Noise Impact Assessment in Relation to an Environmental Impact Assessment (EIA) for the Maghtab Thermal Treatment Facility

As per ERA requirements for PA/06096/23

Report

Noise Impact Assessment in Relation to an Environmental Impact Assessment (EIA) for the Maghtab Thermal Treatment Facility

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Disclaimer

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1 INTRODUCTION

A noise impact assessment is presented in relation to the noise levels emitted from the construction and operation of the Maghtab Thermal Treatment Facility.

It is understood that the noise impact assessment would be included as part of an Environmental Impact Assessment (EIA) for the Maghtab Thermal Treatment Facility.

The proposed development, herein after referred to as the "Scheme" incorporates the development of a new Thermal Treatment Facility (TTF) for the incineration of hazardous waste and will form part of the ECOHIVE development.

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

"With regards to cumulative impacts, reference should be made to section 4.5 of the EIA Terms of Reference, which is also being replicated below:

'The cumulation of the effects of the project with those of other existing and/or approved projects and other waste management facilities as identified within the Waste Management Plan (2021-2030). This shall take into account existing environmental problems, areas of particular environmental importance likely to be affected, and the use of natural resources.'

The terminology utilised for the impact significance (in Section4.5) should be consistent with the impact significance utilised for other studies (i.e not significant, minor, moderate or major significance)."

This noise impact assessment considers:

- A qualitative assessment of the construction noise on human and ecological receptors; and
- A quantitative assessment of the operational noise on human and ecological receptors.

With regard to the qualitative construction noise assessment, it is considered that a full construction noise and vibration assessment is not required due the 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 construction noise assessment is based on predicted noise emissions undertaken for the adjacent Maghtab Materials Recovery Facility (MRF). The assessment considers 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 regard to the operational assessment this is based on predicted noise emissions from proposed operational activities. The assessment considers operational activities impacting on both the defined human and ecological receptors in conjunction with previously measured baseline sound levels and BS4142:2014+A1:2009 *Methods for rating and assessing industrial and commercial sound*.

Baseline environmental sound levels were previously measured at the nearest noise sensitive receptors to the Scheme as part of the noise assessment for the Maghtab Waste to Energy 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 SITE DESCRIPTION

2.1 LOCATION

The geographical location of the Scheme lies in the northern region of Malta, approximately 2.3 kilometres to the south-east of the town of Qawra as shown in Figure 1 below.

FIGURE 1: SCHEME LOCATION

2.1.1 Current Site

Further to the above, the footprint of the entire Site associated with the Scheme is approximately 18,185m^2. The Site is predominantly surrounded by agricultural fields, a dense cover of low-lying trees and remnants of a local maquis/advanced garigue community.

Figure 2 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 site respectively which are either being utilised or have been rehabilitated, having the slopes stabilised and/or re-contoured. To the northwest, 100m away, is the recently constructed Anaerobic Digestion Plant. 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 landfill. A dirt track provides access from the road to the Scheme.

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 Wasteserv Malta (WSM) 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 Materials Recycling Facility (MRF) and an Organic Processing Plant (OPP) within the complex. These two facilities are intended to be located in close proximity to the proposed TTF.

2.1.3 The Scheme in Greater Detail

The project entails the preparation of a new hazardous waste incineration plant with two independent lines, and space for a potential third independent line in the future. The Scheme will form part of the ECOHIVE Complex and will operate in conjunction with the other waste management facilities at Magħtab.

Presently 130-150 vehicles delivering waste are received at the existing TTF, per day. The current plant processes between 5,000 and 6,000 tonnes of hazardous waste per year and this is expected to increase in the future. A new TTF would also provide Malta with the opportunity to treat some of the wastes that are currently being exported. This would be in line with the direction of EU waste policy and self-sufficiency and proximity principles which stipulate that waste should be treated as close as possible at the point which it is generated, thus creating a more responsible and sustainable approach to waste management by limiting the adverse environmental effects from transporting waste over long distances. The new TTF will be equipped with the best available technology and practices for reducing impacts on the surrounding area.

The Scheme comprises four main building areas, as follows:

- Zone A – main plant building and a tank farm.
- Zone B – storage building with parking area.
- Zone C – administration building with five parking spaces.
- Zone D – entrance building and a hardstanding area for the storage of containers.

Each line will consist of a rotary kiln, a waste heat boiler with combustion air fans, an economiser, Flue Gas Treatment (FGT) reactor and bag house filter. Two lines will offer sufficient throughput capacity to cater for the near future demands of the existing thermal treatment facility, therefore reducing the amount of waste which is currently exported for incineration abroad. A second line will provide the additional benefit of ensuring that there is no downtime during maintenance works, or in case of fault within the either of the lines. The proposed project also includes space for the addition of a third line to future proof the project against increased demands and potential new markets.

The proposed layout of the Scheme is shown below in Figure 3.

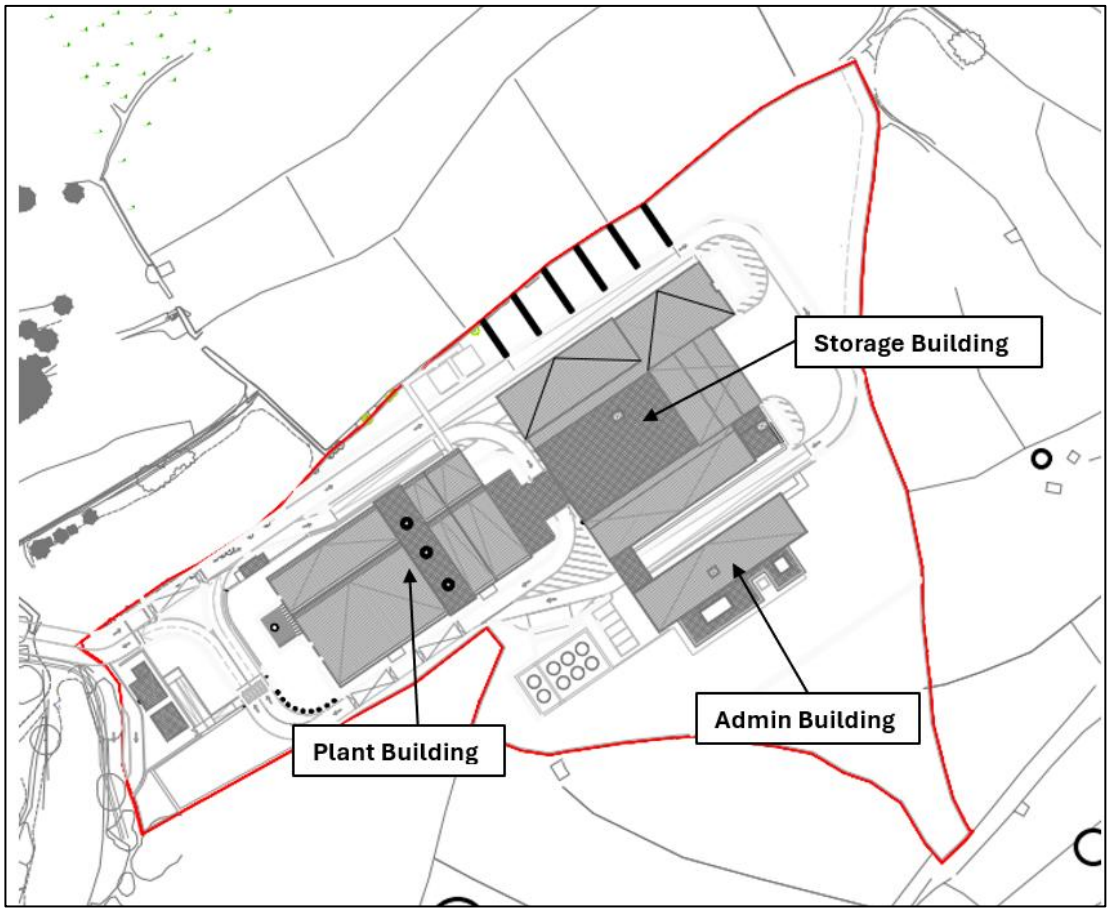

FIGURE 3: PROPOSED SCHEME LAYOUT

2.1.4 Nearest Sensitive Receptors

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

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

The NSRs described above are shown on Figure 4.

Figure 4: Nearest NSRs

3 TERMS OF REFERENCE

The ERA issued the Terms of Reference (ToR) related to the study in June 2024, entitled *"Terms of Reference for the preparation of an Environmental Impact Assessment. Proposed Thermal Treatment Facility in the ECOHIVE Complex, including plant building, storage building, administration building, waste water treatment, tank farm and cisterns."* [document ref: PA/6096/23].

This assessment has been conducted in accordance with the aspects of the ToR relating to noise which is contained in Section 3.9 and reproduced below:

3.9 Noise, Vibrations and Exterior Lighting

"A qualitative statement providing sufficiently detailed information from 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.).*

Note 2: ERA's request for a qualitative study does not need to include baseline monitoring. The study should consist in a desk study outlining the qualitative impact from the operations of the plant on the nearby receptors."

The described human (residents) and ecological receptors in Section 2.1.4 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 July 2024.

A summary of the agreed assessment methodology is provided below.

- The baseline sound levels measured for the Maghtab Waste to Energy Facility in 2020 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.

ASSESSMENT CATEGORY AND THRESHOLD VALUE PERIOD	THRESHOLD VALUE IN DECIBELS (DB)		
	CATEGORY A [A]	CATEGORY B [B]	CATEGORY C [C]

[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, BS4142provides 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 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
High	Threshold limit value exceeded by more than 5dB
Medium	Threshold limit value exceeded by a maximum of 4dB
Low	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
High	Rating level is 10dB(A) or more above the background sound level
Medium	Rating level is between 6 and 9dB(A) above the background sound level.
Low	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
High	Limit value exceeded by more than 5dB
Medium	Threshold limit value exceeded by a maximum of 4dB
Low	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:

- **Major**– 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;
- **Moderate** – environmental significance is associated with the effects that are important considerations, which could result in adverse effects if they are not mitigated;
- **Minor**– environmental significance could have an influence on the decision unless it is mitigated; and
- **Not Significant** – 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	NEGLIGIBLE
MAGNITUDE	High	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Minor	Minor
	Low	Moderate	Minor	Minor	Not Significant
	Negligible	Minor	Minor	Not Significant	Not Significant

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

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.

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 are 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

LOCATION	TIME PERIOD	L_{AEQ}	L_{A90}	L_{A10}	L_{AFMAX}
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

A qualitative assessment of construction noise has been requested by the ERA. This qualitative assessment has been undertaken based on the quantitative construction assessment that was undertaken for the Maghtab MRF, which is located adjacent to the southwest of the proposed Site.

It is considered that, due to the proximity of the proposed Scheme to the Maghtab MRF and the similarity of construction activities that will take place, the predicted construction noise levels for the Maghtab MRF are representative of those that would be generated during construction of the TTF Scheme and are therefore suitable for use within this assessment.

The assessment for the Maghtab MRF was 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 were undertaken within the CadnaA® modelling software, based on the following.

- Predictions were based on the calculation algorithms contained in BS5228:2014.
- The combined sound power level from all construction plant (120dB(A)) was modelled as an area source covering the entire are 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 took into account the local topography and any intervening structures.

Based on the above the predicted noise levels for the Maghtab TTF at each of the NSRs are shown in Table 11 (rounded to the nearest decibel).

TABLE 11: PREDICTED CONSTRUCTION NOISE LEVELS, DB

NOISE SENSITIVE RECEPTOR	PREDICTED NOISE LEVEL, DB $L_{Aeq,\ 1\text{-hour}}$
NSR01 - Residential Property to the 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 of the Site	35
NSR04 - Nature Reserve and Hotel Salini to the 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, in the worst-case be *minor,* following Table 7 definitions for levels of effect. Where the level of effect is *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, in the worst-case *minor*, following Table 7 definitions for levels of effect.

Where the level of effect is *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 AIS Environment Ltd [document ref: PRJ-ENV598,dated 21st February 2024].

7.2.1 Noise Model

The specific noise levels from the Scheme at the nearest NSRs have been predicted using the CadnaA® 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 majority of the plant is internal within the Plant building, with internal vehicle movements taking place within the Storage building.

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

- Plant Building – 85dB(A).
- Storage Building – 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 Control of Noise at Work Regulations 2005.

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 cladding[1] 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 Plant and Storage buildings.

TABLE 14: SOUND REDUCTION, R_W OF BUILDING MATERIALS

CONSTRUCTION ELEMENT	RW (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 below 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)	DATA SOURCE
Stack	At the western façade of the Plant building	90	Assumption, based on similar projects
Air cooled condenser units	At the northern site boundary	98	Measured data from previous assessments (Marsa TTF)
Unloading bays x 4	At the eastern end of the Storage building	91 (per bay)	Measured data from previous assessments (forklift unloading)

7.2.3 On-Site Vehicle Movements

With reference to the PDS it has been determined that the following on-site traffic movements will be associated with the input of waste to the Scheme.

- 43 deliveries brought to the TTF daily; and
- 7 deliveries brought to the TTF during the peak hour.

It has been assumed that during a worst-case peak hour there would be 7 HGV movements for deliveries associated with the Scheme.

It is assumed that the vehicles would follow the routes shown on Figure 32 of the PDS and a vehicle drive by sound power level of 108dB(A)[2] at 16km/h has been assumed (based on measured data from previous assessments).

Two weighing bridges are to be installed as part of the Scheme, at entrance and exit of the Site. The weighing bridges have been included within the model, with an on-time of 10% and an engine idling level of sound power level of 95dB(A) ((based on measured data from previous assessments).

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

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 Plant and Storage buildings will remain open to represent a worst-case scenario.
- 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 $L_{AEQ, 1\text{-HOUR}}$
NSR01 - Residential Property to the east of the Site	Daytime	36
	Night-time	34
NSR02 - Residential Property to the south of the Site	Daytime	32
	Night-time	31
NSR03 - Beach area and Nature Reserve located to the north of the Site	Daytime	32
	Night-time	32
NSR04 - Nature Reserve and Hotel Salini to the west of the Site	Daytime	19
	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 P4) 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	The majority of noise generating plant will be housed within the buildings, which will be operational constantly through the daytime and night-time periods. Therefore, the sound would not be intermittent or impulsive. From previous experience it is also considered that the noise

SOUND SOURCE	SOUND TONAL	SOUND IMPULSIVE	SOUND INTERMITTENT	OTHER SOUND CHARACTERISTIC	COMMENT
					would not be tonal.
External Plant	No	No	No	No	From analysis of the CadnaA® noise model the specific sound levels from external plant (Stack, ACUCs) are insignificant compared to baseline ambient sound levels from 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**

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	36	39	41	-2
	Night-time	34	34	36	-2
NSR02	Daytime	32	35	48	-13
	Night-time	31	31	37	-6
NSR03	Daytime	32	35	54	-19

It can be seen from Table 18 that the rating level at the closest residential receptors due to the operation of the proposed Scheme, has been predicted to be below 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	-2	Negligible	Medium	Minor
	Night-time	-2	Negligible	High	Minor

ASSESSMENT LOCATION	ASSESSMENT PERIOD	DIFFERENCE BETWEEN RATING LEVEL AND BACKGROUND SOUND LEVEL	IMPACT MAGNITUDE	SENSITIVITY OF RECEPTOR	LEVEL OF EFFECT
NSR02	Daytime	-13	Negligible	Medium	Minor
	Night-time	-6	Negligible	High	Minor
NSR03	Daytime	-19	Negligible	Medium	Minor

It can be seen from Table 19 that the level of effect from operational noise on human receptors would be, in the worst-case *minor.* Where the level of effect is 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	32	55	-23
	Night-time	32		-23
NSR04	Daytime	19		-36
	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	-23	Negligible	Medium	Minor
	Night-time	-23	Negligible	Medium	Minor
NSR04	Daytime	-36	Negligible	Medium	Minor
	Night-time	-37	Negligible	Medium	Minor

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

8 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 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 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 (WEF), project reference – PA/03012/20.
- Construction of a Materials Recovery Facility (MRF), project reference – PA/00042/20

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
- 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, $L_{AEQ, 1\text{-HOUR}}$				TOTAL CUMULATIVE LEVEL, DB $L_{AEQ, 1\text{-HOUR}}$
	MAGHTAB WASTE TO ENERGY FACILITY	IC2 DEVELOPMENT	MAGHTAB MATERIAL RECOVERY FACILITY	MAGHTAB THERMAL TREATMENT 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

NOISE SENSITIVE RECEPTOR	PROJECT CONSIDERED AND PREDICTED NOISE LEVEL, $L_{AEQ, 1\text{-HOUR}}$				TOTAL CUMULATIVE LEVEL, DB $L_{AEQ, 1\text{-HOUR}}$
	MAGHTAB WASTE TO ENERGY FACILITY	IC2 DEVELOPMENT	MAGHTAB MATERIAL RECOVERY FACILITY	MAGHTAB THERMAL TREATMENT FACILITY (THE SCHEME)	
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.

TABLE 23: CUMULATIVE CONSTRUCTION NOISE ASSESSMENT, DB

NOISE SENSITIVE RECEPTOR	TOTAL CUMULATIVE LEVEL, DB $L_{AEQ, 1\text{-HOUR}}$.	RELEVANT NOISE LIMIT, $L_{AEQ, 1\text{-HOUR}}$	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 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, in the worst-case *minor.* Where the level of effect is 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, $L_{Aeq, 1\text{-hour}}$				TOTAL CUMULATIVE LEVEL, DB $L_{Aeq, 1\text{-hour}}$
		MAGHTAB WASTE TO ENERGY FACILITY	IC2 DEVELOPMENT	MAGHTAB MATERIAL RECOVERY FACILITY	MAGHTAB THERMAL TREATMENT FACILITY (THE SCHEME)	
NSR01	Daytime	32	32	38	36	41
	Night-time	33	31	35	34	40
NSR02	Daytime	28	26	38	32	40
	Night-time	29	26	32	31	36
NSR03	Daytime	36	39	27	32	42
	Night-time	33	39	25	32	41
NSR04	Daytime	14	25	21	19	27
	Night-time	12	24	18	18	26

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 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	41	44	41	+3
	Night-time	40	40	36	+4
NSR02	Daytime	40	43	48	-5
	Night-time	36	36	37	-1
NSR03	Daytime	42	45	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 NSR02 and NSR03.

With reference to Table 3, Table 5 and Table 7 it can be determined that the cumulative level of effect from operational noise at NSR02 and NSR03 would be, in the worst-case *minor*. Where the level of effect is 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 during the daytime and +4dB above the background sound level during the night-time.

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* and the impact is not significant. The cumulative level of effect from

operational noise at NSR01 during the night-time would be *moderate;* where the level of effect is *moderate*, the impact is defined as significant.

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 47.8dB, which would not be an audible change[3].
- Accounting for the attenuation provided by a partially open window of 13dB[4] the resultant internal level would be 27dB which is below the internal limit of 30dB for 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 NSR03 and NSR04 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

[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.

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

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, in the worst-case *minor*. Where the level of effect is minor, the impact is not significant.

10 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: PA/6096/23).

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 qualitative 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 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 effects.

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 provides a summary of the impacts. It must be noted that the table does not include the assessment of cumulative impacts.

11 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-term	Temporary	Reversible (temporary noise)	Inevitable	Minor	Follow construction good practice	Not significant	N/A
	Site preparation	Construction	Wildlife Habitat	Medium	Direct	Adverse	Low	Approx 300m from each boundary of the Site**	Short-term	Temporary	Reversible (temporary noise)	Inevitable	Minor	Follow construction good practice	Not significant	N/A
	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	Minor	No additional measures proposed other than those embedded into the scheme	Not significant	N/A
	Operational Plant and On-site Vehicle	Operation	Wildlife Habitat	Medium	Direct	Adverse	Low	Approx 100m from each boundary	Long-term	Permanent	Irreversible	Inevitable	Minor	No additional measures proposed other than those	Not significant	N/A

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					
	Movements							of the Site****						embedded into the scheme		

* 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
** At distances greater than 300m from the Site boundary the predicted construction noise level falls below the 55dB AQTAG Limit for Ecological Receptors
*** Distance from boundary of the Site to the nearest human receptor (NSR01)
**** At distances greater than 100m from the Site boundary the predicted operational noise level falls below the 55dB AQTAG Limit for Ecological Receptors

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 Model Outputs

Computer Model Outputs

FIGURE B-01: OPERATIONAL DAYTIME NOISE MODEL OUTPUT

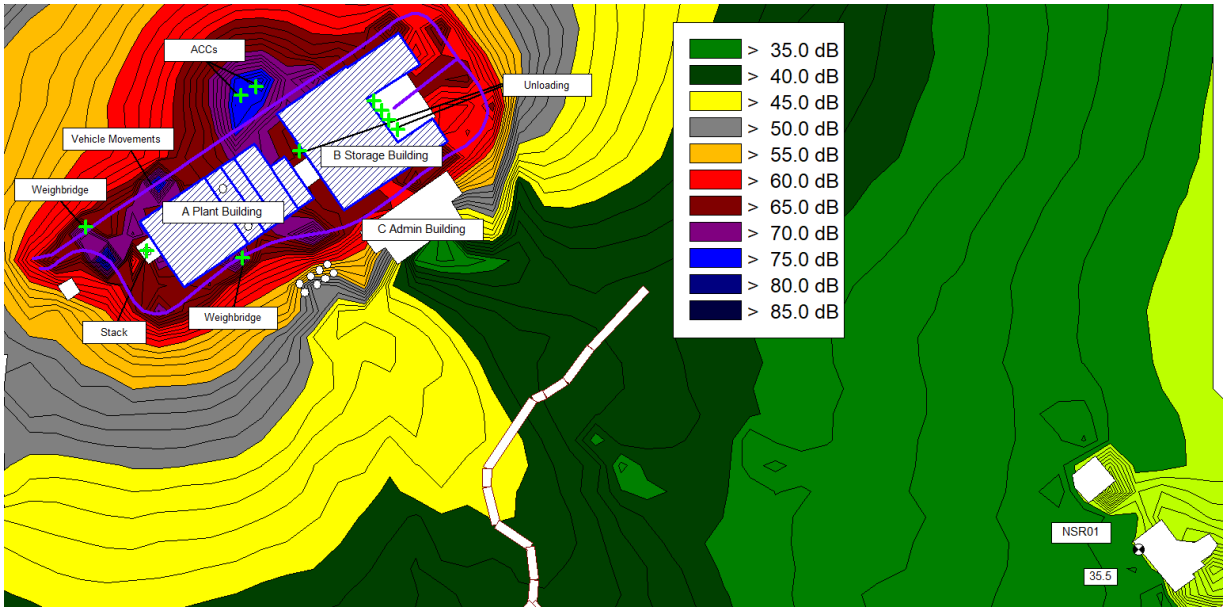

FIGURE B-02: OPERATIONAL DAYTIME NOISE MODEL OUTPUT