



Noise Study for the proposed Materials Recovery Facility (MRF)

WASTESERV MALTA LIMITED

CT2050/2019

SERVICE TENDER FOR THE ENGINEERING, PROCUREMENT
AND CONSTRUCTION OF A NEW MATERIALS RECOVERY
FACILITY

**AIS REF. NO: PRJ-ENV483
FIFTH VERSION
PUBLICATION DATE
21 July 2025**

DOCUMENT REVISION HISTORY

Date	Revision	Comments	Authors/Contributors
21/02/2024	1.0	First Draft Version	Benedict Sarton
09/08/2024	2.0	Second Version	
12/06/2025	3.0	Third Version	
01/07/2025	4.0	Fourth Version	
21/07/2025	5.0	Fifth Version	

DISCLAIMER

This report has been prepared by E&D Consortium with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Wasteserv; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from E&D Consortium. E&D Consortium disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

TABLE OF CONTENTS

1.0	Introduction	1
2.0	Site Description.....	3
2.1	Location.....	3
2.1.1	Current Site	3
2.1.2	Surrounding Area	4
2.1.3	The Scheme in Greater Detail	5
2.1.4	Nearest Sensitive Receptors	6
3.0	Terms of Reference	8
4.0	Consultation and Methodology, Guidance and Standards	8
4.1	Consultation and Methodology	8
4.2	Guidance and Standards	9
4.2.1	British Standard 5228-1:2009+A1:2014 (BS 5228)	9
4.2.2	British Standard 4142:2014+A1:2019	11
4.2.3	Air Quality Technical Advisory Group 09 Guidance on the effects of industrial noise on wildlife (ATAG09)	12
4.2.4	ISO 9613-2: 1996.....	13
5.0	Assessment criteria.....	14
5.1	Receptor Sensitivity	14
5.2	Construction Noise Impact Magnitude	14
5.3	Operational Noise Impact Magnitude	15
5.4	Ecological Receptors Impact Magnitude	15
5.5	Level of Effect.....	15
6.0	Baseline Conditions.....	17
6.1	Baseline Sound Survey	17
6.1.1	Critical Listening and Weather Observations.....	17
6.1.2	Survey Protocol	19
6.1.3	Survey Results	20
7.0	Impact Assessment	22
7.1	Construction Phase Noise Effects	22
7.1.1	Predicted Construction Noise Levels	22
7.1.2	Construction Noise Assessment – Human Receptors.....	23

7.1.3	Construction Noise Assessment – Ecological Receptors.....	24
7.2	Operational Phase Noise Effects.....	24
7.2.1	Noise Model	24
7.2.2	External Plant.....	26
7.2.3	On-Site Vehicle Movements	26
7.2.4	General Assumptions	27
7.2.5	Predicted Specific Noise Levels.....	27
7.2.6	Assessment of Operational Sound on Residential Receptors.....	28
7.2.7	Assessment of Operational Sound on Ecological Receptors.....	31
8.0	Mitigation Measures.....	33
8.1	Construction Noise.....	33
8.2	Operational Noise	33
8.3	Residual Impacts	33
8.3.1	Construction Noise.....	33
8.3.2	Operational Noise – Residential Receptors	34
8.3.3	Operational Noise – Ecological Receptors	34
9.0	Cumulative Assessment	35
9.1	Cumulative Construction Noise Assessment	36
9.2	Cumulative Operational Noise assessment	37
9.2.1	Cumulative Operational Assessment - Human Receptors.....	38
9.2.2	Cumulative Operational Assessment – Ecological Receptors.....	40
10.0	Conclusions	41
11.0	Summary of Impact Table	43
	Acoustic Terminology	46
	Computer Model Outputs	49

TABLE OF FIGURES

Figure 1: Scheme Location	3
Figure 2: Site Red Line Boundary	4
Figure 3: Proposed Scheme Layout	6
Figure 4: Nearest NSRs	7
Figure 5: Baseline Sound Monitoring Locations	17
Figure 6: Cumulative Developments Considered (HDD = Horizontal directional drilling) ...	35

TABLE OF TABLES

Table 1: Construction Noise Residential Receptors – Example Threshold Values	10
Table 2: Specific Noise Levels at Habitat / Nest Sites	12
Table 3: Level of Sensitivity associated with Various NSRs.....	14
Table 4: Construction Noise Impact Magnitude	14
Table 5: Operational Noise Impact Magnitude – Residential Receptors.....	15
Table 6: Impact Magnitude - AQTAG.....	15
Table 7: Noise Effect Significance.....	16
Table 8: Critical Listening Observations.....	18
Table 9: Weather Observations	19
Table 10: Sound Survey Summary.....	20
Table 11: Predicted Construction Noise Levels, dB	23
Table 12: Predicted Construction Noise Levels and Assessment.....	23
Table 13: Construction Noise Assessment – Ecological Receptors	24
Table 14: Sound Reduction, R_w of Building Materials.....	25
Table 15: External Plant	26
Table 16: Predicted Specific Noise Levels	27
Table 17: BS4142:2014+A1:2019 Rating Penalties	28
Table 18: BS4142:2014+A1:2019 Operational Assessment for Human Receptors, dB.....	30
Table 19: Operational Assessment Residential Receptors – Impact Magnitude and Level of Effect 30	
Table 20: Operational Assessment Ecological Receptors.....	31
Table 21: Operational Assessment Ecological Receptors – Impact Magnitude and Level of Effect 31	
Table 22: Total Cumulative Construction Noise Level, dB.....	36

Table 23: Cumulative Construction Noise Assessment, dB	37
Table 24: Total Cumulative Operational Noise Level, dB	37
Table 25: BS4142:2014+A1:2019 Cumulative Operational Assessment for Human Receptors, dB	38
Table 26: Cumulative Operational Assessment Ecological Receptors.....	40
Table 27: Summary of Impacts	43

1.0 INTRODUCTION

A noise impact assessment (NIA) is presented in relation to the noise levels emitted from the construction and operation of the Maghtab Materials Recovery Facility (MRF). It is understood that the NIA would be included as part of an Environmental Impact Assessment (EIA) for the Maghtab Materials Recovery Facility.

The proposed development, herein after referred to as the “Scheme” incorporates the development of a new MRF for the treatment of source-separated and co-mingled dry recyclables collected in Malta.

The assessment has been required to provide a noise impact assessment from the construction and operation of the Scheme in conjunction with the requirements of the Environment and Resources Authority (ERA).

Following the submission of formal method statement (MS) regarding the proposed methodology for the assessment to the ERA, the following response was received regarding the construction noise assessment:

“The MS makes reference to the compilation of a construction noise monitoring study.

Construction noise monitoring study was excluded from the EIA Terms of Reference given that the site is located at a distance away from the receptors, and construction noise impact at the receptors will be masked by existing operational noise as well as road traffic noise.

The study should be limited to “A qualitative statement by an expert opinion providing sufficiently detailed information from any potential increase in noise generating equipment, vibration and nocturnal lighting (as relevant).”

With reference to the above, this assessment considers:

- » A ‘high-level’ assessment of the construction noise on human and ecological receptors; and
- » A quantitative assessment of the operational noise on human and ecological receptors.

With regards to the ‘high-level’ construction noise assessment this is based on predicted noise emissions from construction activities impacting on both the defined human and ecological receptors in conjunction with to BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*.

With regards to the operational assessment this is based on predicted noise emissions from proposed operational activities as impacting defined human receptors, in conjunction with

previously measured baseline sound levels and BS4142:2014+A1:2009 *Methods for rating and assessing industrial and commercial sound*.

The previously measured baseline environmental sound levels were measured at the nearest noise sensitive receptors to the Scheme as part of the noise assessment for the Maghtab Energy to Waste Facility noise impact assessment [document ref: PA/03012/20 VERSION 1, dated 15/05/2020].

The operational assessment also considers the impact on ecological receptors with reference to recommended fixed noise limits following AQTAG09 *Guidance on the effects of industrial noise on wildlife*.

In addition to the above, an additional cumulative assessment has been undertaken to determine whether the noise generated by construction and operational noise from the other proposed developments in the near vicinity of the Scheme would have a cumulative impact at the nearest human and ecological receptors.

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**.

2.1 Location

Qawra Point Beach

Café del Mar Malta

The Malta Classic Car Collection

QAWRA Palace Resort & SPA

QAWRA

Bugibbe Square

Salini Resort

Salina National Park

Bird Park Malta

IS-SALINA

MAGPIAB

BAHARIG-CACCHAO

BURMARRAD

Proposed Scheme

Image Landsat / Copernicus

Figure 1: Scheme Location

2.1.1 Current Site

Further to the above, the footprint of the entire Site associated with the Scheme is 24,500m² and currently comprises of agricultural land, a dense cover of low-lying trees and remnants of local maquis/advanced garigue community.

Figure 2 overleaf shows the approximate red line boundary of the Site.



Figure 2: Site Red Line Boundary

2.1.2 Surrounding Area

To the north-west, and the west lie engineered Għallis and Ta' Zwejra landfill sites respectively which are either being utilised or have been rehabilitated, having the slopes stabilised and/or re-contoured. Directly to the north, is the recently constructed Anaerobic Digestion Plant as can be seen in Figure 2 above. To the east, the landscape is composed of agricultural land subdivided into small parcels by rubble walls. A paved access road runs along the south and west of the Scheme providing access to both the site and the landfill.

Apart from the Anaerobic Digestion Plant, the Scheme is in close proximity to other waste management facilities at Magħtab. The Scheme's location offers a number of operational advantages that are in synchronisation with WSM's strategy for efficient waste processing

operations. The other waste management facilities include the approved Waste-to-Energy plant located around 400m away, the Waste-to-Energy pump room and the existing Malta North plant (Mechanical and Biological Treatment, MBT) found around 500m away.

A temporary MRF sorting line has been recently commissioned by WSM and approved by ERA within Malta North plant. Also present within the ECOHIVE complex are two Weighbridge Control Rooms 1 and 2 located west and south from the proposed MRF respectively, the Administration block on the western side and the Gas Plant located close to the approved Anaerobic Digestion Plant on its western side. WSM is also planning to construct a new Thermal Treatment Facility (TTF) and an Organic Processing Plant (OPP) within the complex. These two facilities are intended to be located in close proximity to the proposed MRF.

2.1.3 The Scheme in Greater Detail

As previously stated, the Scheme covers a total area of 24,500m² and involves the development of a MRF for the treatment of source-separated and co-mingled dry recyclables.

The recyclables will be collected in two separate streams – fibre (cardboard, paper, magazines) and containers (plastic bottles, pots, tubs, trays, metal cans, plastic film, beverage containers). Glass will not be processed at the MRF. The total processing capacity of the MRF plant is 70,000 tonnes per annum; 40,000 tonnes per annum for fibre and 30,000 tonnes per annum for container.

Input material will be stored at the MRF for at least three days or more. The selected storage option for input waste involves the use of a split-level process to promote segregation of vehicle movements from quality control and loading activities based on the use of a large single bay. Residue can be baled as refuse derived fuel (RDF) which will be subsequently treated at the approved Waste-to-Energy Treatment Facility once this is operational.

The output material will be baled and wrapped, and stored on site for a minimum of one week. Baled material will be loaded in ship containers. It is assumed that all output material from the MRF will be sent abroad for recycling. The proposed layout of the Scheme is shown below.



Figure 3: Proposed Scheme Layout

2.1.4 Nearest Sensitive Receptors

The nearest noise sensitive receptors (NSRs) to the Scheme are as follows.

- » NSR01 – Residential Property to the south-east of the Site
- » NSR02 – Residential Property to the south of the Site
- » NSR03 – the Beach area and Nature Reserve located to the north-east of the Site; and
- » NSR04 – the Nature Reserve and Hotel Salini to the north-west of the Site.

The NSRs described above are shown on Figure 4 overleaf.

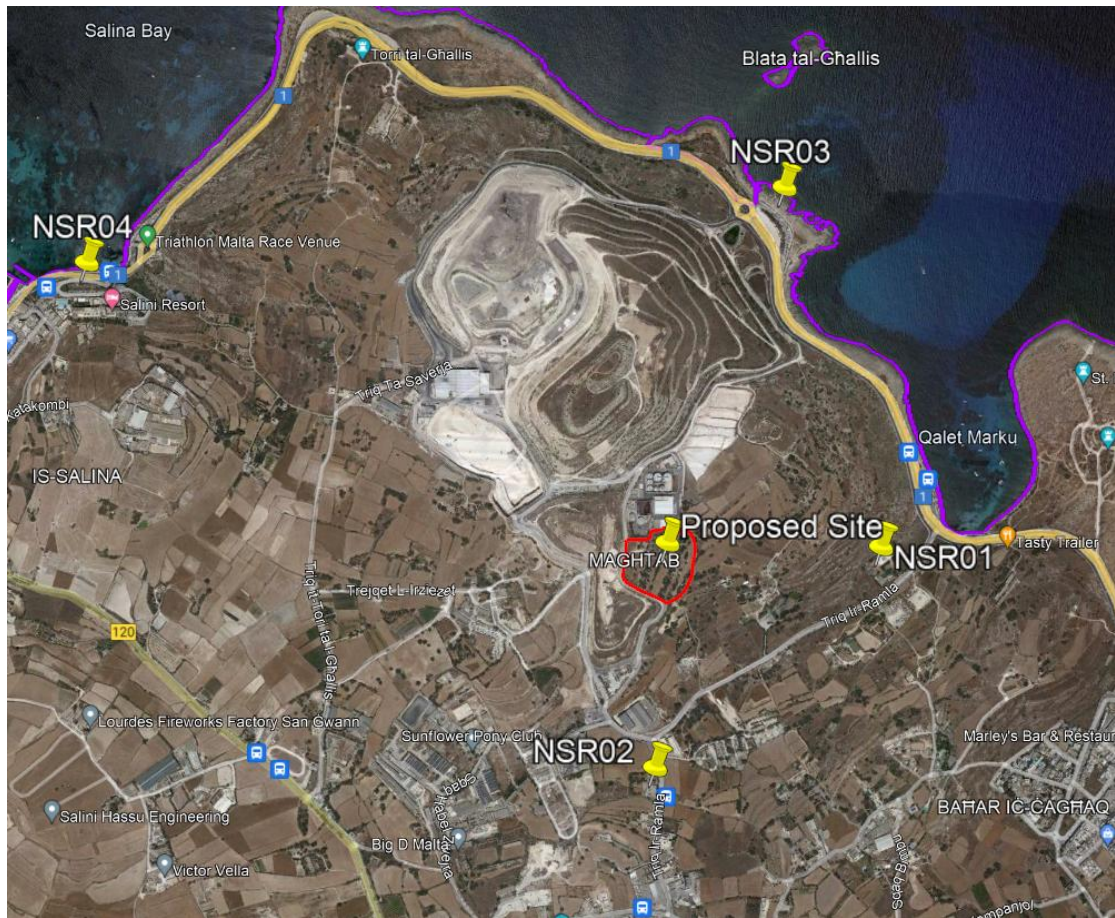


Figure 4: Nearest NSRs

3.0 TERMS OF REFERENCE

The ERA issued the Terms of Reference (ToR) related to the study in April 2023, entitled *“Terms of Reference for the preparation of an Environmental Impact Assessment.*

The proposed construction of a Material Recovery Facility (MRF) for the processing of grey bag and recovery of different streams of materials. The proposal includes ancillary office space, staff quarters and parking spaces.” (REF: EA/00042/20).

This assessment has been conducted in accordance with the aspects of the ToR relating to noise which is contained in Section 3.8 and reproduced below:

3.8 Noise, Vibrations and Exterior Lighting

A qualitative statement by an expert opinion providing sufficiently detailed information from any potential increase in noise generating equipment, vibration and nocturnal lighting (as relevant).

This should also take into account other relevant factors such as:

- » *Sensitive receptors (e.g. residents, recreational areas, fauna and avifauna, natural ecosystems); and*
- » *The potential for attenuation or exacerbation by ‘environmental’ factors (e.g. topography, vegetation, physical barriers etc.), and for mitigation (e.g. shielding, muffling/soundproofing, reduced lighting, etc.).*

The described human (residents) and ecological receptors in Section 2.1.4 have been established as relevant to this assessment.

4.0 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 August 2023.

A summary of the agreed assessment methodology is provided below.

- The baseline sound levels measured for the EIA of the Maghtab Waste to Energy Facility would be utilised as the basis of the assessment.
- A qualitative (high-level) construction noise assessment would be undertaken, with reference to BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*.
- Noise levels from the operation of the Scheme would be predicted at the nearest human and ecological receptors using the proprietary software-based noise model, CadnaA®, and the calculation algorithms contained in ISO9613-2 Acoustics – *Attenuation of sound during propagation outdoors – Part 2 General method of calculation*.
- The predicted noise levels at the human receptors would be compared to the measured background levels and assessed in accordance with British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.
- The predicted noise levels at the ecological receptors would be assessed in accordance with the absolute limits contained in AQTAG09 Guidance on the effects of industrial noise on wildlife.

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.

In addition, a cumulative assessment has been undertaken to determine whether the noise generated by construction and operational noise from the other proposed developments in the near vicinity of the Scheme would have a cumulative impact at the nearest human and ecological receptors.

A summary of the standards and guidance referenced above is provided below.

4.2 Guidance and Standards

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.

BS 5228-1 gives several examples of acceptable noise limits for construction or demolition noise. For this assessment, as baseline noise data is available, it is proposed that the ABC method will be used to determine the threshold value at the receptor locations.

Under the ABC method, a threshold value noise level is determined by establishing the existing ambient noise level at each location. This measured ambient noise level is then rounded to the nearest whole 5dB(A), and the threshold noise value for each receptor is then established from Table E.1 of BS 5228-1. This threshold value is the $L_{Aeq,T}$ noise level that should not be exceeded at the receptor location by operations at the site. Accordance with this method, the threshold noise levels for a potentially significant effect are as detailed in Table 1 below.

Table 1: Construction Noise Residential Receptors – Example Threshold Values

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD	THRESHOLD VALUE IN DECIBELS (dB)		
	CATEGORY A A)	CATEGORY B B)	CATEGORY C C)
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends ^{D)}	55	60	65
Daytime (07:00-19:00) and Saturdays (07:00-13:00)	65	70	75
^{A)} Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values. ^{B)} Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are the same as category A values. ^{C)} Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5dB) are higher than category A values. ^{D)} 19:00-23:00 weekdays, 13:00-23:00 Saturdays and 07:00-23:00 Sundays.			

4.2.2 British Standard 4142:2014+A1:2019

British Standard 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* (BS4142), is used to assess the potential adverse impact of sound, of an industrial and/or commercial nature, at nearby noise-sensitive receptor locations within the context of the existing sound environment.

Where the specific sound contains tonality, impulsivity and/or other sound characteristics, penalties should be applied depending on the perceptibility. For tonality, a correction of either 0, 2, 4 or 6dB should be added and for impulsivity, a correction of either 0, 3, 6 or 9dB should be added. If the sound contains specific sound features which are neither tonal nor impulsive, a penalty of 3dB should be added. In addition, if the sound contains identifiable operational and non-operational periods, that are readily distinguishable against the existing sound environment, a further penalty of 3dB may be applied.

The assessment of impact contained in BS4142, is undertaken by comparing the sound rating level, i.e. the specific sound level of the source plus any penalties, to the measured representative background sound level immediately outside the noise-sensitive receptor location. Consideration is then given to the context of the existing sound environment at the noise-sensitive receptor location to assess the potential impact.

Once an initial estimate of the impact is determined, by subtracting the measured background sound level from the rating sound level, BS4142 states that the following should be considered:

- » typically, the greater the difference, the greater the magnitude of the impact.
- » a difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- » a difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.
- » the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. It is an indication that the specific sound source has a low impact, depending on the context.

BS4142 notes that adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.

Furthermore, it outlines guidance for the consideration of the context of the potential impact, including consideration of the existing residual sound levels, location and/or absolute sound levels. To account for the acoustic character of proposed sound sources, BS4142 provides the following with respect to the application of penalties to account for “*the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention*”.

Tonality – “For sound ranging from not tonal to predominantly tonal the Joint Nordic Method gives a correction of between 0dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible and 6dB where it is highly perceptible.

Impulsivity – A correction of up to +9dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it is clearly perceptible, and 9dB where it is highly perceptible.

Intermittency – When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

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

Finally, BS4142 outlines guidance for the consideration of the context of the potential impact, including consideration of the existing residual sound levels, location and/or absolute sound levels.

4.2.3 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

4.2.4 ISO 9613-2: 1996

The levels of sound generated by the operation of the Scheme has been predicted in accordance with the prediction framework within ISO 9613-2:1996 *Acoustics – Attenuation of Sound during Propagation Outdoors– Part 2: General Method of Calculation*. This method of calculation takes into account the distance between the sound sources and the closest receptors, and the amount of attenuation due to atmospheric absorption. The methodology also assumes downwind propagation, i.e. a wind direction that assists the propagation of sound from the source to the receiver.

5.0 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), Ecological Sites i.e., SAC, SPA, SSSI (or similar areas of special interest)
Low	Offices and other non-noise producing employment areas
Negligible	Industrial areas

5.2 Construction Noise Impact Magnitude

The impact of construction noise upon existing residential receptors will be determined with reference to the ABC method presented in BS 5228-1:2009+A1:2014. The impact of construction noise upon existing residential receptors is as detailed in Table 4 below.

Table 4: Construction Noise Impact Magnitude

MAGNITUDE	DESCRIPTION
Major	Threshold limit value exceeded by more than 5dB
Moderate	Threshold limit value exceeded by a maximum of 4dB
Minor	Threshold limit value exceeded by a maximum of 2dB
Negligible	Threshold value not exceeded

5.3 Operational Noise Impact Magnitude

The impact of operational noise from the Scheme upon existing residential receptors will be determined with reference to BS 4142:2014+A1:2019 the impact of operational noise upon existing residential receptors is detailed in Table 5 below.

Table 5: Operational Noise Impact Magnitude – Residential Receptors

MAGNITUDE	DESCRIPTION
Major	Rating level is 10dB(A) or more above the background sound level
Moderate	Rating level is between 6 and 9dB(A) above the background sound level.
Minor	Rating level is between 1 and 5dB(A) above the background sound level.
Negligible	Rating level is equal to or below the background sound level.

5.4 Ecological Receptors Impact Magnitude

The impact of construction and operational noise on ecological receptors will be determined with reference to the AQTAG 09 guidance. The impact of construction noise upon ecological receptors is as detailed in Table 6 below.

Table 6: Impact Magnitude - AQTAG

MAGNITUDE	DESCRIPTION
Major	Limit value exceeded by more than 5dB
Moderate	Threshold limit value exceeded by a maximum of 4dB
Minor	Threshold limit value exceeded by a maximum of 2dB
Negligible	Threshold value not exceeded

5.5 Level of Effect

Where an adverse impact is identified, the following generic relationship between noise impact and noise effect will be referred to:

- » **Severe** – environmental significance is associated with the impacts where mitigation is not practical or would be ineffective and could influence the decision whether or not to proceed with the project;
- » **Substantial** – environmental significance is associated with the effects that are important considerations, which could result in adverse effects if they are not mitigated;
- » **Moderate** – environmental significance could have an influence on the decision unless it is mitigated; and
- » **Slight/Neutral** – environmental significance will not have an influence on the decision or require modification on the project design or alternative mitigation and noise need not be considered as a determining factor in the decision process.

The significance of the noise effect will depend on the receptor type and its sensitivity to the noise impact, as shown in Table 3. The sensitivity of the receptor, together with the magnitude of the noise impact, defines the significance of the noise effect as shown in Table 7 below.

Table 7: Noise Effect Significance

		SENSITIVITY		
		HIGH	MEDIUM	LOW
MAGNITUDE	Major	Severe	Substantial	Moderate
	Moderate	Substantial	Moderate	Minor
	Minor	Moderate	Minor	Minor
	Negligible/No Change	Minor/Neutral	Minor/Neutral	Minor/Neutral

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

6.0 BASELINE CONDITIONS

6.1 Baseline Sound Survey

A previous baseline sound survey for the Maghtab Waste to Energy Facility was 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 5.

- » 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.

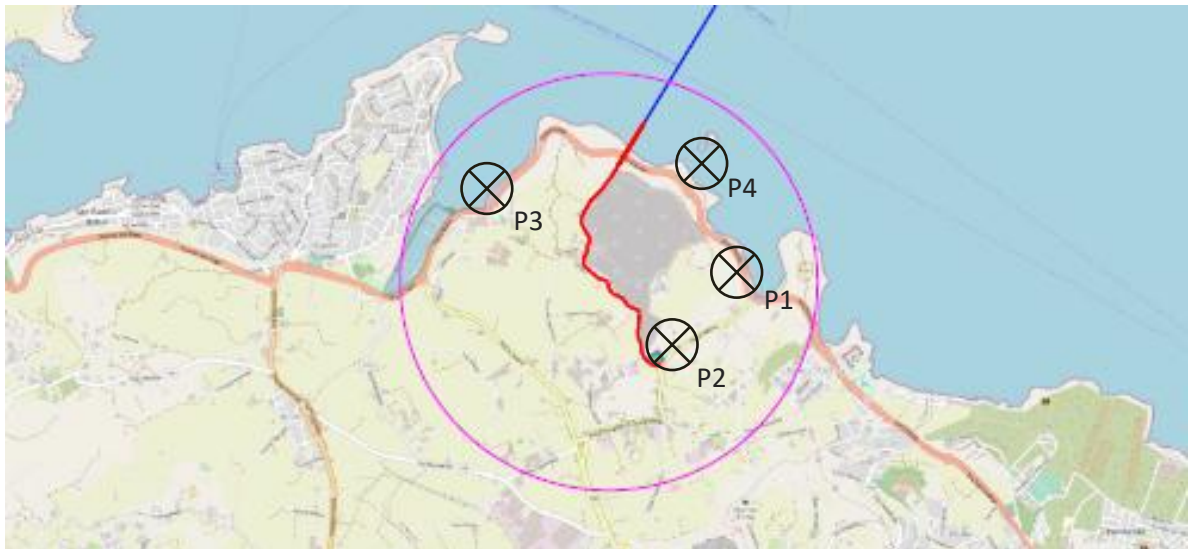


Figure 5: Baseline Sound Monitoring Locations

6.1.1 Critical Listening and Weather Observations

Observations of the acoustic environment were made during the baseline sound survey periods for both monitoring locations and are included in Table 8 overleaf.

Table 8: Critical Listening Observations

LOCATION	DATE	TIME STAMP	CRITICAL LISTENING OBSERVATIONS
P1	28/01/2020	09:56-12:56	Quiet residential area where the dominant source of noise is road traffic. During the survey period there was occasional car, van and truck passing by and helicopter and light aircraft flying overhead. Between 12:30 and 12:56 there was distant machinery noise.
	30/01/2020	Between 02:04 – 06:12	Quiet residential area where the main source of noise was a barely audible low frequency hum from a distant noise source. There was the very occasional car passing by.
P2	29/01/2020	10:25-13:25	The noise environment was dominated by the close-by busy road with frequent cars, HGVs and motorcycles. Agricultural works from the surrounding fields was also audible during the survey period.
	30/01/2020	Between 02:26-05:52	The noise environment was quiet during this period with the only sources of noise being attributable to a low motor noise from a farm nearby. There were also the occasional passing cars and HGVs.
P3	07/02/2020	08:40 – 11:40	During the daytime survey period the noise environment was dominated by the road traffic with frequent passing cars, motorcycles and HGVs.
	30/01/2020	Between 02:54-06:39	During the night survey the noise environment was quiet, with the main source of noise coming from the very occasional passing car. There were no other notable noise sources contributing to the soundscape during this period.
P4	28/01/2020, 29/01/2020 & 07/02/2020	Between 09:47 – 13:55	The survey location was within a quiet parking area adjacent to the bathing area. The noise environment was dominated by the road traffic from the nearby main road. Further to this, the sea noise during rough periods was also a significant contributor to the soundscape at this location.

Observations of the weather conditions were made during the baseline sound survey periods for both monitoring locations and are included in Table 9 below.

Table 9: Weather Observations

LOCATION	DATE	TIME STAMP	TEMPERATURE (°C)	HUMIDITY (%)	WIND SPEED (MS ⁻¹)	CLOUD COVER (%)	PRECIPITATION
P1	28/01/2020	09:56 - 12:56	18.9	63.9	3.7	20	No
	30/01/2020	02:04 - 06:12	16.0	79.2	0.8 - 3.1	25-35	No
P2	29/01/2020	10:25 - 13:25	19.6 – 21.5	61.3 – 78	0.6 - 0.9	30-60	No
	30/01/2020	02:26 - 05:52	16.9	78	0.9 - 3.1	25	No
P3	07/02/2020	08:40 - 11:40	12.4	53.2	2.3	0	No
	30/01/2020	02:54 - 06:39	16.0	78.6	0.6 – 2.8	25	No
P4	28/01/2020	13:09 - 13:24	17.6	61.6	2.2	70	No
	29/01/2020	09:47 - 13:55	16.7	75.5	3.3	5	No
	07/02/2020	11:51 - 12:06	15.8	49.2	3.2	0	No

6.1.2 Survey Protocol

Baseline sound measurements were undertaken during both daytime and night-time periods at each of the four monitoring locations.

The following monitoring protocol is proposed for each receptor:

- » Receptor P1 – Residential: A fully attended 3-hour consecutive measurement, with noise levels being logged every 15-minute during the daytime and four 15-minute non-consecutive readings during the night-time.

- » Receptor P2 – Residential: A fully attended 3-hour consecutive measurement, with noise levels being logged every 15-minute during the daytime and four 15-minute non-consecutive readings during the night-time.
- » Receptor P3 – Nature Reserve including Hotel Salini: A fully attended 3-hour consecutive measurement, with noise levels being logged every 15-minute during the daytime and four 15-minute non-consecutive readings during the night-time; and
- » Receptor P4 – Beach: A fully attended weekday survey consisting of four 15-minute non-consecutive readings during a period in the daytime when the beach is most likely to be utilised.

Measurements at the survey locations were made at 1.5m above the ground in free-field conditions, i.e. at least 3.5m from the closest vertical reflecting surface.

The measurements were attended at all times with a record of all noise observations made. The following noise indices were recorded:

- » $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period T;
- » L_{A90} : the A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise;
- » L_{A10} : The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise; and
- » L_{Amax} : the maximum A-weighted noise level during the measurement period.

6.1.3 Survey Results

The results of the sound survey are summarised in Table 10 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 10: 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 $L_{Aeq,16\text{ hour}}$ rounded to the nearest decibel.

7.0 IMPACT ASSESSMENT

7.1 Construction Phase Noise Effects

Though only a qualitative assessment of construction noise was requested by the ERA, a high-level construction noise assessment has been undertaken based on the information available and previous experience.

The assessment 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.

Based on similar projects of this nature the worst-case (loudest) construction phase from a noise perspective is the initial Site Preparation Phase which involves soil stripping, soil excavation, grading of material and construction of Site compounds and fences.

Again, based on previous experience, the combined sound power level for all plant associated with Site preparation operations, taking into account associated on-times is approximately 120dB(A).

7.1.1 Predicted Construction Noise Levels

Based on the above, high level noise predictions for worst-case construction works have been undertaken within the Cadna/A modelling software which have been based on the following.

- » Predictions have been based on the calculation algorithms contained in BS5228:2014.
- » The combined sound power level from all construction plant (120dB(A)) has been modelled as an area source covering the entire area within the red line boundary at a height of 2m above ground level.
- » A ground absorption factor of 0.5 (mixed ground).
- » Downwind propagation between the source and receptors.
- » A daytime receiver height of 1.5m above ground level.
- » The predictions take into account the local topography and any intervening structures.

A screen shot of the Construction Noise Model Output is shown in **Appendix B**.

Based on the above the predicted noise levels are shown in Table 11 and have been rounded to the nearest decibel.

Table 11: Predicted Construction Noise Levels, dB

NOISE SENSITIVE RECEPTOR	PREDICTED NOISE LEVEL, DB $L_{AEQ, 1-HOUR}$
NSR01 - Residential Property to the south-east of the Site	52
NSR02 - Residential Property to the south of the Site	54
NSR03 - Beach area and Nature Reserve located to the north-east of the Site	35
NSR04 - Nature Reserve and Hotel Salini to the north-west of the Site	25

7.1.2 Construction Noise Assessment – Human Receptors

It has been assumed that construction operations would take place during normal daytime hours, therefore the predicted noise levels at NSR01 and NSR02 have been compared to the Category A daytime noise threshold limits (lowest daytime limits to represent worst-case) contained in BS5228:2014 (see Table 1) and assessed in conjunction with the construction noise impact magnitude detailed in Table 4.

This assessment is shown in Table 12 below.

Table 12: Predicted Construction Noise Levels and Assessment

LOCATION	CONSTRUCTION PHASE	PREDICTED NOISE LEVEL, DB $L_{AEQ,T}$	DAYTIME CATEGORY A THRESHOLD LIMIT, DB $L_{AEQ,T}$	DIFFERENCE, DB	IMPACT MAGNITUDE
NSR01	Site Preparation	52	65	-13	Negligible
NSR02		54		-11	Negligible

With reference to Table 12 the magnitude of the impact would be *negligible* at NSR01 and NSR02 following Table 4 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.

7.1.3 Construction Noise Assessment – Ecological Receptors

The predicted noise levels at NSR03 and NSR04 have been compared to the $L_{Aeq,1hr}$ noise limits contained in the AQTAG09 guidance (see Table 2) and assessed in conjunction with the noise impact magnitude for ecological receptors detailed in Table 6. This assessment is shown in Table 13 below.

Table 13: Construction Noise Assessment – Ecological Receptors

LOCATION	CONSTRUCTION PHASE	PREDICTED NOISE LEVEL, $dB L_{Aeq,T}$	NOISE LIMIT, $dB L_{Aeq,T}$	DIFFERENCE, dB	IMPACT MAGNITUDE
NSR03	Site Preparation	35	55	-20	Negligible
NSR04		25		-30	Negligible

With reference to Table 13 the magnitude of the impact would be negligible at NSR03 and NSR04 following Table 6 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.

7.2 Operational Phase Noise Effects

An assessment has been made in accordance with the guidance contained in BS4142:2014+A1:2019 and AQTAG09 to determine whether noise emissions associated with the operation of the proposed Scheme is likely to give rise to adverse impacts at the closest residential and ecological receptors respectively.

At this stage the specific details of the exact operation plant and processes are not known, therefore the operational noise assessment has been based on previous experience of Sites of this nature.

The operational assessment includes the noise levels generated by on-site traffic movements, the number of movements, associated vehicle types and routes have been determined from the Project Description Statement (PDS) produced by Design and Technical Resources LTD (Ref: CT2050/2019, dated 27th January 2023).

7.2.1 Noise Model

The specific noise levels from the Scheme at the nearest NSRs have been predicted using the Cadna/A modelling software and the calculation algorithms contained in ISO 9613-2

Acoustics – Attenuation of Sound during Propagation Outdoors– Part 2: General Method of Calculation.

The noise model has been based on the following inputs and assumptions.

7.2.1.1 Noise Generating Buildings

As previously stated at this stage the exact specification of the operational plant and processes are yet to be finalised; however, from analysing the proposed Site layout the vast majority of the plant is internal within the processing building, with internal vehicle movements taking place within the reception hall and storage area.

Further to the above, and from previous experience, the following internal reverberant levels have been assumed within the buildings:

- » Operational Building – 85dB(A).
- » Reception Hall – 80dB(A)
- » Storage Area – 80dB(A)

It must be noted that an internal noise level of 85dB(A) is in line with the upper action exposure value and an internal noise level of 80dB(A) is in line with the lower action exposure value, as specified in the WORK PLACE (MINIMUM HEALTH AND SAFETY REQUIREMENTS FOR THE PROTECTION OF WORKERS FROM RISKS RESULTING FROM EXPOSURE TO NOISE) REGULATIONS, S.L.424.28.

With regards to the façade construction, for the purpose of this assessment, the roof and façades of the main buildings would be constructed from insulated composite profiled cladding¹ with an assumed sound reduction index (RW) of 25dB. Details of these building construction materials are provided in Table 14, along with those for the roller shutter doors for the reception hall.

Table 14: Sound Reduction, R_w of Building Materials

CONSTRUCTION ELEMENT	R_w (dB)
Walls and Roof	25
Roller Shutter Doors (closed)	21

¹ Factory insulated foam filled composite panel system,
https://www.tatasteelconstruction.com/static_files/Tata%20Steel/content/Tools%20&%20Resources%20articles/Download%20Zone/Colorcoat/Colorcoat_Acoustic_TechPaper_FINAL.pdf

7.2.2 External Plant

Table 15 shows the identified external plant, its location within the site and assumed sound power levels, which have been determined from similar projects of this nature.

Table 15: External Plant

PLANT	LOCATION ON SITE	ASSUMED SOUND POWER LEVEL, DB (A)
Substation	Directly to the west of the process building	90
Residual Waste Compactor	To the north of the process building.	105

7.2.3 On-Site Vehicle Movements

7.2.3.1 Input

It has been determined that the following on-site traffic movements will be associated with the input waste to the Scheme.

- » 116 deliveries brought to the MRF during the weekly delivery slot for fibre; and
- » 154 deliveries brought to the MRF during the weekly delivery slot for containers.

It is envisaged that there would be two delivery slots per week, one for fibre and the other for container between 10:00 and 14:00, therefore it has been assumed that during a worst-case hour there would be 39 deliveries (154 divided by four-hours) for containers associated with the Scheme.

It is assumed that the 39 deliveries will be split equally between the RCVs and the Hook Loaders and vehicles would follow the routes shown on the PDS report and a vehicle drive by level of 108dB(A)² at 16km/h has been assumed.

7.2.3.2 Output

With reference to Section 3.3.7 of the PDS it has been determined that the Scheme would generate the following vehicle movements.

- » Additional Average Annual Daily Trips (AADT) of 38 vehicles.

As a worst-case it is assumed that the above movements would take place in a four hour slot (as per the input traffic movements), equating to approximately 10 vehicles per hour.

² Noise Level from BS5228:2014 Table C.6 Item 21

The vehicles would access and egress from the Site using the northern access routes, to and from the storage building and a vehicle drive by level of 108dB(A)² at 16km/h has been assumed.

7.2.4 General Assumptions

- » The heights of the buildings are based on the elevation plans included within the PDS.
- » All noise generating buildings and external plant are operational 100% of the time.
- » The roller shutter doors associated with the reception hall and storage area will remain open to represent a worst-case scenario.
- » The proposed operational hours are from 06:00 to 22:00, therefore in conjunction with BS4142 the hour between 06:00 and 07:00 is defined as night-time, during this hour it has been assumed that there will be no heavy goods vehicle on-site traffic movements, with just internal operations being undertaken.
- » A receiver height of 1.5m above ground level during the daytime and 4m above ground level during the night-time for residential receptors.
- » A receiver height of 1.5m for ecological receptors.
- » As no frequency data is available all noise predictions have been made within the 500Hz frequency band.
- » A reflection factor of 3.
- » A ground absorption factor of 0.5 (mixed ground).
- » Downwind propagation between the source and receptors.
- » The predictions take into account the local topography and any intervening structures.

A screen shot of the Daytime Operational Noise Model Output is shown in **Appendix B**.

7.2.5 Predicted Specific Noise Levels

Based on the above assumptions and inputs the predicted specific noise levels during the operation of the Scheme are shown in Table 16 below.

Table 16: Predicted Specific Noise Levels

NOISE SENSITIVE RECEPTOR	ASSESSMENT PERIOD	PREDICTED SPECIFIC LEVEL, DB L _{AEQ, 1-HOUR}
NSR01 - Residential Property to the south-east of the Site	Daytime	38
	Night-time	35
NSR02 - Residential Property to the south of the Site	Daytime	38
	Night-time	32
	Daytime	27

NSR03 - Beach area and Nature Reserve located to the north-east of the Site	Night-time	25
NSR04 - Nature Reserve and Hotel Salini to the north-west of the Site	Daytime	21
	Night-time	18

7.2.6 Assessment of Operational Sound on Residential Receptors

An assessment of operational sound on the closest residential receptors and beach area (P1, P2 and P3) has been undertaken with reference to BS4142:2014+A1:2019, whereby the sound sources under investigation are compared to existing background sound levels. This assessment has been based on the results of the daytime and night-time baseline noise survey. It is assumed that the beach area will only be utilised in the daytime, therefore a night-time assessment has not been undertaken at this receptor.

To account for the acoustic character of operational sound sources, BS4142:2014+A1:2019 requires the application of rating penalties to account for *“the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention”*. In this respect, the acoustic character of each specific sound source – as perceived at the receptor (assessment) locations – and the resulting rating penalty that would apply in accordance with BS4142:2014+A1:2019 has been determined as per Table 17.

Table 17: BS4142:2014+A1:2019 Rating Penalties

SOUND SOURCE	SOUND TONAL	SOUND IMPULSIVE	SOUND INTERMITTENT	OTHER SOUND CHARACTERISTIC	COMMENT
Noise Generating Buildings	No	No	No	No	It has been assumed that the vast majority of noise generating plant will be housed within the buildings, which will be operational constantly through the daytime and night-time (06:00 to 07:00) periods. Therefore, the sound would not be intermittent or impulsive. From previous experience it is

					also considered that the noise would not be tonal.
External Plant	No	No	No	No	From analysis of the Cadna/A noise model the specific sound levels from external plant (substation and waste compactor) is insignificant compared to the other sources at the nearest NSRs, therefore it is considered that no penalties are required.
On-site vehicle Movements	No	No	Yes = 3dB	No	HGV movements would be intermittent during the daytime.
Daytime	0dB	0dB	+3dB	0dB	Total BS4142 Rating Penalty = 3dB
Night-time	0dB	0dB	0dB	0dB	Total BS4142 Rating Penalty = 0dB

Therefore, in accordance with BS4142:2014+A1:2019, the rating level for residential receptors has been determined to be equal to the predicted specific sound levels (as per Table 16) plus a +3dB penalty for daytime.

These rating levels have then been compared to the representative daytime and night-time background sound levels for the residential properties and daytime for the beach area and assessed in accordance with BS4142:2014+A1:2019. The results of this assessment are shown in Table 18, where the predicted rating levels and background sound levels have been rounded to the nearest dB.

Table 18: BS4142:2014+A1:2019 Operational Assessment for Human Receptors, dB

ASSESSMENT LOCATION	ASSESSMENT PERIOD	PREDICTED SPECIFIC SOUND LEVEL, L_{Aeq}	RATING LEVEL, $L_{Ar,T}$	BACKGROUND SOUND LEVEL, L_{A90}	DIFFERENCE
NSR01	Daytime	38	41	41	0
	Night-time	35	35	36	-1
NSR02	Daytime	38	41	48	-7
	Night-time	32	32	37	-5
NSR03	Daytime	27	30	56	-26

It can be seen from Table 18 that the rating level at closest residential receptors due to the operation of the proposed Scheme, has been predicted to be below or equal to the representative background sound level. This is applicable for all NSRs and during both the daytime and night-time periods.

In this regard, BS4142:2014+A1:2019 states that “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”.

Further to the above, Table 19 below compares the difference between the predicted rating levels and the background sound levels in conjunction with the noise impact magnitude for residential receptors shown in Table 5. Table 19 also determines the level of effect with reference to Table 3 (receptor sensitivity) and Table 7 (noise effect significance).

Table 19: Operational Assessment Residential Receptors – Impact Magnitude and Level of Effect

ASSESSMENT LOCATION	ASSESSMENT PERIOD	DIFFERENCE BETWEEN RATING LEVEL AND BACKGROUND SOUND LEVEL	IMPACT MAGNITUDE	SENSITIVITY OF RECEPTOR	LEVEL OF EFFECT
NSR01	Daytime	0	Negligible	Medium	Minor/Neutral
	Night-time	-1	Negligible	High	Minor/Neutral
NSR02	Daytime	-7	Negligible	Medium	Minor/Neutral
	Night-time	-5	Negligible	High	Minor/Neutral
NSR03	Daytime	-26	Negligible	Medium	Minor/Neutral

It can be seen from Table 19 that the level of effect from operational noise on human receptors would be *neutral* or in the worst-case *minor*. Where the level of effect is neutral or minor, the impact is not significant.

7.2.7 Assessment of Operational Sound on Ecological Receptors

Table 20 below summarises the assessment of operational sound for NSRs 03 and 04. The specific sound levels associated with operation of the proposed Scheme (including on-site traffic movements) have been assessed against the guidance levels outlined in AQTAG09.

Table 20: Operational Assessment Ecological Receptors

LOCATION	ASSESSMENT PERIOD	PREDICTED SPECIFIC LEVEL, DB $L_{AEQ,T}$	AQTAG09 NOISE LIMIT, DB $L_{AEQ,T}$	DIFFERENCE, DB
NSR03	Daytime	27	55	-28
	Night-time	25		-30
NSR04	Daytime	21		-34
	Night-time	18		-37

Further to the above, Table 21 below compares the difference between the predicted specific levels and the AQTAG09 Limit values in conjunction with the noise impact magnitude for residential receptors shown in Table 5. Table 21 also determines the level of effect with reference to Table 3 (receptor sensitivity) and Table 7 (noise effect significance).

Table 21: Operational Assessment Ecological Receptors – Impact Magnitude and Level of Effect

ASSESSMENT LOCATION	ASSESSMENT PERIOD	DIFFERENCE BETWEEN SPECIFIC LEVEL AND LIMIT LEVEL	IMPACT MAGNITUDE	SENSITIVITY OF RECEPTOR	LEVEL OF EFFECT
NSR03	Daytime	-28	Negligible	Medium	Minor/Neutral
	Night-time	-30	Negligible	Medium	Minor/Neutral
NSR04	Daytime	-34	Negligible	Medium	Minor/Neutral
	Night-time	-37	Negligible	Medium	Minor/Neutral

It can be seen from Table 21 that the level of effect from operational noise on ecological receptors would be *neutral* or in the worst-case *minor*. Where the level of effect is neutral or minor, the impact is not significant.

8.0 MITIGATION MEASURES

8.1 Construction Noise

The 'high-level' 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.

8.2 Operational Noise

For the closest residential receptors, the operational rating level has been predicted to be below or equal to the daytime and night-time background sound levels, and as such, this results in no significant effect. For the closest ecological receptors, no significant effect has also been determined. Therefore, no mitigation measures (other than those embedded within the design of the Scheme) are considered necessary and no residual effects are predicted.

8.3 Residual Impacts

8.3.1 Construction Noise

From the BS5228-1:2009+A1:2014 predicted assessment results, the noise associated with the construction of the Scheme is not likely to generate an adverse impact and therefore no residual effect is foreseen at this stage.

8.3.2 Operational Noise – Residential Receptors

According to the BS4142:2014+A1:2019 predicted assessment results, the operational noise is not likely to generate an adverse impact and therefore no residual effect is foreseen at this stage.

8.3.3 Operational Noise – Ecological Receptors

The predicted noise impact upon the wildlife once the proposed development is operation, has been evaluated based on the $L_{Aeq,1hr}$ 55dB limit. Since the noise prediction is below this limit for both daytime and night-time, it is believed that there will be no adverse impact, and therefore, no residual effect is foreseen at this stage.

9.0 CUMULATIVE ASSESSMENT

A cumulative assessment has been undertaken to determine whether the noise generated by construction and operational noise from the other proposed and permitted developments in the near vicinity of the Scheme would have a cumulative impact at the nearest human and ecological receptors.

The developments considered within the cumulative assessment are as follows:

- » Construction of an Organic Processing Plant (OPP), project reference - EA 00019/22
- » The onshore element of the second electrical interconnector between Sicily and Malta (the IC2 cable link), project reference – EA 00018/21.
- » Construction of a Waste to Energy Facility (WtE), project reference – PA/03012/20.
- » Construction of a Materials Recovery Facility (MRF), project reference – PA/00042/20
- » Construction of a new Thermal Treatment Facility (TTF), project reference – PA/06096/23

The approximate location of the developments above in relation to The Scheme and nearest NSR's is shown in Figure 6 below.



Figure 6: Cumulative Developments Considered (HDD = Horizontal directional drilling)

From review of the submitted documents relating to noise associated with the developments shown in Figure 6, it has been determined that the same NSRs have been considered within each assessment; however not all of the assessments consider both operational and construction noise impacts on all of the NSRs, as outlined below.

- » OPP Project – Operational noise at all NSRs but no construction noise assessment.
- » IC2 Project – Construction noise only at NSR03; and
- » TTF Project – Construction and operational noise at all NSRs
- » WtE Project – Construction and operational noise at all NSRs.

9.1 Cumulative Construction Noise Assessment

Where applicable the predicted construction noise levels from the projects considered at the relevant NSR have been logarithmically added together to determine the total cumulative construction noise level as shown in Table 22 below.

Table 22: Total Cumulative Construction Noise Level, dB

NOISE SENSITIVE RECEPTOR	PROJECT CONSIDERED AND PREDICTED NOISE LEVEL, $L_{AEQ, 1-HOUR}$				TOTAL CUMULATIVE LEVEL, $dB L_{AEQ, 1-HOUR}$
	MAGHTAB WASTE TO ENERGY FACILITY	IC2 DEVELOPMENT	MAGHTAB THERMAL TREATMENT FACILITY	MAGHTAB MATERIAL RECOVERY FACILITY (THE SCHEME)	
NSR01 - Residential Property to the south-east of the Site	43	-	52	52	55
NSR02 - Residential Property to the south of the Site	41	-	54	54	57
NSR03 - Beach area and Nature Reserve located to the north-east of the Site	45	50	35	35	51
NSR04 - Nature Reserve and Hotel Salini to the north-west of the Site	18	-	25	25	28

The total cumulative construction noise level has been compared to the relevant noise limits at each NSR as shown in Table 23 below.

Table 23: Cumulative Construction Noise Assessment, dB

NOISE SENSITIVE RECEPTOR	TOTAL CUMULATIVE LEVEL, DB $L_{AEQ, 1-HOUR}$	RELEVANT NOISE LIMIT, $L_{AEQ, 1-HOUR}$	DIFFERENCE
NSR01 - Residential Property to the south-east of the Site	55	65 – Category A threshold level from BS5228.	-10
NSR02 - Residential Property to the south of the Site	57	65 – Category A threshold level from BS5228.	-8
NSR03 - Beach area and Nature Reserve located to the north-east of the Site	51	55 – AQTAG09	-4
NSR04 - Nature Reserve and Hotel Salini to the north-west of the Site	28	55 – AQTAG09	-27

It can be seen from Table 23 that the calculated cumulative noise level from construction operations are well below the relevant noise limits at all the NSRs considered.

With reference to Table 3, Table 4, Table 6 and Table 7 it can be determined that the cumulative level of effect from construction noise would be *neutral* or in the worst-case *minor*, where the level of effect is neutral or minor, the impact is not significant.

9.2 Cumulative Operational Noise assessment

Where applicable the predicted operational specific noise levels (excluding penalties) from the projects considered at the relevant NSR have been logarithmically added to together to determine the total cumulative operational noise level as shown in Table 24.

Table 24: Total Cumulative Operational Noise Level, dB

NOISE SENSITIVE RECEPTOR	ASSESSMENT PERIOD	PROJECT CONSIDERED AND PREDICTED SPECIFIC NOISE LEVEL, $L_{AEQ, 1-HOUR}$					TOTAL CUMULATIVE LEVEL, DB $L_{AEQ, 1-HOUR}$
		MAGHT AB WASTE	IC2 DEVELOPMENT	MAGHTA B THERMA	OPP DEVELOPMENT	MAGHT AB MATERI	

		TO ENERG Y FACILI TY		L TREATME NT FACILITY		AL RECOVE RY FACILIT Y (THE SCHEME)	
NSR01	Daytime	32	32	36	32	38	42
	Night-time	33	31	34	31	35	40
NSR02	Daytime	28	26	32	26	38	40
	Night-time	29	26	31	26	32	36
NSR03	Daytime	36	39	32	39	27	43
	Night-time	33	39	32	39	25	43
NSR04	Daytime	14	25	19	25	21	29
	Night-time	12	24	18	24	18	28

9.2.1 Cumulative Operational Assessment - Human Receptors

As per Section 7.2.6 an assessment of the cumulative operational sound on the closest residential receptors and beach area (NSR01, NSR02 and NSR03) has been undertaken with reference to BS4142:2014+A1:2019, whereby the sound sources under investigation are compared to existing background sound levels. This assessment has been based on the results of the daytime and night-time baseline noise survey. It has assumed the beach area will only be utilised in the daytime, a night-time assessment has not been undertaken at this receptor.

With regards to the rating penalties to be applied it is considered that these would mirror those applied within the operational assessment of the Scheme (i.e., +3dB during the daytime for intermittent HGV movements) and no penalties during the night-time.

Based on the above the cumulative operational assessment for human receptors is shown in Table 25.

Table 25: BS4142:2014+A1:2019 Cumulative Operational Assessment for Human Receptors, dB

ASSESSMENT LOCATION	ASSESSMENT PERIOD	CUMULATIVE SPECIFIC SOUND LEVEL, L_{Aeq}	CUMULATIVE RATING LEVEL, $L_{AR,T}$	BACKGROUND SOUND LEVEL, L_{A90}	DIFFERENCE
------------------------	----------------------	---	---	---	------------

NSR01	Daytime	42	45	41	+3
	Night-time	40	40	36	+4
NSR02	Daytime	40	43	48	-5
	Night-time	36	36	37	-1
NSR03	Daytime	43	46	54	-9

It can be seen from Table 25 that the cumulative rating level at closest residential receptors due to the operation of all the development considered, has been predicted to be below the representative background sound levels at NSRs 02 and 03.

With reference to Table 3, Table 5 and Table 7 it can be determined that the cumulative level of effect from operational noise at NSRs 02 and 03 would be *neutral* or in the worst-case *minor*, where the level of effect is neutral or minor, the impact is not significant.

At NSR01 during the daytime Table 25 indicates that the cumulative rating level is +3dB above the background sound level, with reference to Table 3, Table 5 and Table 7 it can be determined that the cumulative level of effect from operational noise at NSR01 during the daytime would be *minor*, where the level of effect is *minor*, the impact is not significant.

At NSR01 during the night-time Table 25 indicates that the cumulative rating level is +2dB above the background sound level, with reference to Table 3, Table 5 and Table 7 it can be determined that the cumulative level of effect from operational noise at NSR01 during the night-time would be *moderate*, which does equate to a significant impact.

However, with regards to context, the following must be noted:

- » The cumulative assessment has considered a worst-case scenario where all the of the developments considered are operating simultaneously with downwind propagation between each source (development) and the receptors.
- » If the predicted cumulative specific level (40dB) is logarithmically added to the measured ambient night-time noise level at NSR01 (47dB), the total level would be 47.5dB which would not be an audible change³.
- » Accounting for the attenuation provided by a partially open window of 13dB⁴ the resultant internal level would be 27dB which is below the internal limit of 30dB for

³ In conjunction with the general principle of acoustics, the minimum dB change audible to the human ear is considered to be +/-3dB

⁴ Section G1 of BS8233: Guidance on sound insulation and noise reduction for buildings, states that if partially open windows were relied upon for background ventilation, the sound insulation would be reduced by approximately 15dB.

sleep disturbance contained in the World Health Organisation (WHO), *Guidelines for Community Noise Document* (1999)⁵.

With reference to all of the above, it is considered that once context is taken into account there would not be a significant noise impact from cumulative operational noise at NSR01 during the night-time.

9.2.2 Cumulative Operational Assessment – Ecological Receptors

As per Section 7.2.7 the assessment of cumulative operational sound at NSRs 03 and 04 have been assessed against the guidance levels outlined in AQTAG09.

Table 26: Cumulative Operational Assessment Ecological Receptors

LOCATION	ASSESSMENT PERIOD	CUMULATIVE PREDICTED SPECIFIC LEVEL, dB L _{AEQ,T}	AQTAG09 NOISE LIMIT, dB L _{AEQ,T}	DIFFERENCE, dB
NSR03	Daytime	42	55	-13
	Night-time	41		-14
NSR04	Daytime	27		-28
	Night-time	26		-29

It can be seen from Table 26 that the cumulative specific level at NSR03 and NSR04 due to the operational of all the developments considered has been predicted to be below the AQTAG09 limit.

With reference to Table 3, Table 6 and Table 7 it can be determined that the cumulative level of effect from operational noise would be *neutral* or in the worst-case *minor*, where the level of effect is neutral or minor, the impact is not significant.

⁵ Also referenced in the WHO Night Noise Guidelines for Europe document.

10.0 CONCLUSIONS

This chapter has assessed the likely effects of the proposed Scheme with respect to noise. The assessments have been undertaken with reference to relevant standards and guidelines, to include BS5228:2009+A1:2014, BS4142:2014+A1:2019, and AQTAG09. The significance of these effects has been determined with reference to the ToR; relating to noise (Ref: EA-00042_20).

With respect to noise and vibration associated with construction activities within the application site, the assessment has referenced the guidance of BS5228:2009+A1:2014.

The assessment of construction noise has shown that the derived daytime criterion is not expected to be exceeded at the closest receptors. In addition, construction activities would be temporary and noise levels have been predicted for a worst-case scenario, resulting in no significant residual effects.

Operational sound levels associated with the proposed Scheme (including on-site vehicle movements) have been predicted to the closest receptors using the calculation methodologies described in ISO 9613-2:1996, using the proprietary sound modelling software CadnaA®.

The assessment of operational sound (for residential receptors) has been undertaken in accordance with BS4142:2014+A1:2019, whereby the operational sound sources under investigation have been compared to the existing background sound levels. The assessment has been based on the results of a daytime and night-time baseline noise survey, undertaken at a location representative of the closest noise-sensitive receptors.

The assessment has shown that, for the closest residential receptors, the operational rating levels have been predicted to be at and below the representative daytime and night-time background sound levels, resulting in no significant residual effects.

For ecological receptors, the assessment of noise effects (during operation) has been made with reference to the guidance of AQTAG09, whereby the threshold value has not been predicted to be exceeded, resulting in no significant effect.

Cumulative construction and operational noise assessment have also been undertaken which have considered the other proposed developments located in the close vicinity of the Scheme.

The results of the cumulative assessments have shown that once context is taken into account there would be no significant level of effect from the cumulative noise levels from both the construction and operation of the developments considered.

Overall, it can be concluded that noise should not pose a significant constraint to the construction and operation of the proposed Scheme.

With reference to the conclusions above Table 27 overleaf provides a summary of the impacts, it must be noted that the table does not include the assessment of cumulative impacts.

11.0 SUMMARY OF IMPACT TABLE

Table 27: 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					
Noise	Site preparation	Construction	Residential/ Human	Medium	Direct	Adverse	Low	Approx 100m from each boundary of the Site*	Short (19-months)	Temporary	Reversible (temporary noise)	Inevitable	Minor	Follow construction good practice	Not significant	N/A
Noise	Site preparation	Construction	Wildlife Habitat	Medium	Direct	Adverse	Low	Approx 300m from each boundary of the Site**	Short (19 months)	Temporary	Reversible (temporary noise)	Inevitable	Not significant	Follow construction good practice	Not significant	N/A
Noise	Operational Plant and On-site Vehicle Movements	Operation	Residential/ Human	High – Night-time Medium - Daytime	Direct	Adverse	Low	Approx 400m from each boundary of the Site***	Long-term	Permanent	Irreversible	Inevitable	Not significant	No addition measures proposed other than those embedded into the scheme	Not significant	N/A
Noise	Operational Plant and On-site	Operation	Wildlife Habitat	Medium	Direct	Adverse	Low	Approx 100m from each	Long-term	Permanent	Irreversible	Inevitable	Not significant	No addition measures	Not significant	N/A

	Vehicle Movements							boundary of the Site****						proposed other than those embedded into the scheme		
<div>* At distances greater than 100m from the Site boundary the predicted construction noise level falls below the 65dB Construction Noise Limit Threshold for Human Receptors</div> <div>** At distances greater than 300m from the Site boundary the predicted construction noise level falls below the 55dB AQTAG Limit for Ecological Receptors</div> <div>*** Distance from boundary of the Site to the nearest human receptor (NSR01)</div> <div>**** At distances greater than 100m from the Site boundary the predicted operational noise level falls below the 55dB AQTAG Limit for Ecological Receptors</div>																

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 (2×10^{-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.

L₁₀ & L₉₀ If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L₁₀ is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L₉₀ is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L₁₀ index to describe traffic noise.

NOISE STUDY

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 Model Outputs

Computer Model Outputs

Figure B-01: Construction Noise Model Outputs

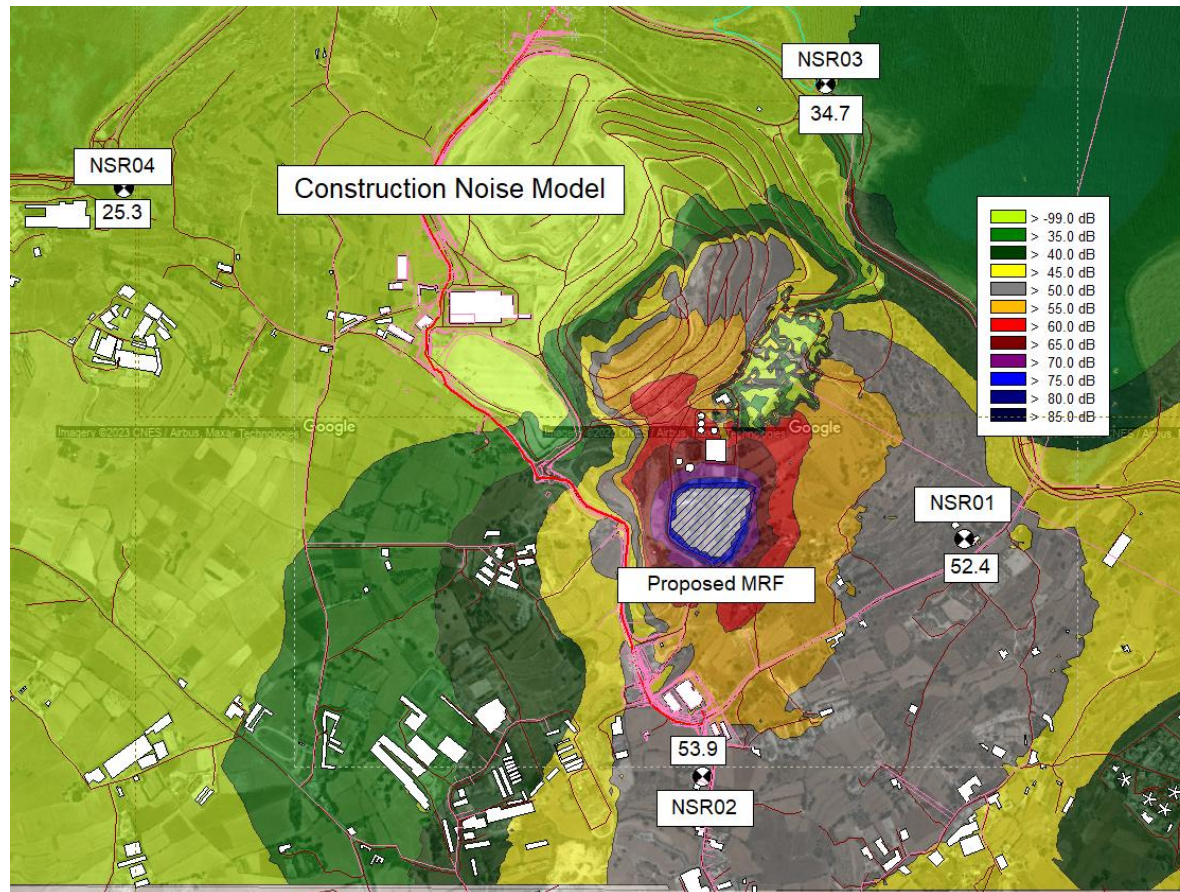


Figure B-02: Operational Daytime Noise Model Output.

