BS 5228
	Tractor & fencing kit	108	1	100	BS 5228
	Tractor & trailer	107	1	70	BS 5228
	Tractor & Fuel bowser (or self-propelled)	117	1	10	BS 5228
	Tractor & Water bowser (for dust suppression)	111	1	25	BS 5228
	Grader	114	1	100	BS 5228
	Telehandler	107	1	70	BS 5228
	Mobile self-contained welfare unit	94	1	25	BS 5228
	Mobile generator	102	2	25	BS 5228
Phase 2 HDD plant	Generator	102	1	100	SLR reference data
	Telehandler	107	2	75	BS 5228

WORKING PHASE	PLANT	SOUND POWER LEVEL, dB LwA	NO. PLANT	PERCENTAGE ON-TIME	DATA SOURCE
	Directional Drill Generator	105	1	100	SLR reference data
	Mounting supports for directional drill (hydraulic hammer)	115	1	25	SLR reference data
	Mud Pump	108	1	100	SLR reference data
	Mixing Tank	103	1	100	SLR reference data
	Cuttings / Recycling Tank	108	1	100	SLR reference data
Phase 2 Trenching Plant	Trencher	105	2	50	Based on 40t Excavator as worst-case BS 8223 C4 ref 63
	Transit mixer for the transportation of lean mix to cover to fill the lower third (600mm) of the trench	108	2	20	Based on concrete truck mixer BS 5228 C4 Ref 20
	Petrol driven winch to pull the cable trough the trench	101	1	10	BS 8223 D.4 Ref 23
	Asphalt paving equipment	108	1	10	BS 8223 D.8 ref 26

Using the sound power levels and associated percentage on-times shown in Table 9 noise levels from each construction activity have been predicted at the identified ecological receptors to the Site.

The predictions have been undertaken using the proprietary noise modelling software CadnaA which incorporates the methodology outlined in BS 5228:2009+A1:2014. The model assumes mixed hard and soft ground (G = 0.5) and applies the screening effect of barriers from Figure F.3 of BS 5228:2009+A1:2014 at 500Hz.

The trenchless drilling compound plant has been positioned at the indicated directional drilling area as indicated in the client supplied HDD laydown drawing provided in **Appendix C.**

For simplicity and in representation of a worst-case assessment, all activities have been predicted to occur simultaneously to provide a single computer model output for each phase. In all cases, it is likely that plant would operate for shorter periods and not all activities would occur at the same time, resulting in lower noise levels. The graphical outputs have been provided in **Appendix B**; the Phase 2 output includes an indicative stand-off distance (shown in green) to represent a predicted level of 55 dB $L_{Aeq,T}$ at approximately 100 m from the trenching construction route, for context.

The predicted construction noise levels have been summarised in Table 10 and have been rounded to the nearest decibel (dB).

TABLE 10: PREDICTED CONSTRUCTION NOISE LEVELS

LOCATION	CONSTRUCTION PHASE	PREDICTED NOISE LEVEL
NSR1 Ghadira s-Safra Nature Reserve	Phase 1 Site Preparation	50
	Phase 2 HDD and Trenching	57
NSR2 Blata tal-Ghallis SPA	Phase 1 Site Preparation	47
	Phase 2 HDD and Trenching	54

7.2 AQTAG – CONSTRUCTION NOISE ASSESSMENT

The predicted noise levels from each phase of working have been assessed in against the guideline noise limits from Table 5 which defines the AQTAG09 target assessment limit of 55dB $L_{Aeq,1hr}$.

TABLE 11: PREDICTED CONSTRUCTION NOISE LEVELS AND ASSESSMENT

LOCATION	CONSTRUCTION PHASE	PREDICTED NOISE LEVEL, DB $L_{AEQ,T}$	GUIDANCE LIMIT, DB $L_{AEQ,T}$	DIFFERENCE, DB	IMPACT MAGNITUDE
NSR1	Phase 1 Site Preparation	50	55	-5	Negligible
	Phase 2 HDD and Trenching	47	55	-8	Negligible
NSR2	Phase 1 Site Preparation	57	55	+2	Minor
	Phase 2 HDD and Trenching	54	55	-1	Negligible

With reference to Table 11 the magnitude of the impact would be *negligible* at NSR1 and *negligible* at NSR2 for Phase 2 and *Minor* at NSR 2 for Phase 1, following Table 5 definition of magnitude. The level of effect would correspondingly be *neutral* or in the worst-case *minor,* following Table 7 definitions for levels of effect. Where the level of effect is neutral or minor, the impact is not significant.

7.3 ASSESSMENT OF CONSTRUCTION OPERATIONS ON EXISTING AMBIENT LEVELS

The predicted noise levels have also been assessed against the existing ambient noise levels to determine if there will any significant changes in the ambient level due to construction noise.

The changes in the ambient levels have been calculated by logarithmically adding the predicted specific sound level from construction operations to the daytime ambient levels ($L_{Aeq,T}$) measured measurement at location P4, which is representative of the prevailing sound climate at the identified ecological receptors, as described in Section 6.1.

The changes in ambient levels is shown in Table 12 below.

TABLE 12: CHANGES IN AMBIENT NOISE LEVEL DUE TO CONSTRUCTION NOISE

LOCATION	CONSTRUCTION PHASE	PREDICTED NOISE LEVEL, DB $L_{AEQ,T}$	EXISTING AMBIENT NOISE LEVEL	CALCULATED AMBIENT LEVEL, $L_{AEQ,T}$	CHANGE IN AMBIENT NOISE LEVEL, $L_{AEQ,T}$	IMPACT MAGNITUDE
NSR1	Phase 1 Site Preparation	50	58	58.6	+0.6	Negligible
	Phase 2 HDD and Trenching	47		58.3	+0.3	Negligible
NSR2	Phase 1 Site Preparation	57		60.5	+2.5	Negligible
	Phase 2 HDD and Trenching	54		59.5	+1.5	Negligible

With reference to Table 12 the magnitude of the impact of the changes in the ambient noise levels due to construction noise would be *negligible* at both NSR's considered during both construction phases, following Table 6 definition of magnitude.

The level of effect would correspondingly be neutral, following Table 7 definitions for levels of effect. Where the level of effect is neutral, the impact is not significant.

7.4 CONSTRUCTION TRAFFIC NOISE

The proposed Onshore Scheme would generate additional traffic on the local road network during its construction, with the proposed access to the site compound from the nearby coast road, Tul Il-Kosta. The majority of construction traffic is expected to be related to the site preparation and drilling compound operation. The overall duration of the HDD construction is not expected to last more than two months whilst the actual drilling itself is estimated to take approximately ten days. Therefore, vehicle trip generation during the construction of the proposed Onshore Scheme would be low intensity, short-term and temporary.

The laydown area for the HDD includes all the necessary facilities to avoid significant movement in and out of the site. Therefore, during the drilling operation, minimal vehicular movement is expected mainly for transfer of personnel or consumables. The compound area is understood to include the necessary pits for collection of drilling material via a hook loader, daily to remove the extracted volume.

Based on the above, it is considered likely that a low volume of site traffic would have a negligible impact relative to the overall volume of traffic already accommodated on the coast road which is notably a dual carriageway and a primary, national traffic route with relatively high volumes of existing traffic flow. Based on these straight-forward operational assumptions and site context, the noise impact of site road traffic has been considered negligible and therefore not significant.

7.5 MITIGATION MEASURES

7.5.1 Construction Noise

The noise impact from construction activities has been predicted as not significant. The impact magnitude, in the worst-case, is minor and with calculation assumptions tending towards a worst-case. However, to further reduce the potential for adverse noise impacts, the following construction mitigation measures are provided as recommended good practice, to be implemented where appropriate:

- Consideration will be given to noise emissions when selecting plant and equipment to be used on site;
- All equipment should be maintained in good working order and fitted with the appropriate silencers, mufflers or acoustic covers where applicable;
- Stationary noise sources will be sited as far away as reasonably possible from noise-sensitive receptors and where necessary and appropriate, acoustic barriers will be used to screen them; and
- The movement of vehicles to and from the site will be controlled and employees will be instructed to ensure compliance with any noise control measures adopted.

There are many strategies to reduce construction noise by the limitation of activities that would result in predicted noise levels being reduced. Any such measures should be considered adequate, and the mitigation adopted should not be limited to the measures proposed.

7.6 RESIDUAL IMPACTS

7.6.1 Construction Noise

The predicted noise impact upon the ecological receptors during the construction phases has been evaluated based on the AQTAG $L_{Aeq,1hr}$ 55 dB target limit. The impact magnitude has been considered, in the worst-case, as minor. Following good industry practice and management, construction noise is not likely to generate an adverse impact on the ecological receptors and therefore no residual effect is applicable.

The predicted noise impact upon the ecological receptors during the construction phases has been evaluated based on the predicted increase in ambient noise levels. The impact magnitude has been considered, in the worst-case, as negligible. Following good industry practice and management, construction noise is not likely to generate an adverse impact on the receptors and therefore no residual effect is applicable.

8 CONCLUSIONS

This assessment has considered the likely effects of the proposed Onshore Scheme with respect to noise construction noise emissions. The assessment has been undertaken with reference to relevant standards and guidelines, to include BS 5228:2009+A1:2014 and AQTAG2009. The assessment of these effects has been determined with reference to the ToR as published by the Environment and Resources Authority (ERA) in July 2022 '*for the preparation of an environmental impact assessment*', reference *EA-00018_21*.

The significance of these effects has been determined with reference to the targeted limits from AQTAG2009 for ecological receptors and in terms of the ambient noise level increase as a result of the construction noise. Industry standard calculation methods using computer modelling techniques have been used following BS 5228:2009+A1:2014 calculation methods.

The assessment of construction noise has concluded, in the worst-case, a minor impact magnitude at the identified ecological receptors with reference to AQTAG target limits; the level of effect has been concluded as not significant.

The assessment of construction noise has concluded, in the worst-case, a negligible impact magnitude at the identified ecological receptors with reference to the predicted increase in ambient noise levels; the level of effect has been concluded as not significant.

Baseline sound levels representative of the assessment locations have been considered further in context; construction noise emissions are not expected to give rise to an adverse impact at the identified receptor locations.

9 Summary of Impact Table

Table 13: Summary of Impacts

Impact type and source			Impact receptor		EFFECT & SCALE							Impact occurring (Inevitable, Likely, Unlikely, Remote, Uncertain)	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements (monitoring, authorisations, etc)
Impact Type	Specific intervention leading to impact	Project phase	Receptor type	Sensitivity towards impact	Direct/ Indirect/ Cumulative	Beneficial / Adverse	Severity	Physical / geographic extent of impact	Short-/medium-/ long-term	Temporary (indicate duration) / Permanent	Reversible (indicate ease of reversibility) / Irreversible					
Construction noise	Site preparation	Construction	Wildlife Habitat	Medium	Direct	Adverse	Low	300 – 600 m	Short (8 months)	Temporary	Reversible (temporary noise)	Inevitable	Minor	Follow construction good practice	Not significant	N/A
Construction noise	HDD drilling	Construction	Wildlife Habitat	Medium	Direct	Adverse	Low	300 – 600 m	Short (2 months)	Temporary	Reversible (temporary noise)	Inevitable	Not significant	Follow construction good practice	Not significant	N/A
Construction noise	Trenching	Construction	Wildlife Habitat	Medium	Direct	Adverse	Low	300 – 600 m	Short (8 months)	Temporary	Reversible (temporary noise)	Inevitable	Not significant	Follow construction good practice	Not significant	N/A
Construction Noise	Road Traffic at Construction site	Construction	Wildlife Habitat	Medium	Direct	Adverse	Negligible	300 – 600 m	Short (8 months)	Temporary	Reversible (temporary noise)	Inevitable	Not significant	n/a	Not significant	N/A

Appendix A
Glossary of Terminology

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A-01
SOUND LEVELS COMMONLY FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel) The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2x10^{-5}$ Pa).

dB(A) A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

L_{Aeq} L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

L_{10} & L_{90} If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.

L_{AFmax} This is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where

occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

Appendix B

Noise Emissions Predictions

Computer Model Outputs

FIGURE B-01
PHASE 1 SITE PREPARATION

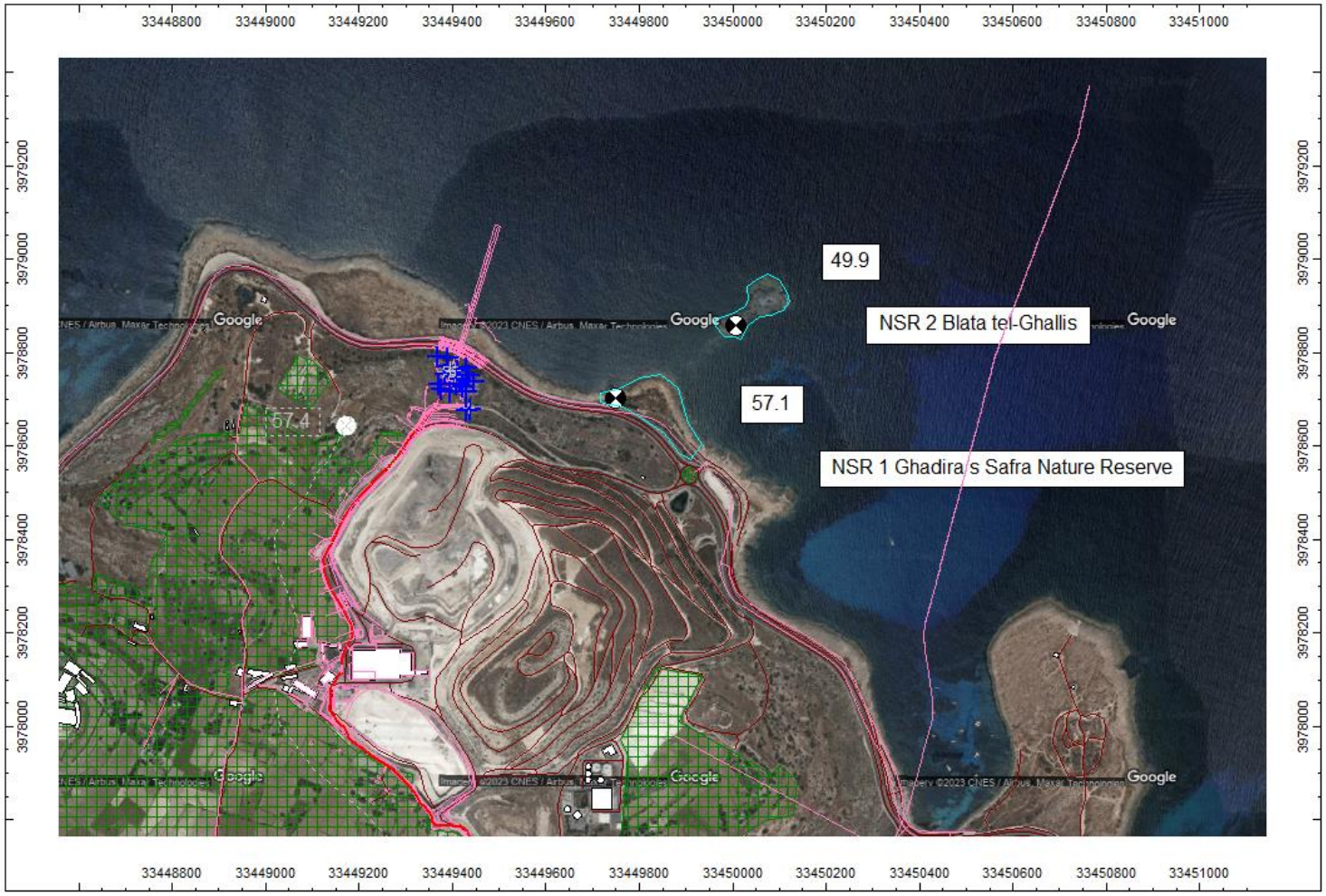

FIGURE B-02
PHASE 2 HORIZONTAL DIRECTIONAL DRILLING AND TRENCHING

Appendix C

HDD Plant Compound

HDD Site Compound Schematic

FIGURE C-01
HDD PLANT COMPOUND LAYDOWN AREA