Coordinated Assessment for the construction of a Thermal Treatment Facility (TTF)

As per ERA requirements for PA 6096/23 (EA/00020/22)

ENVIRONMENT

COORDINATED ASSESSMENT

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26/11/2024	2.0	Second Version – Addressing feedback from COWI	
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13/02/2024	5.0	Fifth Version – Consolidated draft	

Disclaimer

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1 INTRODUCTION

An Environmental Impact Assessment (EIA) is hereby being presented in relation to a development permit, PA/06096/23 (EA/00020/22). The application is entitled *"Proposed Thermal Treatment Facility in the ECOHIVE Complex, including plant building, storage building, administration building, waste water treatment, tank farm and cisterns."*

The EIA focuses on the assessment of potential environmental impacts rising from the physical characteristics of the whole project and the land use requirements during the construction, operational and decommissioning phases. Detailed Terms of Reference (ToRs) for this EIA were issued by the Environment and Resources Authority (ERA) in June 2024, in accordance with the ENVIRONMENTAL IMPACT REGULATIONS (S.L. 549.46).

Wasteserv Malta commissioned AIS Environment Ltd. (Malta) to coordinate the EIA process and compile all the necessary technical studies.

This report presents the conclusions of the Coordinated Assessment, which is required by the ERA to provide context and the key findings of the EIA in its totality. The TORs state the following: *The coordinated assessment should seek to analyse and integrate the main considerations emerging from the technical reports, rather than just reproducing excerpts from the reports.*

1.1 STRUCTURE OF THE EIA

The structure of this EIA is detailed in Table 1, along with the relevant sections of ERA's Terms of Reference (ToRs) for ease of reference.

TABLE 1: STRUCTURE OF THE EIA

CHAPTER IN COORDINATED ASSESSMENT REPORT (EIA)	DESCRIPTION	RELEVANT SECTIONS OF ERA'S TORS
1	Introduction	N/A
2	Description of the proposed development. This section includes the justification of the proposal and a description of the physical characteristics of the whole project and the land	Section 2

Chapter in Coordinated Assessment Report (EIA)	Description	Relevant Sections of ERA's ToRs
	use requirements during the construction and operational phases.	
3	Assessment of alternatives	Section 3
4	A description of aspects of the site and its surroundings (i.e., environmental baseline)	Section 4
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2 Description of the proposed development

2.1 General Introduction

Malta's Long-Term Waste Management Plan (2021-2030) outlines critical challenges and strategies aimed at improving the country's waste management performance, which currently ranks among the lowest in the EU.

The main challenges identified within the plan are the exponential population growth and subsequent waste increase, coupled with low separation and recycling rates.

From 2014 to 2020, Malta's population grew by 73,579, leading to a municipal waste increase of approximately 58,000 tonnes. This rapid growth exacerbates waste management issues, necessitating urgent reforms. Malta has struggled with low recycling rates, achieving only 9.9% for municipal waste in 2019, significantly below the EU average of 47.7%. In terms of hazardous waste, Malta has historically exported the majority of this waste component, almost half of which was incinerated waste.

The plan sets out several strategic objectives to enhance waste management:

- Focus on different management options to increase the resource value of waste.
- Develop initiatives aimed at reducing per capita waste generation.
- Improve efficiency through regionalisation and modernisation of collection practices.
- Study frameworks that encourage producers to manage packaging waste effectively.
- Promote collaboration with private entities in waste management efforts.
- Build necessary facilities for treating recyclable, organic, and residual waste.
- The amended Local Government Act enables Regional Councils to issue tenders for waste management services, promoting economies of scale through regional collection systems.
- A new Materials Recovery Facility (MRF) is proposed to improve recycling rates and reduce landfill dependency. It aims to align with EU directives on emissions and recycling targets.
- Improving the anaerobic treatment of separately collected organic waste by developing a new Organic Processing Plant handling approximately 74kt – 86.5kt of organic wastes annually
- The development of a waste-to-energy plant that will convert non-recyclable materials into energy, helping meet Malta's energy needs while diverting waste from landfills.

The development of a new Thermal Treatment Facility (TTF) and/or upgrading of the existing TTF (currently located in Marsa) is explicitly mentioned in the LONG-TERM WASTE MANAGEMENT PLAN (2021-2030):

> *"**WMRO_13** : To explore options with respect to the upgrading or relocation of the TTF. In recognition of the need to continuously improve and modernise to meet national needs for the thermal treatment of waste, the exploration of the MTTF will be addressed during the first phase of the WMP (2021-2023)."*

The proposed Thermal Treatment Facility (TTF) would be able to address the needs identified in Malta's LONG-TERM WASTE MANAGEMENT PLAN (2021-2030) by providing a viable solution to several pressing waste management challenges as outlined hereunder.

1) Reduction of waste exports

The introduction of a TTF is projected to reduce the reliance on exportation of several hazardous waste streams generated locally. In 2020, Malta exported 32.5kT of hazardous waste, 46% of which was incinerated.

The existing facility at Marsa will likely be retained to act as a cold standby to the new development, as it was deemed unfeasible to expand the existing facility to meet the current and projected demand of all hazardous waste generated . The current plant processes between 5,000 and 6,000 tonnes of hazardous waste per year. The new TTF is designed to meet a demand of hazardous waste exceeding 10kT per annum by 2045.

The proposed TTF will be designed to handle the following waste streams: fallen animals, expired food, butcher shop waste, clinical waste, manufacturing and industrial waste.

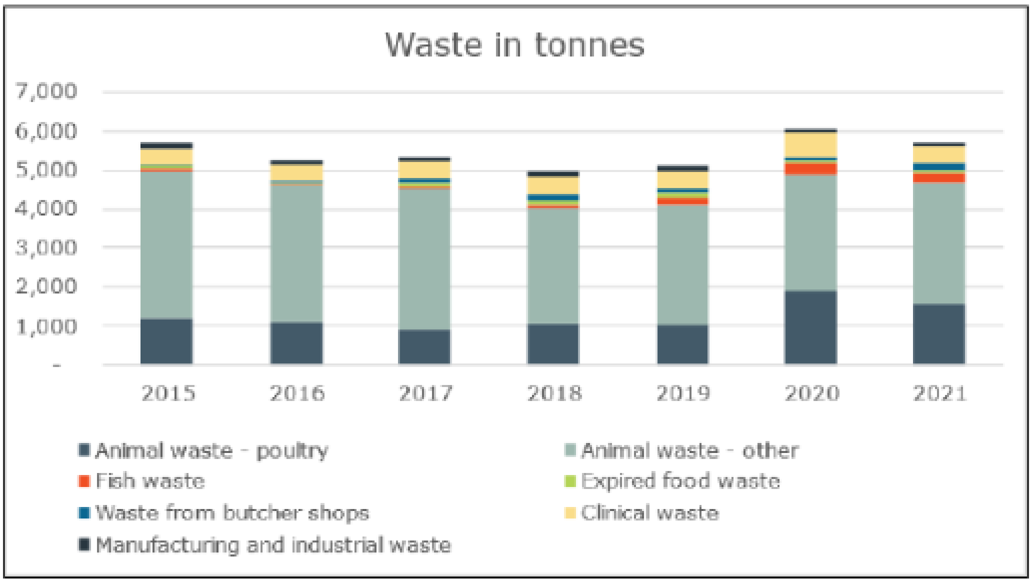

FIGURE 1: WASTE RECEIVED AT THE EXISTING MTTF BETWEEN 2015 - 2021

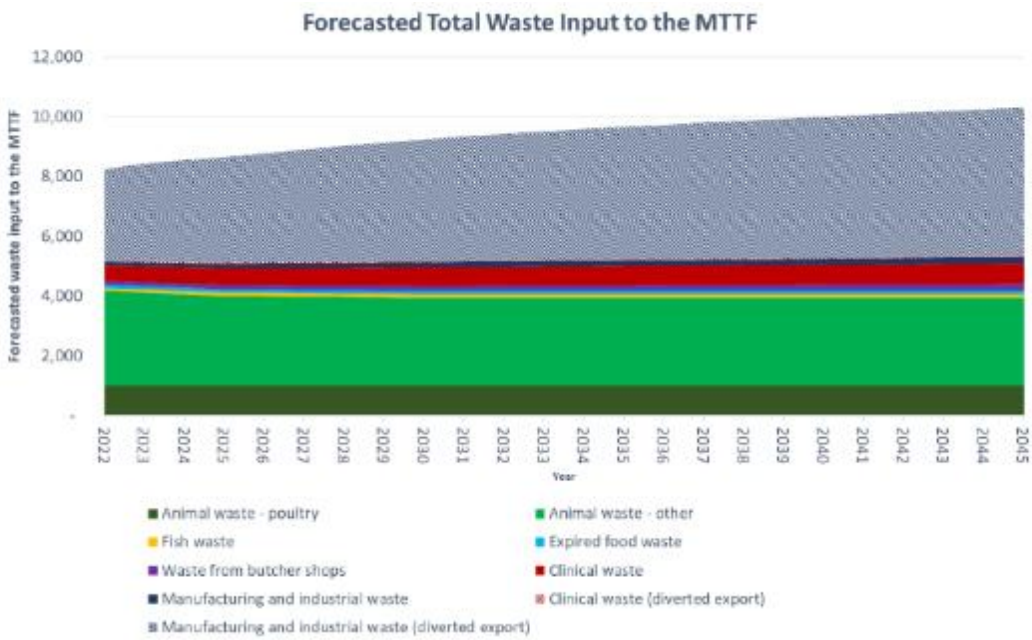

FIGURE 2: FORECAST WASTE INPUTS TO 2045

2) Centralising and improving waste management infrastructure

The establishment of a new TTF is part of a broader strategy to modernise Malta's waste management infrastructure. This includes investments in facilities that treat recyclable, organic, and residual waste effectively, ensuring compliance with EU directives and enhancing environmental sustainability. Additionally, these developments will be consolidated within one main area at the ECOHIVE complex. The centralised operations will increase the efficiency of waste management processes, reduce overall costs and impacts. Additionally, halting operations at the existing TTF in Marsa would eliminate the operational impacts in the area. The proposed site, on the other hand, is located in a rural area near a natural rocky coastline, and forms part of an existing complex of waste-management facilities (known as the ECOHIVE). The surrounding land uses are primarily agricultural and industrial, with the nearest town being Baħar iċ-Ċagħaq.

The proposal includes the construction of a new hazardous waste incineration plant with two independent lines, each line consisting of a rotary kiln, a waste heat boiler with combustion air fans, an economiser, FGT reactor and bag house filter. Two lines will offer sufficient throughput capacity to cater for future demands, therefore reducing the amount of waste which is currently exported for incineration. 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 potentially accommodate new markets.

The development should be conformant with the EU direction on waste policy and SELF-SUFFICIENCY AND PROXIMITY PRINCIPLES which stipulate that waste should be treated as close as possible to the point where it is generated. This creates a more responsible and sustainable approach to waste management by limiting the adverse environmental effects from transporting waste over long distances.

2.2 Scheme site and immediate surroundings

The proposed site for the TTF forms part of the ECOHIVE complex, located in Magħtab, a suburb within the locality of Naxxar. This area forms part of the North-East coastal zone of Malta, as shown in Figure 3 and Figure 4. The area is mainly characterised by rural and agricultural land. The satellite map of the scheme site and a 100 m boundary around the proposed site are shown in Figure 5.

FIGURE 3: THE GEOGRAPHICAL LOCATION WITHIN THE MALTESE ISLANDS (SOURCE: GOOGLE EARTH)

FIGURE 4: SCHEME LOCATION IN MALTA (Source: Google Earth)

FIGURE 5: PROPOSED SCHEME SITE FOOTPRINT AND IMMEDIATE SURROUNDINGS

2.2.1 Present land uses and environmental characteristics of the site

The total area covered by the proposed Thermal Treatment Facility (TTF) spans approximately 18,185 m². In addition to the primary plant and its operational and storage structures, the proposed facility features several ancillary buildings. These will include a water treatment facility, offices, restrooms, laundry services, kitchen, various administrative spaces, access control points, a reception area for pet carcasses, and a substation. The development will also include parking areas and landscaped zones designed to blend seamlessly with the surrounding environment.

To the Northwest and West lie the engineered Għallis and Ta' Żwejra landfill sites. The former is still in use whilst the latter has been rehabilitated through slope stabilisation and re-contouring. About 100 meters to the Northwest from the proposed site lies the Anaerobic Digestion Plant. To the East, the landscape is primarily comprised of agricultural fields divided into small plots by rubble walls. A tarmacked access road runs to the West of the site, providing access to other areas of the ECOHIVE complex, while a dirt track currently connects this road to the facility site.

The site's location presents several operational benefits that align with WSM's strategy for effective waste processing. Nearby facilities include an approved but not yet developed Waste-to-Energy plant approximately 400 meters away, an associated seawater pump room, and the existing Malta North plant (Mechanical and Biological Treatment), situated about 500 meters from the TTF. Recently, WSM has commissioned a temporary Materials Recovery Facility (MRF) sorting line within the Malta North building. The ECOHIVE complex also encompasses two Weighbridge Control Rooms located to the West and South of the proposed TTF, along with an Administration block on the Western side and a Gas Plant near the Anaerobic Digestion Plant. WSM also plans to establish a new Materials Recycling Facility (MRF) and an Organic Processing Plant (OPP) within this complex, both intended to be located adjacent to the proposed TTF.

The scheme falls under the governance of the CENTRAL MALTA LOCAL PLAN (CMLP), more specifically within the Baħar iċ-Ċagħaq region of the locality of Naxxar (Figure 6). The TTF site is located within an Area of Ecological and Agricultural Value as designated by the CMLP through policies CG22 and CG24 respectively.

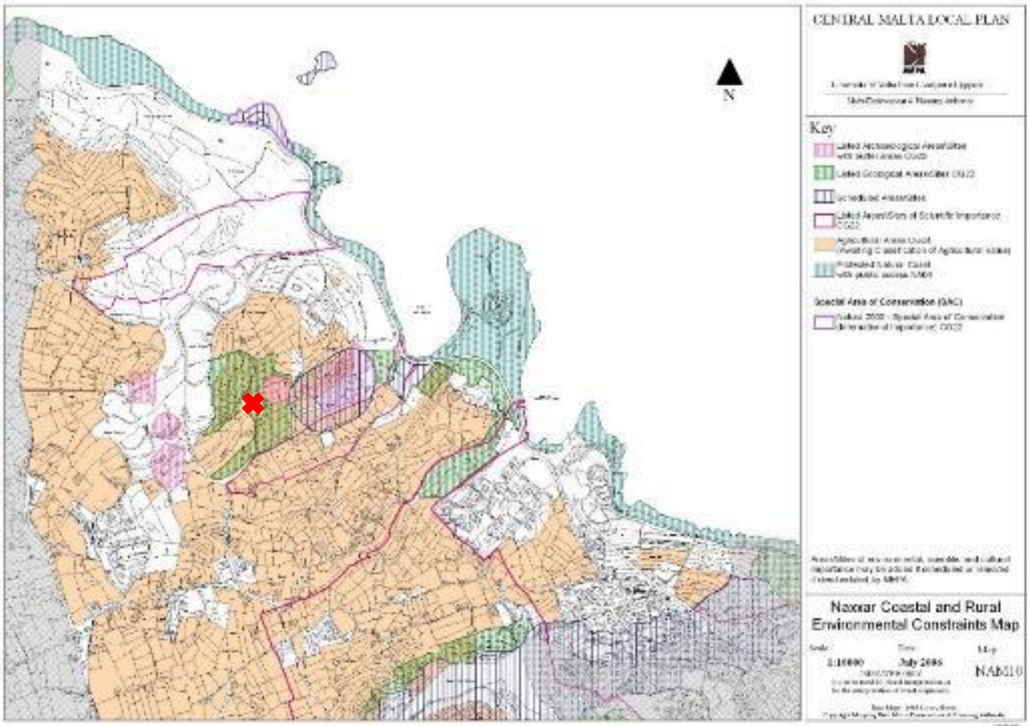

FIGURE 6: COASTAL AND RURAL POLICY MAP FOR BAĦAR IC-CAGĦAQ, NAXXAR (SOURCE: CMLP, 2006)

The TTF site boundary does not intersect with any protected Natura 2000 sites. Natura 2000 sites comprise a network of protected areas established by the EU to conserve wildlife and habitats. The network covers various sites across all EU Member States, including Malta. The main objective of the Natura 2000 network is to protect and conserve threatened species and habitats, and to ensure the long-term survival of Europe's most valuable and threatened species and habitats. Several Natura 2000 areas lie within close proximity of the TTF site, including:

- Terrestrial Environment:
    - MT0000007 - *Is-Salini* designated as a Special Area of Conservation via Government Notice 1379 of 2016; and
    - MT000008 – *L-Għadira s-Safra u l-Iskoll tal-Għallis* – a Special Area of Conservation via G.N. 1522 of 2019

- Marine Environment:
    - MT0000105 - *Żona fil-Baħar bejn il-Ponta ta' San Dimitri (Għawdex) u Il-Qaliet* designated as a Special Area of Conservation of International Importance via Government Notice 682 of 2018; and
    - MT0000112 - *Żona fil-Baħar ta' madwar Għawdex* – Special Protected Area via Government Notice 1311 of 2016.

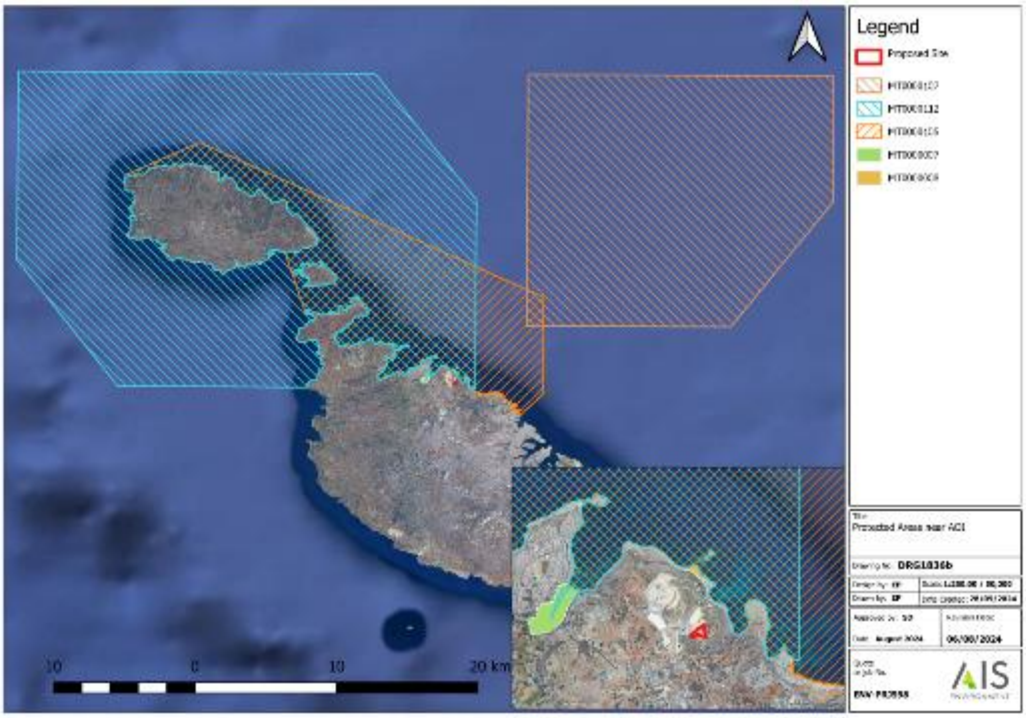

FIGURE 7: NEARBY SITES PROTECTED WITHIN THE NATURA 2000 FRAMEWORK

2.3 JUSTIFICATION FOR THE PROPOSAL

The existing Marsa TTF, which processes hazardous waste, has faced significant operational challenges, including high costs and frequent odour and noise complaints from nearby residents and other sensitive receptors.

The existing facility faces several operational limitations. The plant was constructed in 2007, with the intention of catering exclusively to animal wastes. This makes the plant already operational for 17 years. Additionally, the current plant is catering to a much wider range of wastes than originally envisaged.

Following a fire which occurred at the site in 2020, parts of the autoclave plant were out of operation. The odour control system was also affected by the fire, resulting in increased odour-related complaints. The long-term issues caused by the fire reduced the operational capacity of the site.

The site also contains a very limited cold storage capacity, and limited space for expansion of such.

The incineration line experiences frequent down-time periods due to technical faults and maintenance requirements, with an estimated availability maximum of 5000 hours per year, which is significantly below the standard within the incineration industry.

Overall, the MTTF is implementing the permit requirements for emissions and their monitoring, however, several limit exceedances were reported in flue gas emissions over the years. These may be caused by degradation of the machinery, and a lack of optimisation in the process control system. The effluent water system faces challenges in getting a biological balance in the treatment system, which is causing instances of pollutant levels exceeding the threshold values. Noise-generating components of the site, while not outdated in terms of technology, can benefit from being replaced by silent motor-drives to reduce impacts in this regard.

The technology currently implemented at the MTTF as individual units is considered fit for purpose, however the technology integration is less than optimal, and the level of automation in the process control system is limited, primarily due to the site constraints.

Operational costs at the existing MTT facility are relatively high, at around 571 EUR/t, compared to 320-350 EUR/t for similar hazardous waste plants elsewhere in the EU.

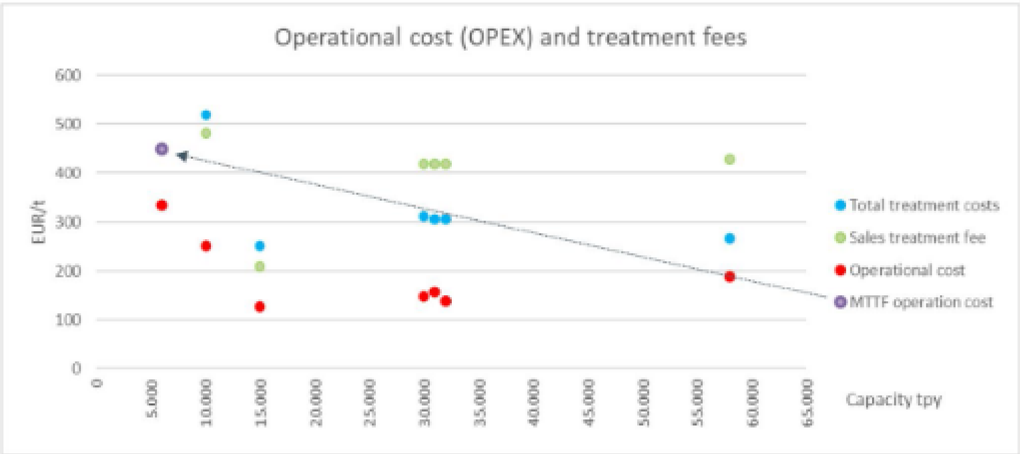

FIGURE 8: OPEX COSTS FOR THE EXISTING MTTF COMPARED TO SIMILAR PLANTS IN THE EU

Economic analyses concluded that upgrade of the existing facility is not economically viable in comparison with investing in new technology at a more suitable location.

Additionally, the nearby land uses at the existing site, which constitute several industrial, office and residential users, frequently submit complaints with regards to odour generation at the site. While investments were made at the existing MTTF to introduce air deodorisers and scrubbers, better storage and best practices to limit odorous emissions to the extent possible, these may not be completely eliminated due to the limitations of the site. Therefore, the relocation to the Maghtab ECOHIVE complex presents the most effective solution, both in terms of eliminating direct impacts on residents, and also increasing the efficiency of the waste management system as a whole, due to shorter transfers of materials between sites due to the proposed site being within the ECOHIVE complex.

The proposed relocation to Magħtab aims to alleviate the aforementioned issues by moving the operations to a less populated area, thereby removing the impact on the local communities in Marsa. The new TTF would form part of the broader ECOHIVE complex, which aims to centralise Malta's waste treatment facilities. This complex includes various operational arms operated by Wasteserv Malta which are all designed to enhance waste management capabilities and reduce reliance on landfills. The centralised location will also limit impacts related to the transport of waste from various sites, streamline logistics and reduce operational costs.

WASTE REGULATIONS (S.L. 549.63) transposing Directive 2008/98/EC stipulate that emissions form waste treatment facilities must adhere to strict air quality limits. These conditions will be achieved through the installation of best available technologies within the new TTF to minimise emissions of nitrogen oxides, dioxins, particulate matter etc. The proposed facility will be designed to handle the specific hazardous categories as outlined in the legislation, ensuring compliance with the classification and handling protocols established in S.L. 549.63. Additionally, the proposed design adheres to the stipulations that waste is treated as such to minimise the environmental impact and maximises resource recovery, where possible.

The development of a new TTF would also support Malta in transitioning towards a circular economy, in line with the wider EU movement in this direction. This is possible by reducing reliance on landfills, exportation and reducing the costs and environmental impacts of the treatment of such waste.

Malta is committed to investing in the necessary infrastructure to adhere to European requirements, thus instilling a national culture of resource efficiency. The proposed infrastructure aims to promote the prevention and sustainable management of waste by means of[1]:

- Maximising the resource value in waste through different management options;
- Innovating by designing waste prevention initiatives to lower Malta's per capita generation rate;
- Reforming the collection system to increase economies of scale, harmonise collection practices and modernise the collection fleet;
- Studying the feasibility of an enhanced producer responsibility framework to complement Malta's transition to a circular economy and reflect further on the true cost of waste management;
- Promoting further the involvement of the private sector in waste management.
- Building the necessary waste management facilities to treat recyclable, organic and residual waste to achieve Malta's targets;

The development of the new Thermal Treatment Facility (TTF) is expected to make a significant contribution to the objectives outlined above. It is essential to consider the TTF's development within the broader context of the overall expansion and modernisation of the ECOHIVE complex and the waste management systems in the Maltese islands. Integrating the TTF into the ECOHIVE complex will further streamline the national waste management system by centralising operations at one location, fostering synergies between different waste treatment facilities.

[1] Long Term Waste Management Plan 2021 – 2030 - ERA accessed on 15/02/2024.

The development anticipates the expected increase in demand for waste incineration and ensures that such wastes are treated as close to their source as possible, aligning with EU recommendations. By minimising transport distances and implementing Best Available Techniques (BAT) in all aspects of the proposed design, the environmental impacts associated with hazardous waste treatment are further reduced. Additionally, treating a wider range of wastes locally enhances the nation's self-sufficiency in waste management.

2.3.1 Demand

The existing TTF in Marsa processes approximately 5,000 to 6,000 tonnes of hazardous waste annually. Weekly transport trips reach figures of 130-150 vehicles. The annual throughput of waste to be processed at thermal treatment facilities is projected to rise above 10,000 tonnes per year by 2045.

The proposed TTF incorporates two separate lines, each equipped with rotary kilns and capable of processing a maximum of 1.2 tonnes of waste per hourThus the proposed new development will permit the processing of a maximum of 7,000 tons per year in each line. Initially, the development will run with one line, with the possibility of expanding operations to two lines to meet future demand.

TABLE 2: TONNAGE OF WASTES PER STREAM PROCESSED AT THE MARSA MTTF IN 2019

Thermal Treatment Facility – 2019 Data	Tons
Civil Abattoir	1629
Fallen Animals	944
Private Processing Plants	437
Chicken Farms - processing	1002
Animal by products from hatchers	52
Rabbit Farms	19
Fish Farms	190
Dairy Farms	2
Stray Fallen Animals	32
Expired Food stuffs	130
Fuel Oil Diesel	2
Engine Oils	14
Clinical Waste	456
Medicines and Pharmaceuticals	44
Chemicals – dangerous substances (human)	3
Grease Oil Hazardous Waste	2
Contaminated Packaging Waste	16
Waste Paint	13
Sealants/Adhesives	1
Paper for Incineration	4
Excipients from MFSU of Pharmaceuticals	3
Organic unused products	2
Organic Material	19
Waste from Butcher shops	109
Toners	1
Total	5127

2.3.2 Policy requisites

The coastal area at Naxxar is of high ecological, scientific, and scenic importance, protected by the Coastal Strategy Paper, which seeks to conserve and safeguard the natural and cultural values of the protected coastal areas. The proposed scheme location avoids Qalet Marku Bay and other sensitive areas to ensure preservation of coastal, transitional and land ecosystems. The newly proposed TTF will be part of and interact with the other waste treatment facilities at the ECOHIVE Complex while minimising land consumption of agricultural fields.

Local Plan Policies

The location of the site falls under the provisions of the CENTRAL MALTA LOCAL PLAN, 2006 (CMLP). Policies of the CMLP which are relevant to the scheme are summarised in Table 3.

TABLE 3: AFFECTED AREA POLICIES

TITLE	REFERENCE	POLICY GIST:
Coast Road Alignment	NA06	NA06 proposes that the improvement of the Coast Road, between Baħar ic-Ċagħaq and Salina Bay, as indicated on the Naxxar Coast Transport Policy Map, should take the form of an on-line improvement rather than the construction of a new road as indicated in the current Structure Plan.[2]
Protected Natural Coast	NA04	NA04 will not permit urban development along the open coastal area of Naxxar, between Għallis and Baħar iċ-Ċagħaq, as designated in the Naxxar Coastal Policy Map. All efforts will be made in order to retain or reinstate these designated areas in their natural state.[2]
Rural Environment – Protection of SACs, SSIs, AEIs and AHLSs	CG22	The proposed scheme is located within a rural/ODZ area and is a Listed Ecological Area/Site.

[2] https://parlament.mt/media/100349/03434.pdf - Partial Local Plan Review of the Central Malta Local Plan

Title	Reference	Policy gist:
Protection of of Archaeological Importance	CG23	An area of Archaeological Importance lies to the South of the site. This area includes archaeological feature number 26. This comprises Megalithic Remains from the Temple Period and is warranted Class B protection with an approximate 50m Buffer Zone.
Protection of Areas of Agricultural Value	CG24	The proposed scheme is located within an area of Agricultural Value

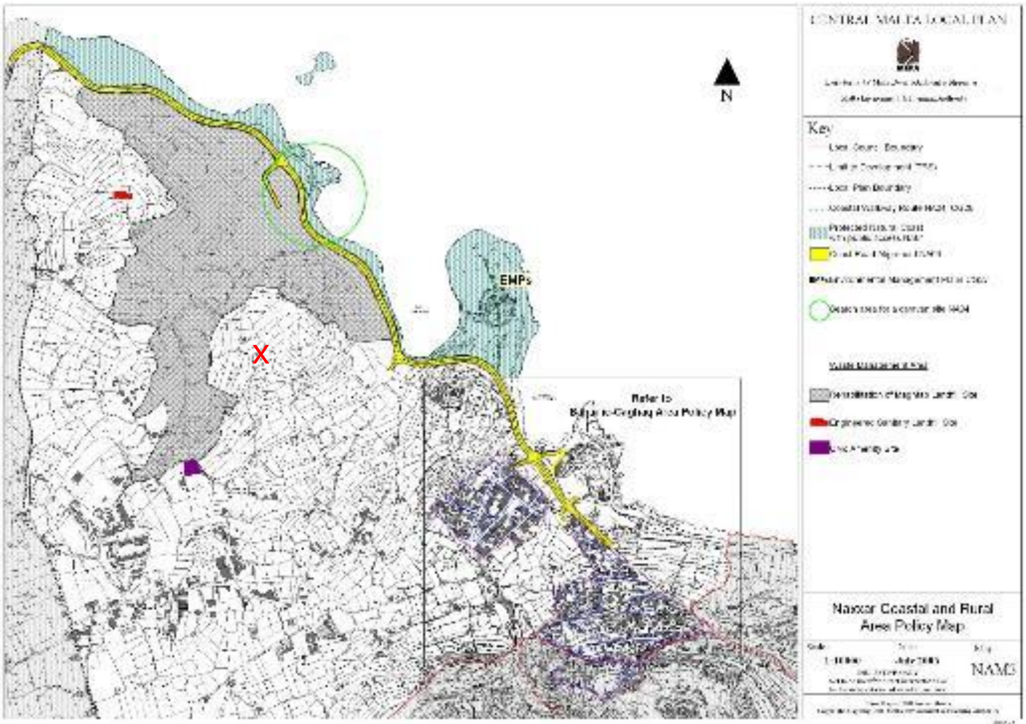

FIGURE 9: NAXXAR COASTAL AND RURAL AREA POLICY MAP (CMLP, 2006), SITE MARKED IN RED X

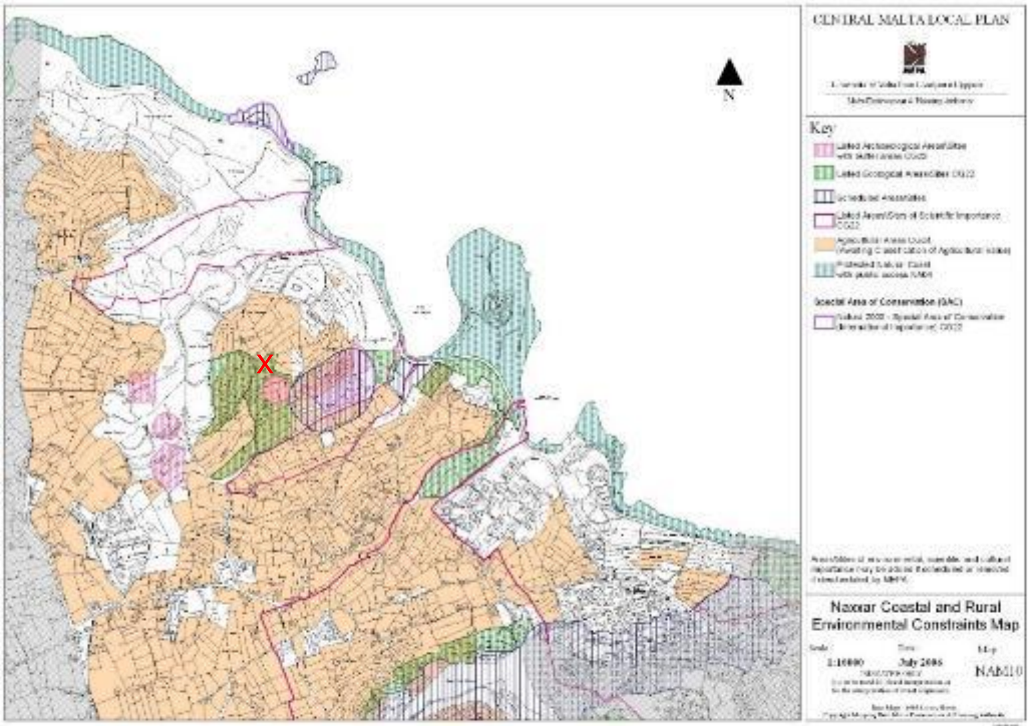

FIGURE 10: COASTAL AND RURAL POLICY MAP FOR BAĦAR IC-CAGĦAQ, NAXXAR (SOURCE: CMLP, 2006). SITE MARKED WITH RED X

Long-Term Waste Management Plan- 2021-2030 of the Maltese Islands

MALTA'S LONG-TERM WASTE MANAGEMENT PLAN (LTWMP) 2021-2030 seeks to improve resource recovery, lessen environmental impacts, and encourage sustainable waste management practices throughout the nation. The plan addresses significant challenges, including high per capita municipal waste generation, elevated landfilling rates, and the lowest recycling rate in the EU.

The LTWMP aims to maximize resource value within waste through various management strategies. It proposes innovative initiatives to reduce individual waste generation, enhance collection systems for greater efficiency, establish vital recycling and treatment facilities, investigate improved producer responsibility frameworks, and involve the private sector in waste management efforts. Emphasizing waste prevention as a primary focus, the plan aims to boost resource efficiency and minimize waste output. Furthermore, it targets the reform of waste collection and treatment systems to ensure their effectiveness while optimizing overall waste management practices to support a transition toward a more resource-efficient and circular economy.

2.3.3 Other planning developments in the area

Several developments are planned within the area of influence. Wasteserv Malta is spearheading the ECOHIVE project, which signifies a major investment in waste management and sustainability. This proposed initiative aims to mitigate the environmental effects of waste while maximising its potential as a resource to fulfil the nation's recycling and landfilling objectives primarily, but also the overall waste management of the Maltese islands. The ECOHIVE project represents the largest investment in Malta's waste management sector, propelling the country towards a circular economy. By processing waste in an environmentally sustainable and resource-efficient manner, ECOHIVE will convert waste into valuable resources such as energy and agricultural compost.

Wasteserv has received an outline development permit to build and operate a Waste to Energy (WtE) facility at the ECOHIVE complex (PA3012/20). The project encompasses drilling and installing two HDPE pipes extending approximately 1 km northeast from the shoreline, just outside the Qalet Marku inlet. These pipes will be utilized for sourcing cooling water for the facility and for discharging warm water back into the sea. The WtE plant is scheduled to commence operations in 2027.

Another facility planned within the complex is an Organic Processing Plant (OPP), intended for processing organic waste to generate biogas and agricultural compost. This investment focuses on decreasing the amount of biodegradable waste sent to landfills while recovering valuable resources from waste that would otherwise be discarded. The OPP is projected to handle approximately 74,000 tons of organic waste each year.

Additionally, a proposal for a Materials Recovery Facility (MRF) has been put forward to treat source-separated and co-mingled dry recyclables collected in Malta. The proposed scheme aims to minimise landfilling as much as possible and enhance the recovery efficiency of recyclables, making them more suitable for sale or export. This proposal is currently undergoing permitting procedures alongside an Environmental Impact Assessment (EIA) (EA/00042/20). The MRF is designed with a total processing capacity of 70 kilotons per year to align with future waste demand forecasts.

Furthermore, Enemalta's terminal station for the Maltese Interconnector 2 (IC2) will be situated in the Magħtab area. This new electricity interconnector is intended to satisfy future electrical demands while also contributing to a reduction in atmospheric emissions produced by existing natural gas and diesel power stations at Delimara. The IC2 project will link the TERNA 220kV substation located in Contrada Camillá, Ragusa (Sicily, Italy) with the Magħtab terminal station. The cable connection will have a capacity rating of 245kV and will be designed to operate alongside the existing link to optimise power transfer between both networks. No permanent above-ground structures will be erected in Malta; instead, Horizontal Directional Drilling (HDD) techniques will be employed to lay cables offshore, thereby minimising environmental impacts on the seafloor. The cable may be used to import energy produced by solar farms in Italy, further reducing the global environmental impact from energy usage in the Maltese islands.

2.4 Physical characteristics and land use requirements

2.4.1 General Characteristics

Operational requirements

The operational requirements for the proposed facility can be summarised as follows:

- Receiving waste through approved channels, delivered to the Facility by private vehicles
- The unloading or discharge of received waste onto the Facility and its preparation or processing as necessary for storage (including cold storage if needed)
- The transfer of various waste streams to the incineration plant
- The cleaning and preparation for re-application, along with the associated storage of all transfer units

- The operation of the entire plant and its operational units, including necessary control, maintenance, and general repairs
- The management of by-products resulting from the incineration process
- The collection, management, treatment, and distribution for use or disposal of all rainwater and other waters, including water utilized for cleaning and fire-fighting if required
- The provision of all necessary facilities, including parking areas, to accommodate the full staff of the Facility in numbers appropriate to the planned operational usage.

Plant components

The proposed plant is comprised of the following components:

- Waste reception and guard room
- Wheel washing area
- Separate unloading and discharge areas for bins/containers, liquid wastes and animal carcasses
- Pallet storage area
- Refrigerated storage
- Tank farm
- Shredder room
- Intermediate storage areas
- Rotary kiln and stacks
- Boilers
- Flue gas treatment
- Air-cooled condensers
- Administration building
- Laboratory
- Workshop
- Auxillary equipment areas
- Storm and waste-water storage
- Water treatment systems
- Landscaping

Waste management

Between 130 and 150 trucks are expected weekly at the site. These will be offloading a wide variety of materials for incineration, including:

- Liquid wastes
- Solid wastes
- Organic waste
- Medical waste
- Various loose wastes

- Cytotoxic and/or cytostatic waste
- Abattoir, butcher and meat processing wastes
- Chemical liquid wastes
- Waste oils
- Carcasses and fallen animals

The sorting and processing of such waste streams varies according to type. The primary unloading area will process waste delivered in containers/bins/barrels that can be stored in the unloading dock/bay on pallets. Additional storage bins will be on hand in this area to package wastes delivered in loose form. A second unloading area will cater to liquid wastes, which may be discharged directly into the tank farm for temporary storage before processing. A third unloading area will cater to wastes related to animal carcasses.

Such organic waste deliveries will be immediately directed into the shredder for swift processing. Temporary storage may be necessary when processing equipment is running at full capacity. Therefore, the facility will also be equipped with considerable areas for temporary storage, with specific features which are adequate to cater for a variety of different waste streams. This includes a 300m^2 refrigerated store for organic wastes such as food waste and animal carcasses. The storage area which caters for packaged waste is not refrigerated and has a capacity to accommodate 300 pallets, a significant storage upgrade when compared to the existing MTTF. Palletisers, forklifters and gantry cranes would be used to lift and transport wastes to the appropriate waste processing stream.

The waste incineration plant features an efficient design for transferring waste directly from the unloading bay to the infeed system. It consists of two levels with maintenance gangways, including one that connects the plant to the storage area for easy access. The ground floor primarily serves maintenance and services, with 5-meter-wide roads facilitating movement between the two incineration lines. An underground conveyor system shall be used for transporting output materials like fly ash and slag. To maintain continuous operation, the plant includes two interconnected rooms on different levels: one for auxiliary equipment and electrical functions, and another for control and server operations. The plant's height is divided into four volumes, with the tallest section housing the emergency relief vent (ERV), extending above the rest of the roof. The stack will be situated towards the central sections of the ECOHIVE complex with the intention of further minimising visual impacts.

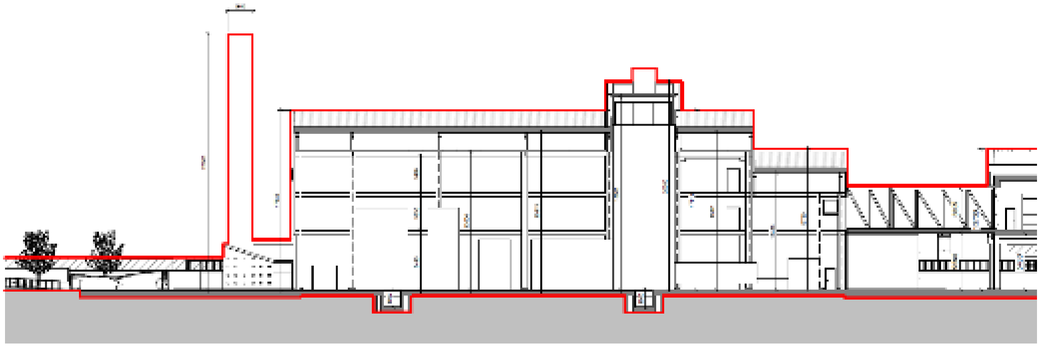

FIGURE 11: CROSS-SECTION VIEW OF THE PROPOSED BUILDING DESIGN

Site characteristics

The site primarily consists of agricultural land situated on the southeast side of the ECOHIVE complex. From a distance, the site can be viewed as a field encircled by other waste management facilities, specifically the proposed OPP and Waste to Energy facility to the North, as well as the existing Anaerobic Digester plant and proposed Material Recovery Facility plant to the West. Given the site context, the design challenge for the TTF is to create a facility that integrates into this pre-established environment, emphasising the optimal placement (both orientation and elevation) and volume of structures while minimising excavation waste.

By dissecting each part of the integrated operational process into distinct sections and situating each section at logical elevations while ensuring their intended functionality, the TTF design has effectively embraced a waste-free excavation strategy. Leveraging the site's varying topography, the facility enhances its efficiency by establishing optimal connections between various plant operations, including storage areas, processing units, and other auxiliary spaces. This method allows the TTF to closely align with and honour the existing landscape. Core testing has verified the “inferior” quality of the rock in the area. Consequently, reuse will be restricted to raising levels of the site after crushing and compacting is carried out. The material generated will also serve as the deeper structural layers for the road network within the TTF compound. It is expected that most if not all excavated material will be reused on site.

Building design

With respect to the landscape as described in the previous section, the building design incorporates the use of brightly-coloured materials, translucent surfaces and greenery to add visual interest to the inevitably industrial look of the building. Steel, concrete and glass are the main components, with the former two materials painted in primary colours. Bridges are incorporated into the design to further introduce light into the building and increase visual interest from the exterior outlook.

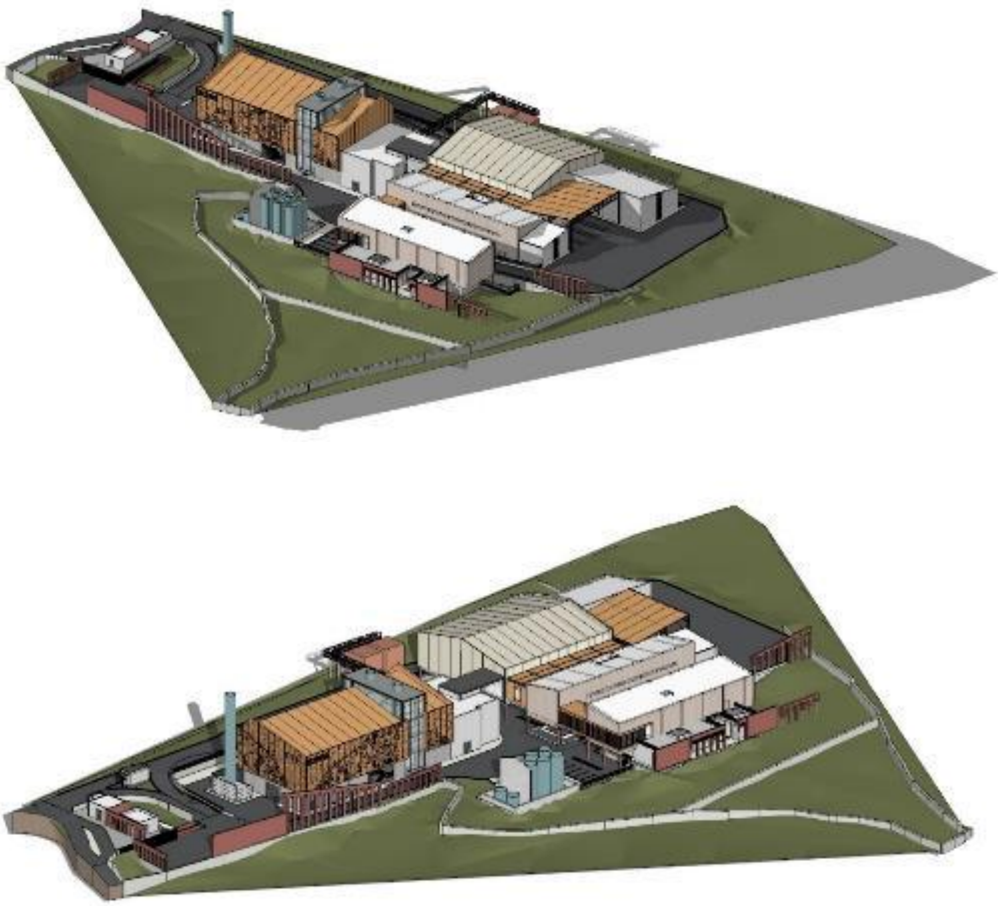

FIGURE 12: 3D VISUALISATION OF THE PROPOSED DESIGN

FIGURE 13: PROPOSED BUILDING MATERIALS AND COLOUR SCHEME

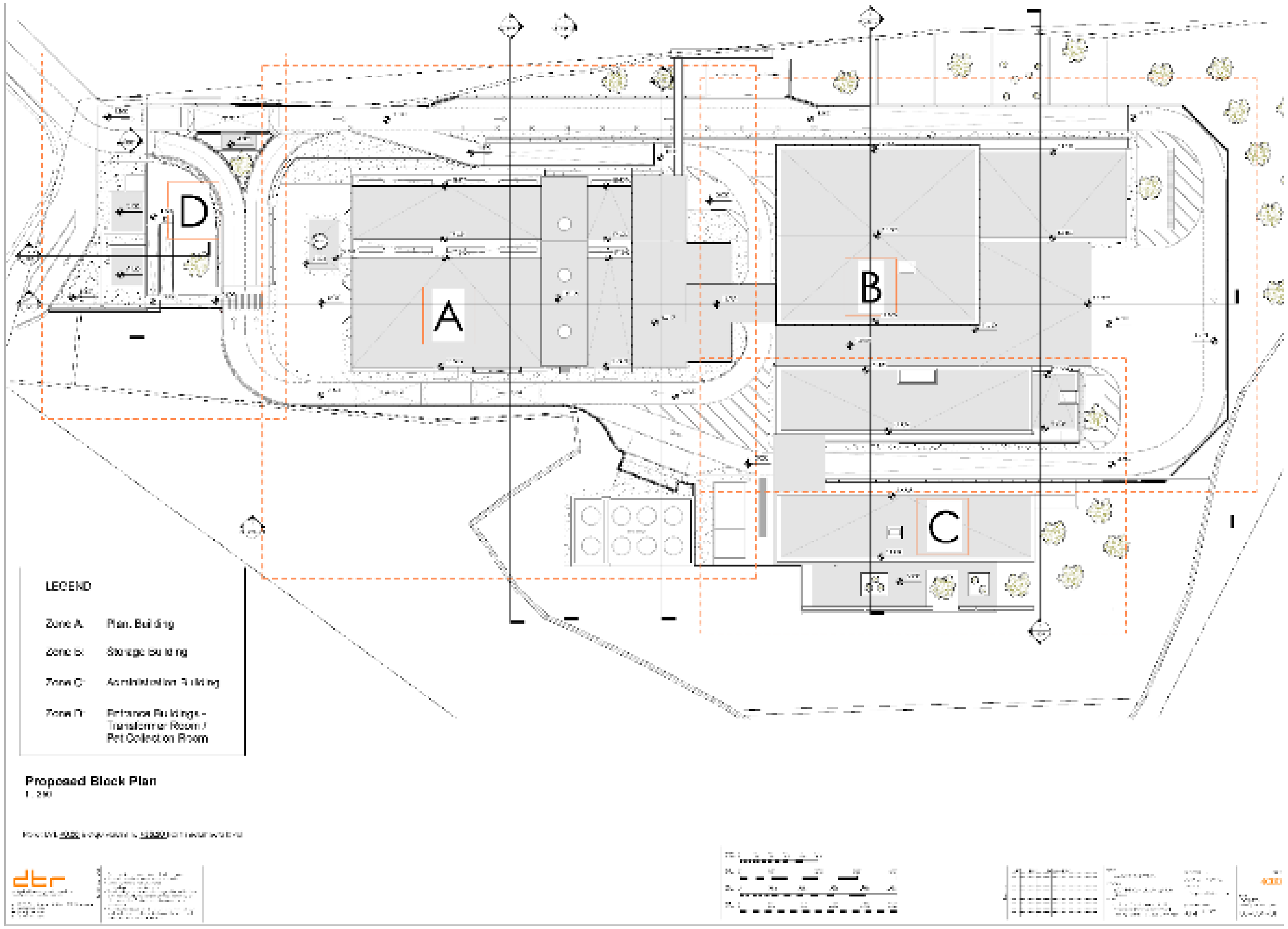

FIGURE 14: PROPOSED BUILDING BLOCK PLAN

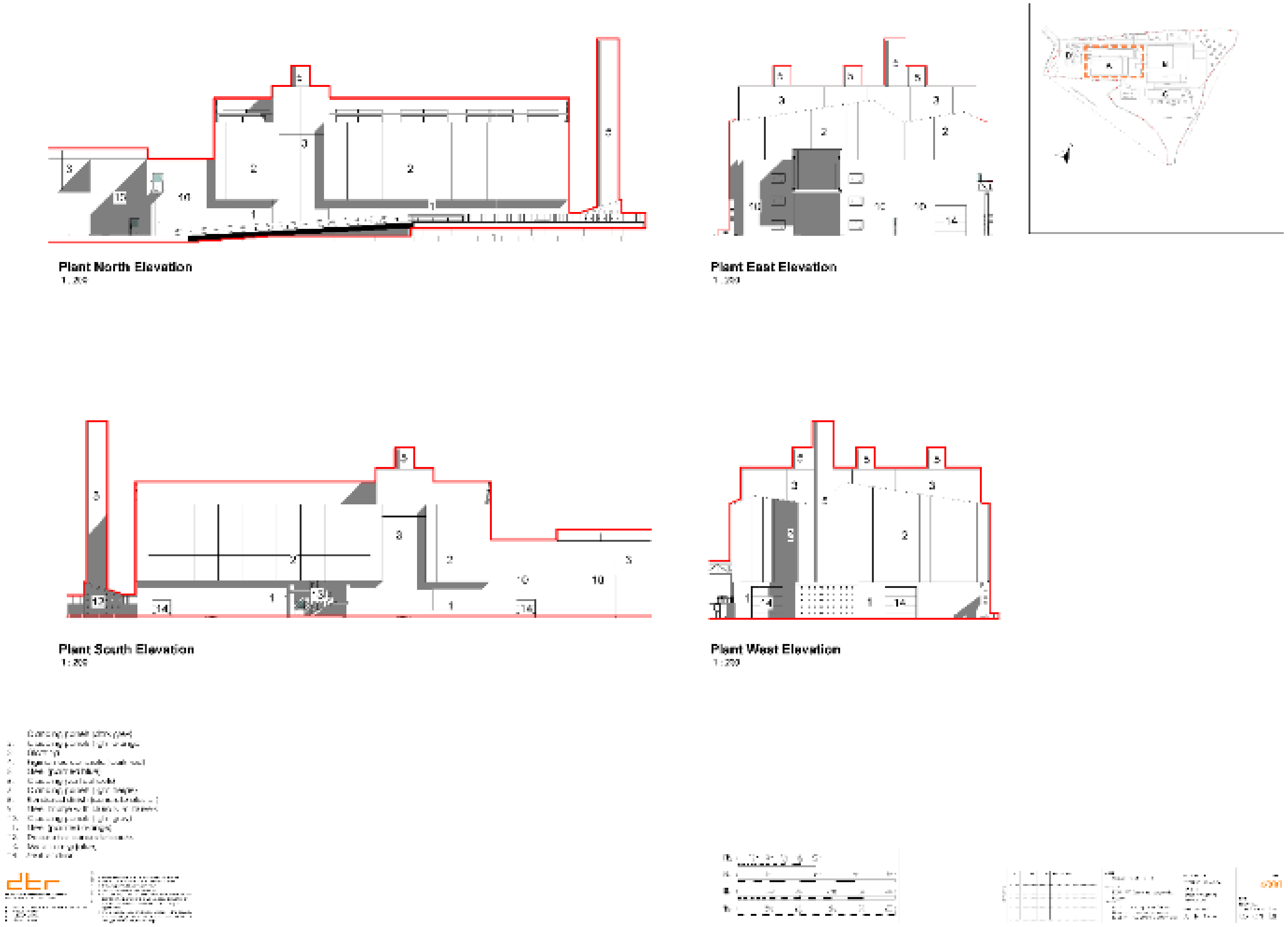

FIGURE 15: PROPOSED PLANT ELEVATIONS

2.4.2 Construction Phase

Approximately 100 employees will be required to implement the construction phases. The construction period will be comprised of the following phases:

TABLE 4: INDICATIVE PHASES OF THE CONSTRUCTION PERIOD

PHASE	INDICATIVE DURATION
Tendering Phase	9 months
Detail design phase[3]	5 months
Construction[3]	15 months
Test and commissioning	6 months

Spatial requirements

The total site footprint is estimated at 18,185 m^2. An area of around 3,000 m^2 will be required during the construction phase for storage of materials, an additional 1,500 m^2 is needed for pre-assembly and lay down and heavy lifting areas, and 700m^2 are required for site offices and parking. All spatial requirements will be catered for within the proposed site boundaries.

Services

Prior to the actual construction works, the following services are required to be present on site.

- Potable water, for site offices and site huts
- Sewage, for site offices and site huts
- Potable water for site for cleaning, hosing down, pressure testing etc.
- Construction power by local connection
- Fuel storage for site vehicles
- Site offices and Site huts

Materials

Due to the size and complexity of the project, a considerable number of raw materials are required for its construction. Notably, around 9,000 m^2 of crushed rock is required for backfilling. This should be possible to source from the

[3] Some overlap is expected between the Detailed Design and Construction phases

excavation of other parts of the site itself. Other materials as expected are rebar, concrete slabs, steel mesh, road paving, screeds etc.

Machinery

The construction is expected to require the use of excavators, cranes, trailers and trucks, the quantities of which are yet to be determined.

2.4.3 Operational Phase

Reception of Waste

Upon arrival at the facility, trucks shall be directed to a weighbridge to record their load. To manage varying waiting and unloading times, the plant will have three distinct unloading points. These points are connected by a one-way road, ensuring vehicles are separated based on the type of waste they carry. This design prevents congestion and tailbacks. The proximity of the shredder and tank farm to the rotary kiln minimises the need for extensive piping systems.

The facility includes three reception points:

- An unloading bay for pallets and containers
- An unloading bay for the shredder
- An unloading bay for the tank farm

At the main unloading area, waste transported on pallets and in wheel containers is unloaded from trucks of various sizes. Before entering the unloading bay, a guard room shall guide delivery personnel to the appropriate area. Once unloaded, forklifts transfer the waste to storage buildings. Vehicles would exit the facility after passing over an exit weighbridge and a wheel washer, where their weight would be recorded.

Storage of Waste

The new facility (TTF) improves upon the previous design (MTTF) by using a two-line system, with the potential for a third line in the future. This allows for faster processing of stored waste materials. Waste shall be segregated into two types of storage areas connected by additional buildings.

The storage areas include "dirty" storage, a wash-up area, and "clean" storage, enabling workers to operate independently and efficiently. The pallet storage area is divided into two connected volumes, with pallets stored in rows on two levels. All waste in containers, bins, barrels, or cardboard boxes would be wrapped in plastic and placed on pallets. A shrink wrapper area is designated within the pallet storage to facilitate this process without interfering with unloading.

The wheelie container storage area, used for organic, cytotoxic, and cytostatic waste, employs manual pushing of bins on the ground level for easy access. This area includes a cooled room for organic and medical waste, as well as designated areas for containers bound for direct incineration. The storage building is connected to the shredder area via a feeding chute and cargo lifts.

Shredder Area

The shredder would be located beneath the wheelie container storage area, allowing workers to discard waste directly into the shredder via a feeding chute and a hoist. The shredder unloading bay is positioned in a semi-outdoor space for natural ventilation, while the shredder itself is indoors to contain odours with air suction for incineration. This setup ensures adequate odour control and minimal space for cooling.

The shredder would lie close to the rotary kiln, minimising material transport distance. A grabber would need to be used to lift carcasses from trucks directly to the shredder or into open-top containers. The shredder unit also includes a small storage room and a toilet cabin.

Tank Farm

The TTF shall have a dedicated unloading point for liquid waste stored in the tank farm. This design minimizes pipework and ensures sufficient space for truck manoeuvring without congestion. The tank farm, surrounded by a bund wall to collect any leaks, has a capacity of eight tanks.

Processing of Waste

After storage or directly from the unloading bay, waste would be transferred for incineration via the most efficient route into the infeed system. The plant has two levels with gangways for operation and maintenance. One gangway is at the same level as the bridge connecting the plant to the storage area, facilitating easy access. The ground floor would be used for maintenance and services, with 5-meter-wide roads for easy manoeuvring between the three incineration lines.

An underground conveyor system is provided for collecting and transporting output materials, namely fly ash and slag. Two interconnected rooms on separate levels, one for auxiliary equipment and electrical functions and the other for control and server operations, ensure uninterrupted incineration processes.

The plant's height is divided into four volumes corresponding to the interior housing. The highest volume includes an Emergency Relief Vent (ERV), which rises above the roof level.

Stack

The stack's placement was determined by mapping views that pass through or overlook the site. It is located within the inner sections of the ECOHIVE complex to minimize visual impact. At ground level, the stack is enclosed in a room with the flue gas induced draft fan and is directly connected to the three-line process through individual fluegas ducts. The stack height is established at a minimum of 25 meters above the facility floor level. The stack will comprise of one outer steel pipe which contains the three individual fluegas ducts.

To adhere to the emission control requirements as set by the AMBIENT AIR QUALITY DIRECTIVE 2008/50/EC, SCHEDULE 2 OF S.L.549.81 - THE INDUSTRIAL EMISSIONS (WASTE INCINERATION) REGULATIONS, and COMMISSION IMPLEMENTING DECISION (EU) 2019/2010 OF 12 NOVEMBER 2019 establishing the best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for waste incineration. The aforementioned regulations set limit values as described in the following tables.

TABLE 5: LIMIT VALUES WHICH REFER TO 3% OF THE LIMIT VALUES OR TARGET VALUES ESTABLISHED IN DIRECTIVE 2007/50EC ON AMBIENT AIR QUALITY AND CLEANER AIR FOR EUROPE

POLLUTANT	LIMIT
Fine particulate matter (PM2.5)	0.6 $\mu g/m^3$
Coarse particulate matter (PM10)	1.2 $\mu g/m^3$
Nitrogen dioxide (NO_2)	1.2 $\mu g/m^3$
Benzo(a)pyrene (B[a]P) in PM10	0.36 pg/m^3
Lead (Pb) in PM10	15 ng/m^3
Cadmium (Cd) in PM10	0.15 ng/m^3
Arsenic (As) in PM10	0.18 ng/m^3
Nickel (Ni) in PM10	0.60 ng/m^3

POLLUTANT	LIMIT
Chromium (Cr) in PM10	0.50 ng/m^3
Hexavalent chromium (Cr (VI)) in PM10	51 pg/m^3
Mercury (Hg) total	1.5 ng/m^3
Polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/F)	70 fg WHO-TE/ m^3

TABLE 6: TENTATIVE LIMIT VALUES UNDER NORMAL OPERATING CONDITIONS BASED ON BAT AND IED

DAILY AVERAGE VALUES	LIMIT	
Total dust	5 mg/Nm^3	
Total volatile organic carbon (TVOC)	10 mg/Nm^3	
Hydrochloric acid (HCl)	6 mg/Nm^3	
Hydrogen fluoride (HF)	1 mg/Nm^3	
Sulphur dioxide (SO_2)	30 mg/Nm^3	
Nitrogen oxides (Nox expressed as NO_2)	120 mg/Nm^3	
Ammonia (NH_3)	10 mg/Nm^3	
HALF-HOURLY AVERAGE VALUES	LIMIT	
	100%	97%
Total dust	30 mg/Nm^3	10 mg/Nm^3
Total volatile organic carbon (TVOC)	20 mg/Nm^3	10 mg/Nm^3
Hydrochloric acid (HCl)	60 mg/Nm^3	10 mg/Nm^3
Hydrogen fluoride (HF)	4 mg/Nm^3	2 mg/Nm^3
Sulphur dioxide (SO_2)	200 mg/Nm^3	50 mg/Nm^3
Nitrogen oxides (Nox expressed as NO_2)	400 mg/Nm^3	200 mg/Nm^3

DAILY AVERAGE VALUES	LIMIT	
AVERAGE VALUE OVER 30MIN TO 8 HOURS	LIMIT	
Cadmium and Thallium and their compounds, expressed as Cadmium (Cd) and Thallium (Tl)	Total: 0.02 mg/Nm^3	
Total Metals and their compounds, expressed as their native elements (As, Cr, Co, Cu, Mn, Pb, Sb, V & Ni)	Total: 0.03 mg/Nm^3	
Mercury and its compounds, expressed as Mercury (Hg)	0.02 mg/Nm^3	
AVERAGE VALUE OVER 6 TO 8 HOURS	LIMIT	
Polychlorinated dibenzo-p-dioxins / polychlorinated dibenzofurans (PCDD/F)	< 0.06 ng I-TEQ/Nm^3	
Polychlorinated dibenzo-p-dioxins / polychlorinated dibenzofurans (PCDD/F) + dioxin-like polychlorinated biphenyls (PCBs)	< 0.08 ng WHO-TEQ/Nm^3	
AVERAGE VALUE	LIMIT	
	DAILY	30 MIN
Carbon monoxide (CO)	50 mg/Nm^3	100 mg/Nm^3

TABLE 7: LIMIT VALUES FOR BULK DEPOSITION

POLLUTANT	LIMIT
Polychlorinated dibenzo-p-dioxins / polychlorinated dibenzofurans (PCDD/F)	4 pg WHO-TE/m^2-day (bulk deposition)
Cadmium (Cd)	2 µg/m^2 day (bulk deposition)
Arsenic (As)	4 µg/m^2 day (bulk deposition)
Mercury (Hg)	1 µg/m^2 day (bulk deposition)

Pollutant	Limit
Nickel (Ni)	15 µg/m^2 day (bulk deposition)
Lead (Pb)	100 µg/m^2 day (bulk deposition)
Thallium (Tl)	2 µg/m^2 day (bulk deposition)

Prior to release of emissions from the chimney stack, the fluegas will be subjected to a Fluegas Treatment System. The proposed system is designed with sufficient capacity to ensure that the emission limits are met in all operation cases and in short term emission peaks. The following abatement techniques will be implemented:

Table 8: Emissions abatement techniques

Pollutant	Abatement techniques
Particulate matter (dust)	Bag house filters
Oxides of nitrogen (NO_x)	Selective Non-Catalytic Reduction (injection of NH3 or Urea in the boiler where flue gas has the right temperature)
Acid Gases (Sulphur dioxide SO_X and Halides HCL & HF)	- Dry sorbents (lime or sodium bicarbonate), Bag filters, plus - Wet scrubber (quench & acid scrubber, alkaline scrubber, neutralising)
Heavy Metals	Activated Carbon Injection & Bag filters
Dioxins and furans	Activated Carbon Injection & Bag filters + Combustion control

Emissions from the stack will be continuously monitored through a Continuous Emissions and Monitoring System (CEMS). The following pollutants will be monitored by the system:

- NO_x (or NO + NO_2) content (mg/Nm^3), expressed as NO_2
- HCl content (mg/Nm^3)
- HF content (mg/Nm^3)
- SO_2 content (mg/Nm^3)

- CO content (mg/Nm^3)
- CO_2 content (mg/Nm^3)
- O_2 content (mg/Nm^3)
- Particulate (mg/Nm^3)
- TOC content (mg/Nm^3)
- H_2O content (vol %)
- NH_3 content (mg/Nm^3)
- Fluegas flow (m^3/s)
- Fluegas pressure (kPa)
- Fluegas temperature (°C)

Ancillary Spaces and Buildings

The TTF will be staffed by approximately 50 employees. An administrative building of around 300 square meters includes facilities such as changing rooms, toilets, showers, and a uniform washroom. Multiple toilets and recreational areas, along with a kitchen-eating space, are provided to enhance the working environment.

Office employees have separate office space connected to but distinct from the plant's day-to-day functions. The administrative building includes a manager's office, office space for ten workers, a conference room, reception desk, archive, laboratory with a separate entrance, kitchen area, and showers with changing rooms.

Parking areas are designed to utilise the topography, with a naturally ventilated parking area below the pallet and wheelie bin storage and a smaller ground-level parking area next to the admin block.

Reservoirs and Wastewater System

Rainwater shall be collected from all building roofs and hard surfaces, amounting to 4,506 cubic meters annually. Additionally, water will be collected from the leachate pit, which will collect water from contaminated drains of the tank farm, floor cleaning, wheel wash and runoff from the access roads; and the drain pit which will collect boiler drain water and blowdown which is conditioned by NH_3 and NaOH. The rainwater pond will collect clean rainwater from the building roofs. This water would be directed through an impermeable underground ventilated system into two holding cisterns and managed by the Water Treatment Plant.

The treated water will be used for industrial purposes in the plant operations.

Any runoff from the TTF will be directed through the underground water management system. Additional safeguards include the use of impermeable materials for all flooring, and the inclusion of an automatic wheel-washing system in the project design which will capture and disinfect any materials from the wheels of trucks leaving the site.

Fire-fighting system

Fire pumps shall be supplied according to BS EN 12845:2015+A1:2019 and with two electrical pumps supplied both from mains supply and through diesel supply via ATS switch to select active supply. A fire alarm system and emergency lighting will be in place during operations. The building design will adhere to the local building regulations including the Design Guidelines for Fire Safety in Buildings in Malta and BS 9999 – Code of practice for fire safety in the design, management and use of buildings. Water used for fire-fighting will be directed to the leachate pit, and treated in the aforementioned water treatment plant before re-use.

Hazardous wastes exported abroad

Hazardous wastes exported from Malta can be categorised into three types:

- Incineration-suitable waste: Waste that can be burned for energy recovery
- Recovery-suitable waste: Waste that can be processed and reused
- Non-recoverable waste: Waste that is unsuitable for both incineration and recovery

Between 2016 and 2020, Malta exported an average of 59,679 tonnes of hazardous waste annually.

By analysing historical data, it is estimated that 3,090 tonnes of the hazardous waste currently exported is suitable for incineration, with projections indicating this will rise to 4,997 tonnes by 2045. Additionally, around 54% of the exported waste that can be incinerated or recovered is deemed suitable for recovery.

In 2022, an estimated 3,587 tonnes of manufacturing and industrial waste was exported for recovery, projected to increase to 5,825 tonnes by 2045. Clinical waste recovery is projected to remain stable at about 40 tonnes annually through 2045. Overall, it is estimated that 3,627 tonnes of currently exported hazardous waste is suitable for recovery, with this figure expected to reach 5,866 tonnes by 2045.

Expected waste streams at the proposed TTF

The following table provides a brief description of how the waste streams which would be arriving at the proposed thermal treatment facility would be handled by the operator at the dedicated unloading bays.

TABLE 9: DESCRIPTION OF CATEGORIES OF RAW MATERIALS TO BE TREATED AT THE TTF

DELIVERY	ITEM	DESCRIPTION
Containers, bins, drums	Liquid wastes	These items must contain an energy content of each container equivalent to 100 litre light fuel oil or less. The containers are shrink-wrapped for storage, then fed as is into the kiln.
	Waste in solid form	
	Organic wastes	
Cardboard boxes, crates, plastic wrap	Medical waste	These items are stored in containers and temporarily placed in the storage area before incineration.
	Pharmaceutical waste	
	Expired items	
Plastic bags, cardboard boxes	Loose waste (not liquid)	
Metal 1110L wheeled containers	Abattoir waste	The containers are emptied into the shredder and directly conveyed to the rotary kilns.
	Butcher waste	
	Wastes from animal processing	
Plastic 770 litres four-wheeled (yellow) containers	Medical / Clinical wastes	These containers are emptied into a hopper and fed into the rotary kilns.
Tank trucks	Chemical liquid waste	These vehicles will deliver liquid wastes directly into a storage tank (tank farm) at the dedicated unloading bay until further processing in the kilns.
	Waste oil	
Not packaged	Fallen animals	These will be lifted using a small crane directly from the delivery truck into the shredder, after which they will be stored in a temporary storage silo before incineration.

Delivery	Item	Description
Double wrapped plastic bags in four-wheel plastic containers	Cytotoxic and cytostatic waste	These items will be delivered packaged and fed directly into the kiln after unloading to minimise potential contact with people

Final outputs

The incineration process produces a minimal amount of waste materials, namely slag and fly ash. These are discussed in Section 2.4.8

2.4.4 Decommissioning phase

The new TTF shall be designed for a lifetime of 20 years. Decommissioning of the facility must follow acceptable standards required for eliminating environmental and health hazards during site decommissioning and clean-up. These requirements include:

- Removal of structures on or beneath the ground;
- Disposal or secure isolation and/or treatment of contaminated equipment in-situ or off-site;
- Remediation of aesthetics (back-filling, stained soil removal, waste disposal, etc.);
- Access controls for physical structures remaining on-site that are unsafe or hazardous to humans or animals;
- Remediation of aesthetically unacceptable portions of the site (filling of pits, removal of stained soil and odorous material, levelling of mounds, disposal of waste rock, etc.);
- Clean-up of the site to a level which will provide long-term environmental protection and will be safe for the intended future use;
- Submission to the applicable regulatory agency and other required jurisdictions of a report confirming that decommissioning and clean-up has been completed.

The area may be utilised by Wasteserv Malta for other waste management operations as deemed fit at the time of decommissioning.

2.4.5 Phasing

It is estimated that around 100 persons will be employed to construct the proposed Scheme. The phasing of the construction will be split in four parts (See Table 4 in the Construction Phase chapter), with the longest period dedicated to the actual construction, estimated at 15 months. This phase involves site clearing, excavation and backfilling/levelling, followed by lay-down of pipework and electrical, the actual construction of the buildings and equipment installation.

2.4.6 Access

Since the proposed TTF forms part of the ECOHIVE Complex, existing internal routes will be utilised for vehicular movements during the construction and operational stages of the project.

Upon completion of works, access requirements will be limited to authorised Wasteserv personnel, third-party trucks related waste carriers and some influx from farmers (carcasses) and the general public (pets).

The expected quantity of vehicles is estimated in the region of 220 - 240 trips a weekly, with lower flows expected on Saturdays and in the afternoons. The traffic influx towards the TTF is not likely to generate significant impacts on public and internal routes.

During the operation stage, the entrance of the TTF will be connected to the complex's internal road network (Figure 16), hence, public roads shall only be impacted to a minor extent. Once inside the ECOHIVE Complex, workers and truck drivers will be directed towards the reception area, where the guard will direct the driver to the appropriate unloading bay. Trucks will leave the complex by making use of the same routes.

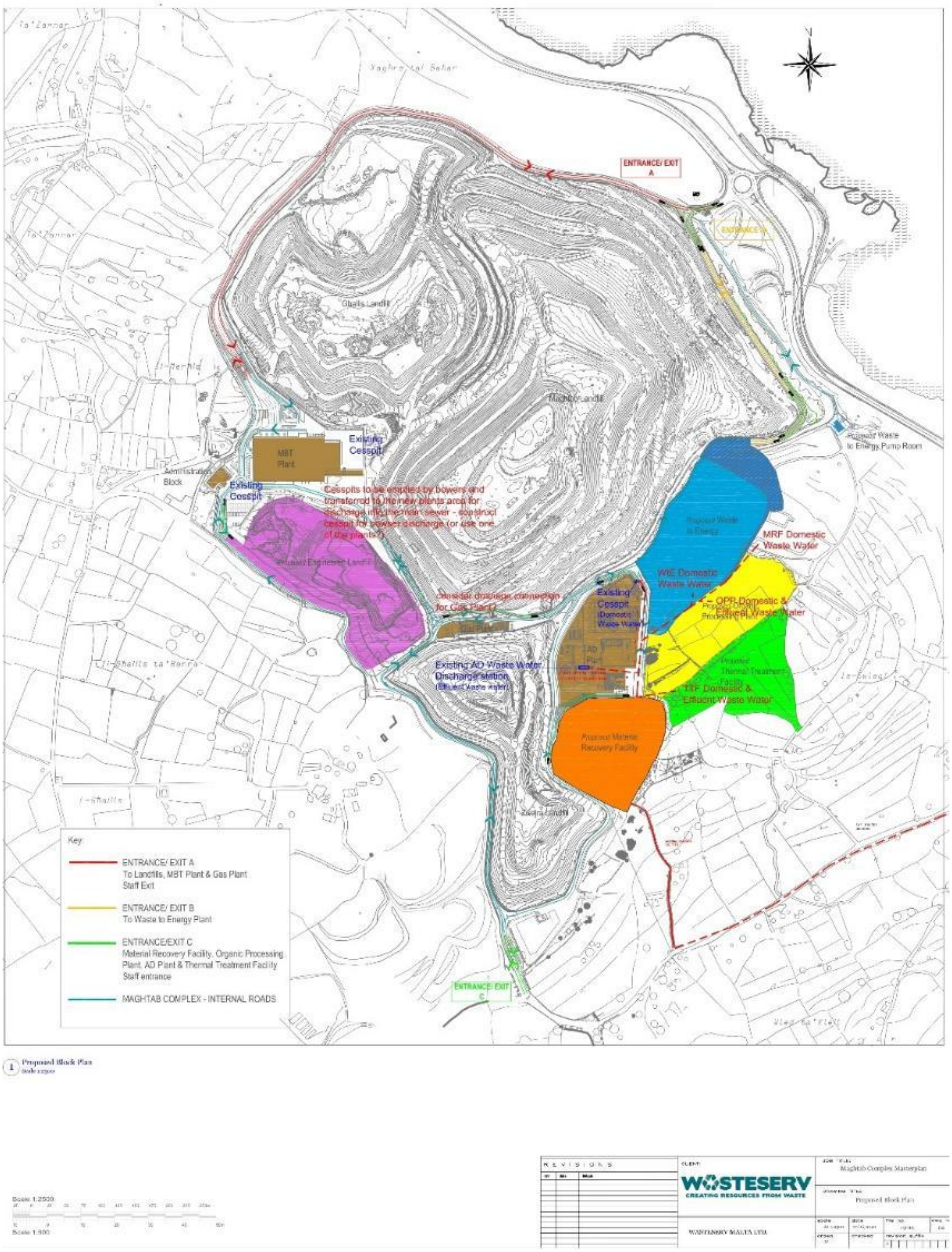

FIGURE 16: MAGHTAB MASTERPLAN INDICATING PUBLIC AND INTERNAL ROUTES OF THE ECOHIVE COMPLEX.

2.4.7 Sewerage, runoff management, energy, telecommunications, and ancillary infrastructure

2.4.7.1 Construction Phase

The ECOHIVE Complex is already connected to the necessary infrastructure and utilities. During the construction phase, a temporary connection is required for water and electricity.

A slight increase in discharges of water or wastewater is envisaged compared to the existing flow rates related to the use of mobile toilets and building of the TTF structure during phases requiring concreting works. During the construction phase, all the generated wastewater streams will be collected and conveyed towards treatment plants.

2.4.7.2 Operational Phase

Runoff

No discharge or flow of surface water or other substances sourced within the facility during its normal functioning is foreseen. The TTF is designed to operate without producing any run-off which can have negative impacts on the environment and surrounding ecosystems. This helps to minimise long-term environmental impacts.

Sewage

Household and sanitary wastewaters will be discharged to the public sewer system.

Wastewater

Water reuse at ECOHIVE Complex is highly encouraged. An interconnected network of rainwater harvesting and water treatment systems ensures minimal supplies of water from external sources. Wastewater streams sourced with leachate, drain and rainwater are collected and properly treated to provide high quality water within the Complex. The process flow diagram of water, drainage and sewage at the ECOHIVE complex is shown in Figure 17.

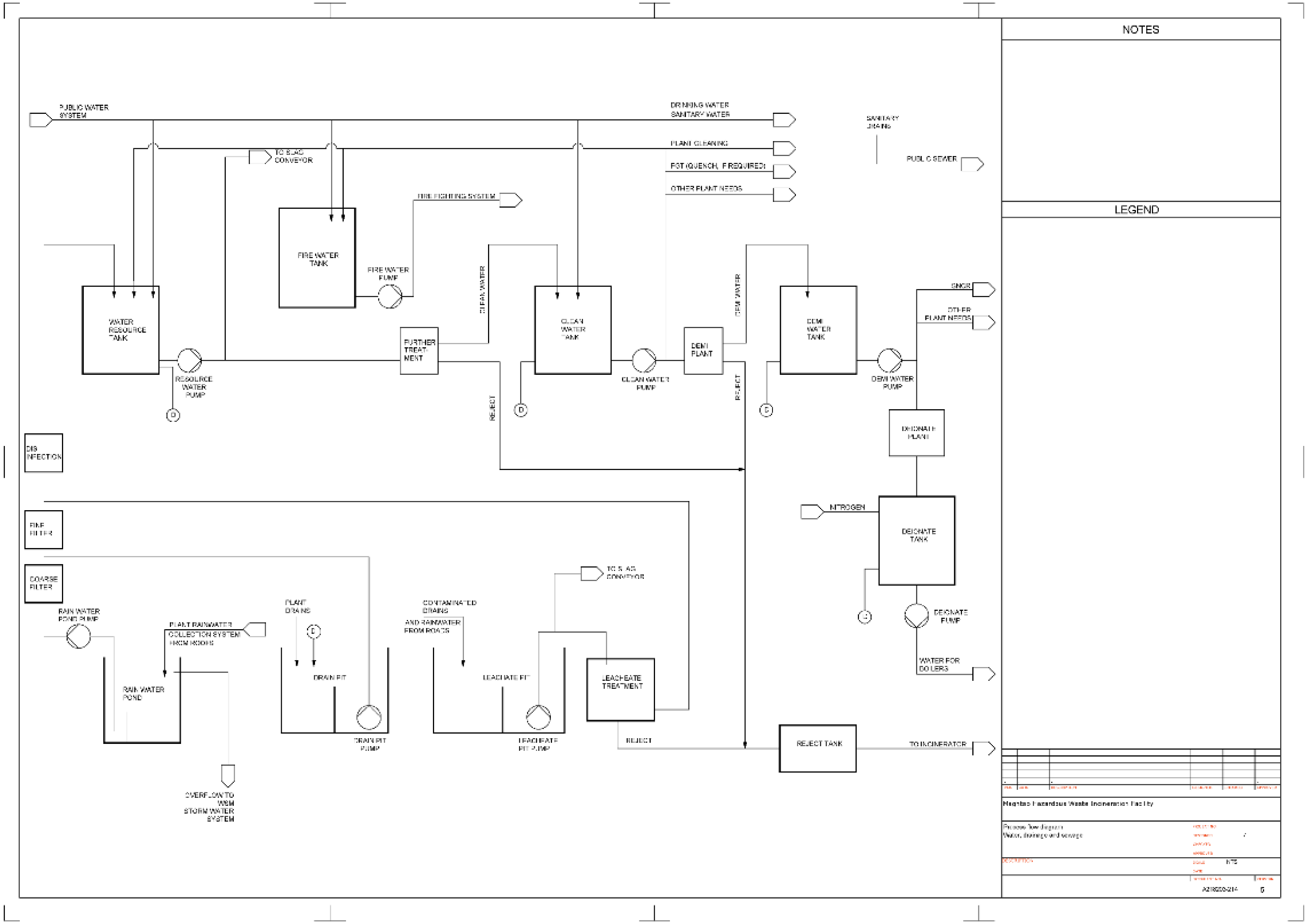

FIGURE 17: PROCESS FLOW DIAGRAM OF WATER, DRAINAGE AND SEWAGE AT THE ECOHIVE COMPLEX

The TTF plant features a water collection system where rainwater shall be collected off the roofs of every building as well as off the roads, parking areas and unloading zones. Approximately 4,506 cubic meters of rainwater runoff shall be collected. This shall be directed to two holding cisterns, to be processed by the Water Treatment Plant and then directed for use in industrial processes related to the plant operations. The entire amount of rainwater collected in this way will be re-utilised on site.

Stormwater overflow from the rainwater and water retention pond will be directed to a connection point at the site boundary. The water will be piped from the connection point to an existing storm water reservoir South of Magħtab, which has a capacity of 17,000 m^3.

The site will also collect grey water from two sources which collect water from drains present in all areas of the site expected to collect water:

1) the Leachate pit
2) the Drain Pit

The former is the dirtiest source of water and may potentially be polluted. Water from this pit may be reused to top up the slag conveyor system, which is at a constant loss of water. The reuse of this water requires an intense treatment process featuring an oil separator, filtration of particles, precipitation of heavy metals, ultrafiltration, and UV disinfection before being transferred to the Water Resource Tank for further treatment and reuse. Any reject from this process will be re-introduced into the boiler lines.

The latter is conditioned with NH_3 (Ammonia) and NaOH (Sodium Hydroxide) and may also contain magnetite, dirt from the boiler and small amounts of other chemicals such as oxygen scavengers or antiscalants. Small particles will be removed from this water using microfiltration, and the resulting water will be UV disinfected before being pumped into the Water Resource Tank for further treatment and re-use.

Energy

The Power to the TTF will be supplied from the Enemalta 11kV substation in the Maghtab complex. The EPC contractor shall expand the switchboard with a new 11kV breaker and establish an approximately 300 m long cable to a 11kV switchgear at the TTF. Electricity demands are expected to be around 600 MWh (70 kWh per tonnes waste).

2.4.8 Waste management

2.4.8.1 Waste Management Regulations

The Waste Framework Directive (2008/98/EC) provides a legal framework for waste management in the EU, including definitions of waste, hazardous waste, and recovery operations, as well as guidelines for waste prevention, reuse, and recycling. The national legislation S.L. 549.63 of 2011 (Waste Regulations) transposes the aforementioned directive, which provides a comprehensive strategy to manage waste through increased prevention, re-use, recycling and recovery schemes.

EU principles dictate that waste should preferentially be treated as close to source as possible, with preference to circular methods which divert waste away from landfills. The TTF development will enable an expanded local waste treatment, with no final outputs resulting in landfilled waste.

2.4.8.2 Waste During Construction Activities

During the construction and excavation phase, some waste will be generated. It is not expected that the Scheme will generate any electrical or electronic waste. If any, such waste will be recovered in line with the WEEE Directive 2012/19/EU as transposed into S.L. 549.89 of 2014 (Waste Management [Electrical And Electronic Equipment] Regulations) and later amendments. Any batteries and accumulators will be recovered as per Directive 2006/66/EU, transposed into local legislation by S.L. 549.54 of 2010 (Waste Management [Waste Batteries and Accumulators] Regulations) and subsequent amendments.

Additional waste streams expected will be related to packaging of the raw materials, which typically comprise of recyclable items such as metal wires, plastic and cardboard. These will be separated and stored in dedicated containers for transfer to the appropriate processing facility.

The excavation phase is expected to generate 8,640m^3 of rock material. This will be crushed, sorted by size and cleared of any other materials. All the excavated material shall be reused within the site boundary.

Ground contamination assessments and characterisation tests on the material to be excavated reveal that the limits stipulated in Decreto 152 of 2006 have not been exceeded. Consequently, the material excavated from the site is suitable for backfilling. Any excess inert material can be backfilled in quarries permitted to accept such waste given that leachate results also reveal full compliance with the EU limits stipulated in 2003/33/EC.

2.4.8.3 Waste During Operations

The only wastes produced by the TTF incineration process include fly ash and slag. Annual estimated production is 850 tonnes of slag (bottom ash) and 170 tonnes of fly ash.

Fly ash is considered hazardous waste which Malta does not currently have the facilities to treat, and it is normally exported for appropriate treatment. The fly ash waste will be stored in big bags until it is exported.

Slag will be conveyed to an open top container which can be covered with tarpaulin. Containers shall be used to store the Incineration Bottom Ash (IBA) in the hard standing area. When the IBA is conveyed from the incinerator, metal is taken out with a magnet separator, giving better options for handling the bottom ash. The resulting metal can be handled separately.

The IBA can either be:

- EWC 19 01 11* bottom ash and slag containing hazardous substances
- EWC 19 01 12 bottom ash and slag other than those mentioned in 19 01 11

The potential for re-use of the non-hazardous bottom ash component may be explored in future projects. Until options for the re-use of the non-hazardous components are determined, the resulting IBA will be considered hazardous, and packaged for export to be treated in appropriate facilities abroad.

Disposal or recovery of wastes leaving the installation shall take place only at sites permitted, locally or abroad. Records of all incoming and outgoing wastes will be kept up to date and will include:

- Quantities of waste
- Information on the date of acceptance/removal from site
- European Waste Catalogue (EWC) code of the waste
- Consignment note number, in the case of hazardous wastes
- Description of the waste
- The mode of transport and the names of the agent and transporter of the waste, together with the Waste Carrier Registration Number (GBR Number) where applicable
- Information on where such wastes are deposited and the name of the person responsible for ultimate disposal or recovery
- Whether wastes are recovered or disposed, and if they are recovered, the details of this process.

Otherwise, minimal additional waste quantities shall be generated during the operation stage. Waste generated during the operational phase will be mostly limited to maintenance waste and the replacement of abatement systems and/or equipment. The type and quantities of waste will depend on the maintenance work required, and is therefore difficult to specify and quantify at this stage.

Small quantities of waste will also be generated from operators working within the offices. This waste will be of a domestic nature. The operators will be encouraged to implement the Four R Principle (Reduce, Reuse, Recover and Recycle) to limit the amount of domestic waste generated.

3 Assessment of alternatives

3.1 Alternative sites

An Alternative Site Assessment was carried out to assess the suitability of various sites to accommodate the proposed TTF. The site suitability assessment was based on the filtering of technical, economic and environmental factors.

Retaining the current site

At the onset of the project, the applicant considered the upgrading of the exiting TTF for hazardous waste, fish waste and Cat 1-3 waste (the latter for when/if the autoclave is not in operation), along with the refurbishing of the existing autoclave plant for fish waste and Cat 1-3 waste.

- Category 1: Dead ruminants (cows, sheep, goats etc.) including BSE (Bovine Spongiform Encephalopathy) carcasses and suspects, specified risk material, and catering waste from international transport
- Category 2: Other dead animals than ruminants, ex. pigs and poultry, condemned meat and gut contents
- Category 3: Catering waste from households and restaurants, former food other than Cat 1, and slaughter house waste e.g. waste blood & feathers

The relocation and/or upgrading of the existing Marsa TTF is explicitly mentioned in the Long-Term Waste Management Plan (2021-2030), and therefore the existing site was given full consideration in the project planning and design process.

The existing site is approximately 8,000 sqm, with two narrow site entrances/exits, and limited possibilities of expansion due to the surrounding land uses including the adjacent Marsa harbour. Notably, the MTTF's layout lacks a basement, which would facilitate ground-level waste feeding and eliminate the need for elevators. Additionally, placing the rotary kiln at ground level would allow for a vertical post-combustion chamber without increasing building height. Therefore, the size and siting of the current MTTF already poses significant challenges to development of an upgraded plant which caters to both current and future demands.

An operational and economic assessment was conducted to evaluate whether the upgrading of the Marsa TTF site was a viable option from a technical and financial perspective. The results concluded that the running costs of the existing plant were considerably higher than comparable facilities in Europe. Additionally, the economic investment required would still place the upgrading at a disadvantage to a new plant from an economic standpoint.

The autoclave at the site required restoration following a fire incident, and plans were put in place for a new LPG-fired steam boiler to enhance process efficiency. WSM considered further options to increase automation and efficiency at the site, and to tackle known issues such as odour complaints and frequent outages. The site is envisaged to remain present as a cold standby to the new TTF during the operations period.

However, the aforementioned limitations supported the conclusion that the site was not suitable to fully cater for the envisaged future demand.

FIGURE 18: EXISTING MTTF SITE IN MARSA

Alternatives

By taking into account the fact that the majority of WSM's current operations in Malta are located at the Maghtab Environmental Complex (ECOHIVE Complex), four areas were shortlisted for the proposed project, namely:

- The currently proposed site – East area of the ECOHIVE complex
- Site 1 – Area to the North East of the proposed site
- Site 2 – Area to the West of the proposed site
- Site 3 – Area adjacent to the proposed site

The following figures illustrate the size, shape and location of the proposed site and alternative sites considered. The conclusions of the alternative site assessment for each considered site are described in the following text.

Figure 19: Alternative Sites within the ECOHIVE Complex considered for the project

Site 1

Site 1 is the Northernmost site, and is approximately 22,000 sqm, which is larger than the required footprint for the development of a new TTF.

Developing the area would require additional interventions and land take-up when compared to the other sites as the site boundary is located within terraced agricultural land and garigue and would require new access and manoeuvring roads.

Sparse trees are present in the area, including *Pistacia lentiscus* (Lentisc) and some typical garigue shrubs such as *Thymbra capitata* (Thyme). Therefore, the direct impacts of the development on protected tree and shrub species at Site 1 would likely be lower than at the proposed site. However, Site 1 lies in much closer proximity to the nearest protected area at Qalet San Marku, with a direct outlook onto the marine and coastal area. Therefore, the site is poses a higher risk in terms of spillover effects into the surrounding coastal and marine area, including protected marine areas.

The proximity to the protected area would not only increase the likelihood of spillover effects from the construction phase affecting both the users of the road and the protected areas, but additional concerns would arise with regards to operational impacts from the incineration of waste. The chimney stack and associated building, would also be highly visible from the nearby road and residential areas of Bahar iċ-Ċagħaq, Pembroke and even beyond at higher elevations.

Additionally, Site 1 contains a considerable gradient down towards the coast road, which presents some challenges with regards to the building design. The requirements of a TTF with multiple lines lends itself well to an elongated building design, with material unloading to one end followed by areas for temporary storage, processing and finally incineration. While the proposed site is elongated, the rectangular shape would lie within a lateral sloping gradient, which would pose difficulties to accommodate in the project design.

Due to these considerations, this site was considered unsuitable for developing the proposed TTF.

Site 2

Site 2 is approximately 25,000sqm, which is considerably larger than the required area for the development of a new TTF facility. The site is relatively detached from the other currently developed and proposed plants within the ECOHIVE complex, with longer distances for material movements between the facilities. Greater construction efforts would be required in terms of electrical, plumbing and site access requirements of this site due to its location.

Due to its location at the Western periphery of the ECOHIVE complex, the development of the TTF at Site 2 would be visible from a substantial distance away from the complex. Currently, the area adjacent to this site comprises primarily of spent or in use landfills, which eventually will be capped and converted into a landscaped area. Additional land uses include farmhouses and agricultural land. Therefore, if Site 2 is developed, the improvement in visual impacts achieved by the envisaged landscaping of the landfills would be marred by the presence of a new development comprising several buildings a tall stack in this area of the ECOHIVE, which would otherwise largely be converted to greenery.

Site 2 is located at the boundary of the MAGHTAB PLANNING STRATEGY AREA, which seeks to ameliorate the cohesiveness of land uses around the ECOHIVE complex, within the area locally known as 'Magħtab'. The site falls within the boundary of a dedicated 'Animal Husbandry Area'.

The area policies were developed following a partial review of the CENTRAL MALTA LOCAL PLAN in 2017. The development of a new TTF at Site 2 would contradict the amended land use designation, and would also cause the ECOHIVE complex boundary to spread towards the West, which is located in close proximity to the nearest residential areas.

Site 2 would not require the removal of any protected species or cause direct impacts to protected habitats, since the site and its surroundings are comprised of agricultural land and landfills. Some spillover effects would be expected affecting the surrounding sensitive receptors, such as dust deposition on the adjacent fields. Locating the development at Site 2 would cause an increase in vehicles to the West area of the complex which is currently accessed by heavy duty and construction vehicles. Since the proposed TTF will receive materials from private third parties such as farmers and pet owners, limiting such users' access away from the landfilling areas of the complex would be commendable in the interest of health and safety.

Due to the aforementioned challenges, Site 2 was not considered to be the most suitable alternative for the proposed development.

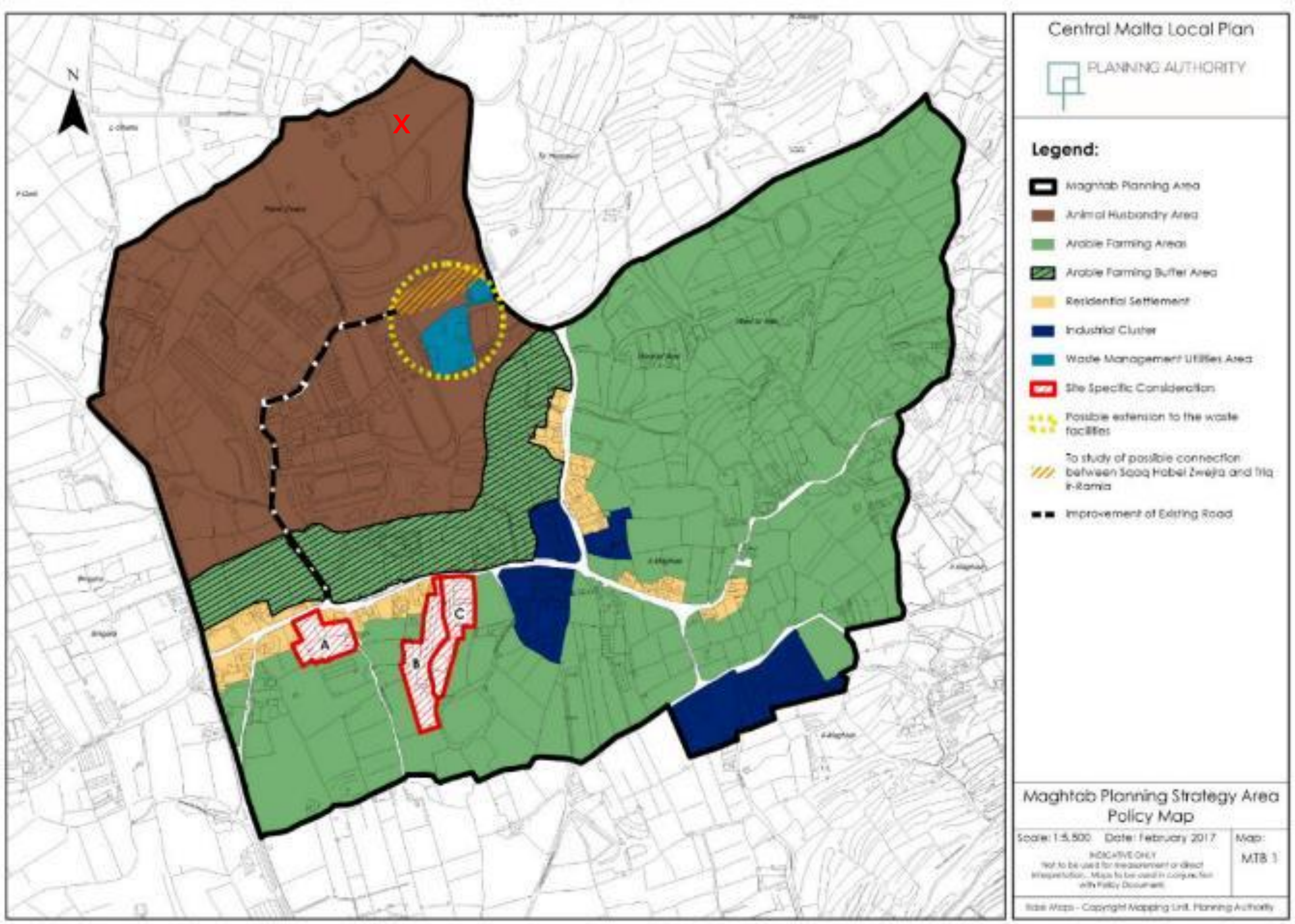

FIGURE 20: MAGHTAB PLANNING STRATEGY AREA POLICY MAP (SITE 2 MARKED WITH RED X)

Site 3

Site 3 is approximately 21,500sqm, making it considerably larger than the area required for the development of the TTF. Site 3 has some minor advantages as it offers a lower slope gradient and lies in closer proximity to the nearest access roads and the other ECOHIVE facilities.

In terms of ecological impacts, Site 3 contains a high number of mature protected species, namely Carob and Olive trees bordering unused agricultural fields. Should the development be located at this site, the contractor would be required to adequately compensate for any tree losses, and could incorporate such compensation within landscaping surrounding the site. Such compensation could result in an increased ecological quality of the areas surrounding the site, particularly if native tree and shrub species are planted in natural assemblages.

Site 3 is currently earmarked for the development of a new Material Recovery Facility, and is undergoing a separate Environmental Impact Assessment. Therefore, while the area may be suitable for the development of the TTF, the site will not be considered further in this exercise.

Proposed site

The site is approximately 18,000sqm, which is larger than the area required to develop the facility. However, the size of the plot is triangular, which poses some limitations to the siting and orientation of the buildings, with considerable areas which are unsuitable for development due to their shape and gradient. These additional areas will be utilised for landscaping. The proposal will incorporate a considerable amount of greenery surrounding the site, which benefits the proposal both in terms of reducing its environmental impacts and visual footprint.

The staggered elevation of the proposed site offers additional challenges with regards to the siting of the building, however, this challenge was transformed into an advantage by the project designers, as it allowed the partial concealment of the development by compartmentalising operations in areas situated at varying elevations. The proposed stack, which is the most visible element due to its height, could be sited at the centre of the ECOHIVE complex of current and proposed developments to reduce its visual impact.

Additionally, locating the proposed development adjacent to other related facilities facilitates logistics of operations when compared to Site 1 and 2, which are present relatively at a distance to other site operations.

The relocation of the existing MTTF to this area reduces traffic flows in the highly trafficked Marsa area currently used for incineration facilities.

The proposed site is also at a sufficient distance away from the nearest protected areas, and should not result in any significant impacts on nearby sensitive receptors both at construction and operations phases. One notable exception is the inevitable impacts on the mature trees present on site. The proposal incorporates a considerable number of landscaped areas which provide the opportunity for transplanting all uprooted trees. Any tree losses will be compensated accordingly, and the transplanting and/or compensation of trees presents the opportunity of creating a more cohesive natural habitat in the surrounding areas when compared to the present ecological value of trees bordering agricultural land.

Overall, the proposed site results in the best outcome in terms of visual impacts, safety and logistics. In terms of environmental impacts, should the loss of trees be compensated at the usual 1:10 ratio, the siting of the proposal at the current site could be an opportunity to increase the extent and quality of the natural tree cover in the surrounding areas, which ultimately benefits the overall biodiversity of the area in the long term.

3.2 Alternative technologies

3.2.1 Construction phase

The building design is staggered and compartmentalised into four areas to allow a better fit into the existing slope of the site. A considerable amount of landscaped area will be developed around the building, incorporating native tree and shrub species. The construction is primarily comprised of concrete and steel elements, along with glass windows which lighten building form and increase visual interest. Primary colours were included to highlight the various elements of the building structure, resembling ‘toys in a field’. The development also includes rain and waste water harvesting facilities, with water being reused for the site operations.

3.2.2 Operational phase

The selection of the most suitable technology for the new TTF is largely dependent on the waste streams being treated, and their respective annual throughput volumes. The proposed development was required to cater for both solid and liquid wastes of various sizes, multiple chemical components and infectious materials.

TABLE 10: COMMONLY USED FACILITIES USED TO TREAT VARIOUS WASTE TYPES

WASTE STREAM	APPLICABLE TREATMENT FACILITIES
Abattoir waste	Incineration, biogas, bio energy
Fallen animals	Incineration, bio energy
Clinical waste	Incineration, autoclave
Oil & chemical waste	Rotary kiln incineration
Sludge waste	Incineration, Fluidised bed, rotary kiln (small amount)

Rotary Kiln

The rotary kiln is a widely used technology for the incineration of hazardous oil and chemical waste, capable of handling various waste types without the need for shredding. It operates at high temperatures, typically 850°C for waste containing less than 1% Chlorine and 1100°C for waste containing more than 1% Chlorine, allowing for complete destruction of solid organic particles within a residence time of 1.5 to 2 hours. The kiln's design includes a refractory lining and can accommodate large waste volumes, including whole drums and sludge. Compliance with EU regulations mandates maintaining a minimum temperature of 1100 °C for waste with high chlorine content to prevent harmful emissions. Rotary kilns come in various sizes, with capital expenditures (CAPEX) ranging from 900 to 2000 Eur per tonne treated, while operational costs (OPEX) typically fall between 150 to 420 Eur per tonne. Rotary kiln incineration was chosen as the preferred incineration technology at the proposed TTF.

Grate Incinerator

Grate incinerators are primarily used for municipal solid waste (MSW) and biomass, requiring incineration temperatures above 850 °C for effective operation. These systems are characterised by inclined grates that facilitate the movement of waste while allowing combustion air to enter. However, they are limited in handling hazardous waste with chlorine content exceeding 1%, which necessitates higher temperatures. Grate kilns vary in size from about 1,000 to 400,000 tonnes per year, with CAPEX estimated between 800 and 1700 Eur per tonne treated, and OPEX costs ranging from 30 to 120 Eur per tonne.

Fluidised Bed

Fluidised bed technology enhances combustion efficiency by using a bed of fluidised sand heated by compressed air. Operating at temperatures up to approximately 900 °C, it is suitable for incinerating sludge and fine materials but cannot handle hazardous waste with high chlorine content due to temperature limitations. This technology requires careful control of particle size and ash content to maintain fluidisation. Fluidised bed plants typically have capacities ranging from 50 to 400,000 tonnes per year, with CAPEX costs estimated at 900-1800 Eur per tonne and OPEX costs around 30-120 Eur per tonne.

Fixed Hearth

Fixed hearth kilns are among the oldest types of incinerators, designed for batch processing of solid or liquid waste. They operate at lower temperatures (850-900 °C) and are often used for smaller quantities of hazardous waste or clinical applications. The size of fixed hearth installations varies significantly, usually ranging from small units treating up to 8,000 tonnes per year. CAPEX is estimated between 600 and 1500 Eur per tonne treated, while OPEX costs range from 30 to 100 Eur per tonne.

Gasification/Pyrolysis

Gasification transforms organic waste into syngas through controlled heating, while pyrolysis involves heating without air injection to produce syngas, char, and oil. Both processes require shredding the waste into smaller particles for efficient operation. Gasifiers vary in design and can handle various waste types but are not commonly used for hazardous oil and chemical wastes. Capacities range widely from small mobile units to large facilities handling up to 500,000 tonnes per year. CAPEX for gasification plants is generally higher than for incineration plants, estimated at around 900-2000 Eur per tonne treated, with OPEX costs typically between 50-200 Eur per tonne.

Plasma Pyrolysis/Gasification

Plasma gasification employs extremely high temperatures (up to 10,000 °C) generated by electrical energy to treat waste materials. This method allows for enhanced purity in metal recovery but remains largely experimental with few commercial applications available. Plasma systems are designed primarily as demonstration plants due to their high operational complexities and costs. The

CAPEX and OPEX for plasma gasification facilities are not well-defined due to the lack of commercially operating plants.

Autoclave

Autoclaves are commonly used for sterilizing clinical waste through steam treatment at elevated temperatures (typically above 100 °C). The process involves shredding the waste before sterilization and is designed to reduce volume while maintaining weight. Autoclave systems can range from small units handling a few kilograms per hour to larger facilities treating up to 10,000 tonnes per year. The CAPEX for autoclave systems is generally lower than that for incineration plants, estimated at around 5-6 million Eur for large installations, while OPEX is expected to be around 100-180 Eur per tonne treated.

Microwave

Microwave treatment technology uses microwave energy for the thermal treatment of waste materials, effectively sterilizing or breaking down organic substances without combustion. This method is particularly advantageous for specific applications like clinical waste but has limitations regarding scale and types of waste that can be processed efficiently.

Ozone Treatment

Ozone treatment is employed in smaller facilities for disinfecting and sterilizing clinical waste, applicable to both liquid and solid forms. Typically, clinical waste is shredded before being placed in a vessel where ozone is injected to eliminate bacteria and infectious materials. While most facilities operate on a batch basis, some newer continuous systems are emerging. The sterilized residue is generally sent to landfill but can also be repurposed as fuel in Waste to Energy facilities. Existing commercial plants can process between 100-500 kg/h, but due to the scarcity of reference plants, estimating CAPEX and OPEX is challenging; however, costs are generally higher than those for microwave treatment.

Chemical Treatment

Chemical treatment involves disinfecting clinical waste using agents like sodium hypochlorite or chlorine dioxide. The waste is usually shredded or milled before being mixed with chemicals in a vessel. These facilities typically operate in batches, but concerns regarding the corrosiveness and toxicity of the chemicals necessitate special staff Personal Protection Equipment (PPE). The residue from chemical treatment is often landfilled. Chemical treatment plants generally handle capacities ranging from 40-700 kg/h, but due to the small size of most facilities, estimating costs for larger operations (e.g., 10,000 tpy) is difficult; overall costs are typically higher than those for microwave treatment.

Biogas

Biogas plants treat organic waste that is easily converted into biogas, often receiving a mix of waste types such as animal manure, industrial residues, sewage sludge, and sorted municipal solid waste. Many biogas facilities in Northern Europe focus on animal manure due to farmers' challenges with raw manure disposal. With rising interest in producing Renewable Natural Gas (RNG) and EU directives on food waste treatment, numerous new biogas plants are being planned. A significant concern with treating abattoir waste is disease transfer risk, often mitigated by heating the waste to approximately 70°C. The capacity for co-digesting abattoir waste depends on the size of the biogas plant.

Drying

Drying processes can be applied to certain organic waste fractions for further processing, particularly for crops and slaughterhouse waste intended for animal feed. Typically, the material is ground and dried using a rotary dryer that tumbles and heats it. For dried abattoir waste to be suitable as animal feed, it must be exceptionally clean to meet safety standards.

TABLE 11: COMPARISON OF THE VARIOUS TYPES OF HAZARDOUS WASTE TREATMENT TECHNOLOGIES

WASTE TREATMENT TYPE	WASTE TYPES	WASTE CATEGORIES	RESIDUE	RESIDUE USE	WEIGHT REDUCED %	TEMPERATURE °C	SIZE TONNE
Rotary kiln	All	Chemical, oil, abattoir, Clinical	Slag/bottom ash	Road fill, Landfill	80	1100	3,000-60,000
Grate	Solid and liquid	MSW, Clinical	Bottom ash	Road fill, Landfill	80	850	3,000 – 400,000
Fluidised bed	Pasteous, shredded	Sewage, Sludge, MSW, Chemical	Bottom ash	Road fill, Landfill	80	850	50,000 – 400,000
Fixed hearth	Solid in batch Liquid	Household Waste, MSW, Clinical	Slag, Bottom ash	Road fill, Landfill	80	850 - 1100	0 - 100,000
Autoclave	Solid in batch	Clinical	Sterilised waste	Landfill, Fuel	0	100 - 180	0 – 3,000
Microwave	Solid in batch or continuous	Clinical	Sterilised waste	Landfill, Fuel	0	100 - 180	0 – 1,500

Waste treatment type	Waste types	Waste categories	Residue	Residue use	Weight reduced %	Temperature °C	Size Tonne
Ozone	Solid in batch or continuous	Clinical	Sterilised waste	Landfill, Fuel	0	Ambient	0 - 3,000
Chemical treatment	Solid in batch	Clinical	Sterilised waste	Landfill, Fuel	0	Ambient	0 – 500,000
Gasification plant	Shredded, solid only	MSW, Household Waste, Clinical	Slag	Road fill, Landfill	80	600 – 1,000	0 – 500,000
Plasma gasification (not commercialised)	Shredded, solid only	MSW, Household Waste,	Slag, Bottom ash	Road fill, Landfill	80	2,000 – 14,000	0 – 20,000
Biogas	Liquid or solid	Organic residue	Digestate	Fertiliser	20 - 40	35/55	-
Drying	Solid	Non hazardous	Dry matter	Fuel, landfill	20 - 40	-	-

Waste treatment type	Notes	Animal Waste and Expired Food Stuffs	Fish Farms Waste	Clinical Waste	Waste Paint and Ink	Medicines and Pharmaceuticals	Contaminated soils	Waste Oils
Rotary Kiln	N/A	+ Large amounts of water in waste can cause problems for kiln operation	+ Large amounts of water in waste can cause problems for kiln operation	+++	+++	+++	++	+++
Grate Incinerator	Chlorine content must be less than 1%	+ If mixed with other waste types	+ If mixed with other waste types	++ If mixed with other waste types	++ If injected into the furnace	++ If mixed with other waste types	-	++ If injected into the furnace in a lance
Fluidised Bed	Only few commercial fluidized bed facilities for hazardous waste exits	+	+	-	++	+	-	++

Waste treatment type	Notes	Animal Waste and Expired Food Stuffs	Fish Farms Waste	Clinical Waste	Waste Paint and Ink	Medicines and Pharmaceuti-cals	Contaminated soils	Waste Oils
Fixed Hearth	Normally small-scale plants	+	-	++	-	++	-	+ If injected into the fixed hearth in a lance
Auto-clave	Normally used for disinfection / sterilisation residue sent to landfill	+ Normally not relevant	++ Normally not relevant	+	Not relevant	Not relevant	Not relevant	Not relevant
Micro-wave	For disinfection / sterilisation Residue sent to landfill	+ Normally not relevant	+ Normally not relevant	+++	Not relevant	Not relevant	Not relevant	Not relevant

WASTE TREATMENT TYPE	NOTES	ANIMAL WASTE AND EXPIRED FOOD STUFFS	FISH FARMS WASTE	CLINICAL WASTE	WASTE PAINT AND INK	MEDICINES AND PHARMACEUTI-CALS	CONTAMINATED SOILS	WASTE OILS
Ozone	For disinfection / sterilisation Residue sent to landfill	+ Normally not relevant	+ Normally not relevant	+	Not relevant	Not relevant	Not relevant	Not relevant
Chemical Treatment	For disinfection / sterilisation. Residue sent to landfill	-	-	+	Not relevant	Not relevant	Not relevant	Not relevant
Plasma Gasification	Not commercialised at present							

WASTE TREATMENT TYPE	NOTES	ANIMAL WASTE AND EXPIRED FOOD STUFFS	FISH FARMS WASTE	CLINICAL WASTE	WASTE PAINT AND INK	MEDICINES AND PHARMACEUTICALS	CONTAMINATED SOILS	WASTE OILS
Biogas		+++	+++	-	-	-	-	-
Drying		+	-	-	-	-	-	-

KEY

-	Not suitable
+	Suitable after initial treatment
++	Suitable
+++	Very suitable

3.2.3 Land use requirements

Referring back to the comparison tables in the previous sub-sections (See Section 3.2.2), one can note that alternative technologies can only cater to one or a limited number of waste streams which are expected to be received at the proposed site. Using such limiting technologies would entail the construction of multiple or larger facilities to cater for all the waste streams generated on the island. This approach would increase the land use requirements for the proposed development by a considerable margin. Each alternative technology would require additional land take-up for waste reception, storage, sorting and vehicle manoeuvring, aside from the space required by the waste treatment machinery itself.

One should also note that the development of a number of alternative technologies that are capable of treating non-hazardous waste streams have already been developed or are planned for development within the ECOHIVE complex. The complex already includes a biogas treatment facility, and the development of a waste-to-energy (incineration) plant is foreseen within the complex as well in the coming years.

Therefore, investment in rotary kiln incinerator technology was deemed most appropriate as it may cater for a wider variety of hazardous waste streams within a smaller area.

The separation of hazardous wastes directed to one facility was deemed necessary to eliminate issues related to the potential mixing and contamination of non-hazardous waste streams, allowing for dedicated best practices in hazardous waste handling and storage to be carried out efficiently at the proposed site.

Conclusion

Rotary kiln technology was chosen for this project due to its unmatched ability to handle the diverse and complex waste streams the new TTF facility will receive. It is the only technology capable of treating all waste types, including solid and liquid hazardous materials, as well as high-chlorine-content waste, ensuring compliance with strict environmental regulations. Operating at temperatures of up to 1600°C, the rotary kiln guarantees the complete destruction of organic materials.

The following sections delve into the options which were explored within the aim of further minimising the land take-up of the proposed development.

3.3 ALTERNATIVE LAYOUTS

Several layout alternatives were considered during the design phase of the proposed development. The design was based on a comprehensive set of requirements, including the envisaged waste types and their expected amounts and characteristics, requirements for discharges and storage, transferring of wastes from the delivery areas to the plan, cleaning and re-preparing reception, wastes generated from the plant operations, and administrative facilities. These requirements have been described in further detail in prior sections of this chapter.

Assessment of alternative site layouts

The initial proposal comprised a typical 'shed' style design commonly used in industrial developments, with the site entrance and unloading bays at one end of the site, and the stack placed at the other end.

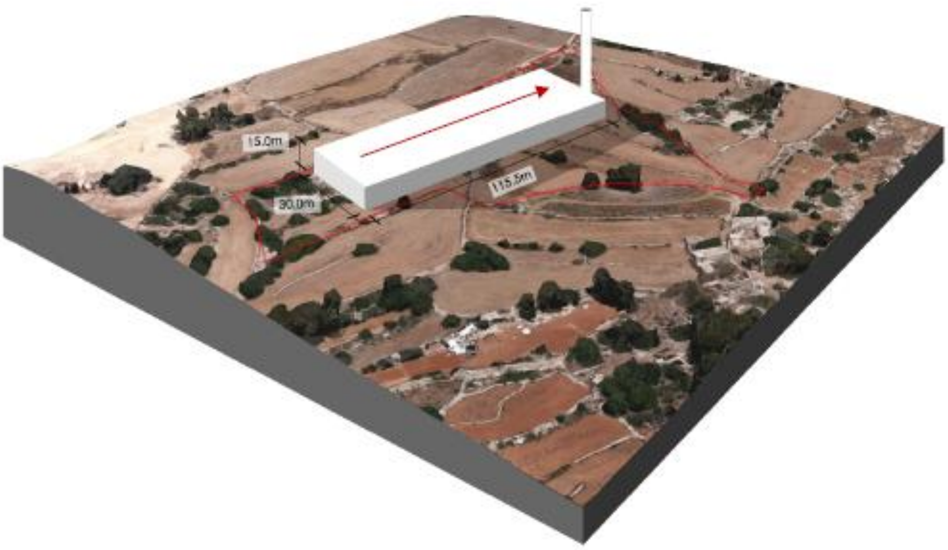

FIGURE 21: INITIAL PROJECT DESIGN

Additional to the previously listed parameters, the design also considered projected costs, health and safety considerations and working conditions, operational flows and visual impacts.

The initial proposal would result in difficulties in managing traffic flows particularly during peak hours. A maneuvering analysis was carried out where traffic flows were considered in further detail. Additional consideration was given to the fact that trucks would likely need to enter the unloading bays in reverse to carry out the waste transfers.

FIGURE 22: RESULTS OF MANEUVERING ANALYSIS

Following the aforementioned analysis conclusions, the design was amended to shift the unloading area to the far end of the site, which allowed for better maneuvering possibilities and also allowed for a talkback of approximately 9 trucks waiting inside the site boundaries, rather than waiting on the main access road or site entrance as originally proposed. Alternative routes were provided for trucks unloading different waste streams, and also for the plant workers.

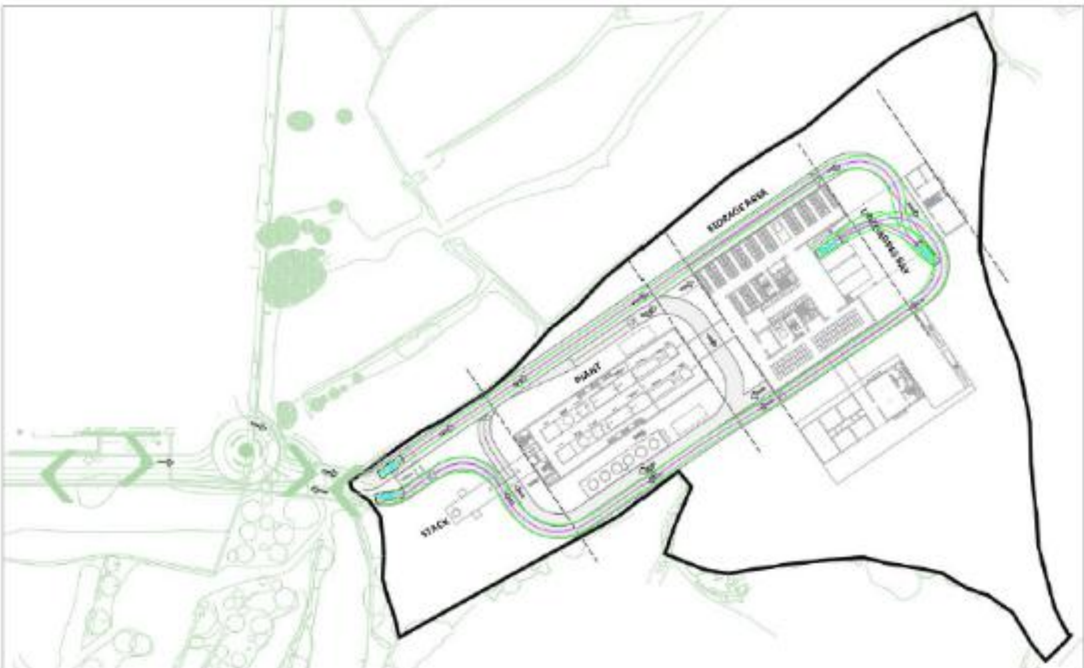

FIGURE 23: AMENDED UNLOADING AREA LOCATION AND RESULTING OPERATIONAL FLOWS

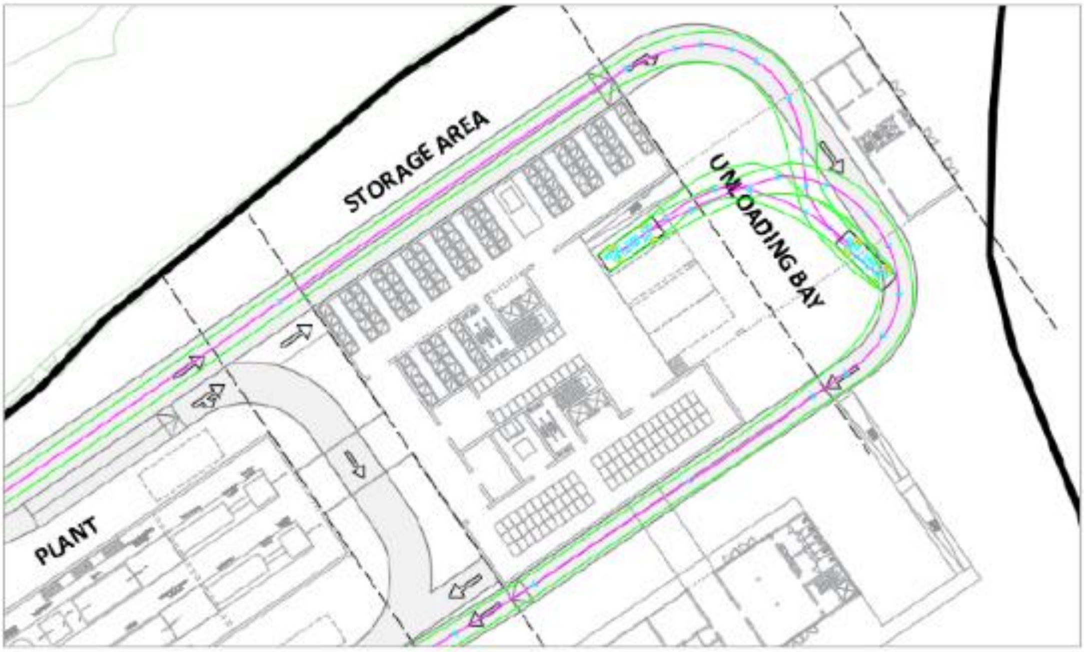

FIGURE 24: AMENDED UNLOADING AREA LOCATION AND RESULTING OPERATIONAL FLOWS

Further amendments were made to the project design to allow for the split of the original shed building concept into smaller areas, which can be developed at varying elevations and interconnected with bridges. This alternative minimises the bulk of the project building, and allows for the opportunity to better integrate the design into the existing slope, further minimising visual impacts and excavation needs. The final volumes were determined based on the related processes required of the site operations.

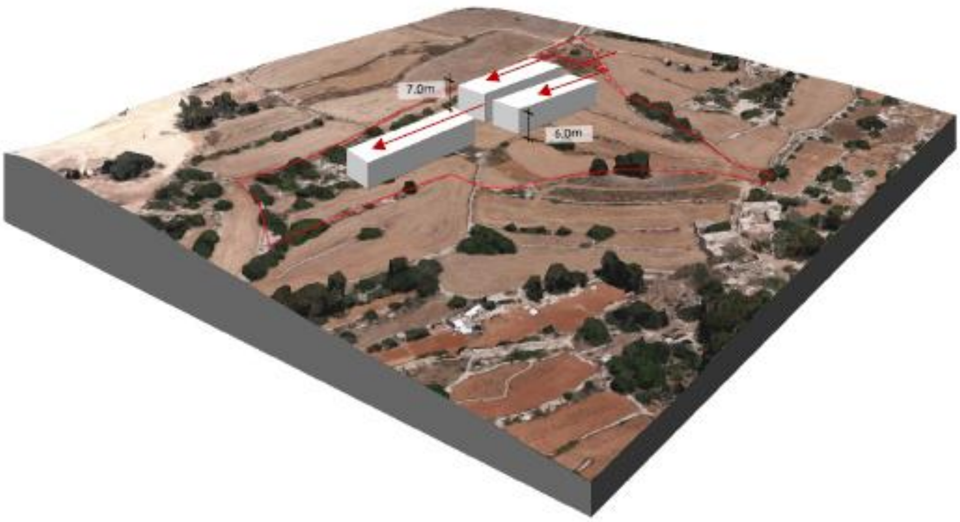

FIGURE 25: STUDY OF SPLIT BUILDING VOLUMES TO ALLOW FURTHER FLEXIBILITY

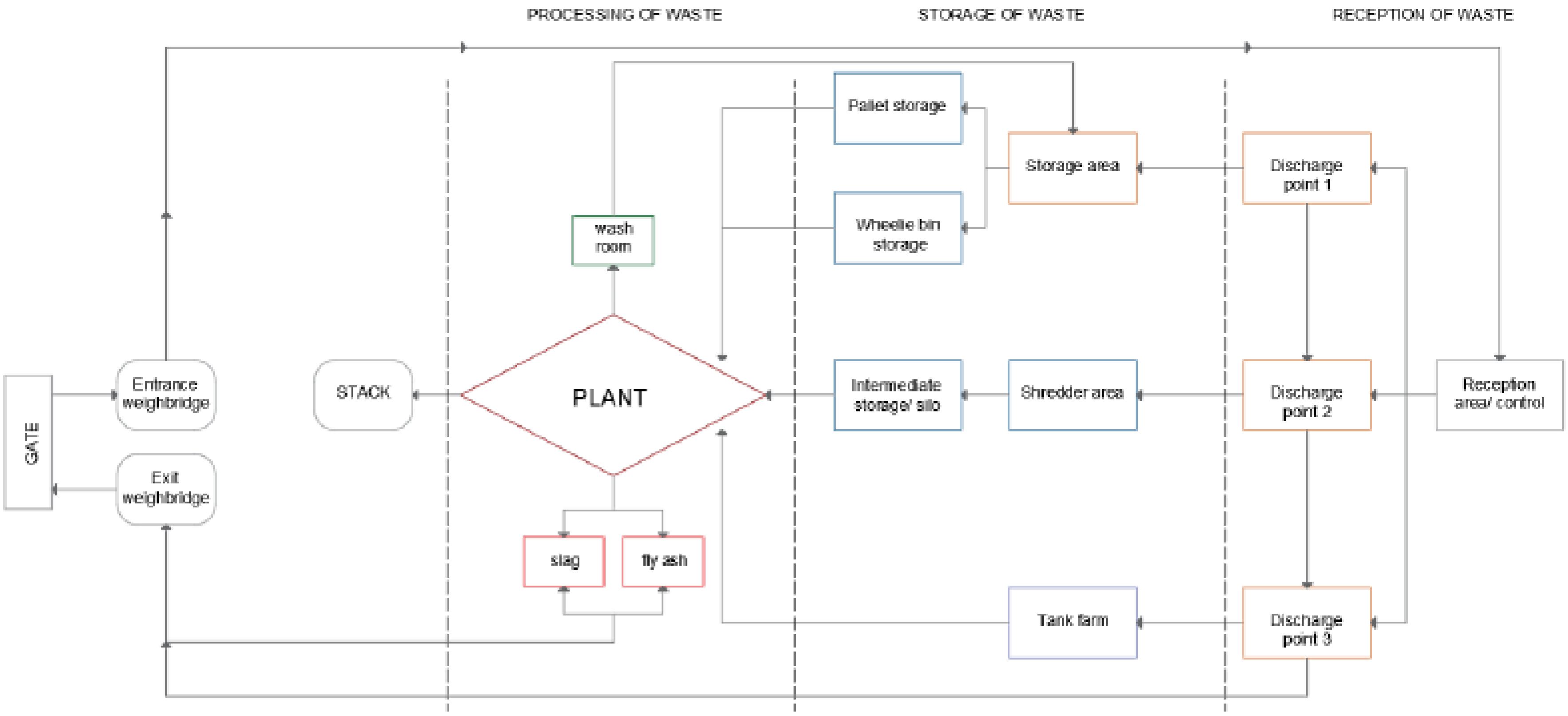

FIGURE 26: SITE PROCESS FLOWS

Net zero excavation waste

The designers proposed a project with 'Net zero excavation waste'. This implies that the waste generation during the excavation of the proposed TTF will be minimised or completely eliminated.

The LONG-TERM WASTE MANAGEMENT PLAN identifies excavation waste as the largest contributor to landfilling, and an issue to be addressed through waste reduction and reuse, along with identifying other alternative solutions to local landfilling.

Three scenarios were explored to model the quantity of excavation waste potentially generated by the project, each proposing a different plant and excavation level.

- Scenario 1: Plant floor level at 0.225m[4]
  Final level of the main plant would be reduced to 32.625m above mean sea level (MSL). The modelling exercise concluded that in this scenario, 8,669,69c.m. of excavation is required, and 11,669c.m. of volume will be created into which material can be backfilled, resulting in net zero when considering bulking of material.

- Scenario 2: Plant floor level at 0.325m[4]
  Final level of the main plant would be reduced to 32.375m above MSL. The modelling exercise concluded that in this scenario, 10,688.61c.m. of excavation is required, and 10,918.61c.m of volume will be created into which material can be backfilled, resulting in material needing to be exported when considering bulking of material.

- Scenario 3: Plant floor level at -0.025m[4]
  Final level of the main plant would be reduced to 32.725m above MSL. The modelling exercise concluded that in this scenario, 7,937,27c.m. of excavation is required, while 10,478.98c.m of volume will be created into which material can be backfilled, resulting in 2,541.71c.m. material needing to be imported.

The first scenario was selected to ensure that net zero is achieved in terms of excavation and backfilling requirements for the project.

[4] Height above a zero mark set for the project, not the MSL

Additional considerations

Additional alternative layouts that were considered included the amalgamation of certain elements of the proposed development, notably the proposed stack and cooling system, with the proposed development related to the Waste to Energy (WTE) Plant planned to be developed near to the TTF. The TTF ultimately is designed with its own stack and an air-cooling system as opposed to the seawater cooling system used by the WTE plant. This decision was a result of long-term discussions that concluded that the logistics related to operations and tendering would add undue complications to the smooth operations of both sites.

3.3.1 Downscaling of the project or elimination of project components

While the size of the plot in question is technically large enough to accommodate the proposed development, it poses some limitations in terms of its configuration, which is quasi triangular in shape, and also a variation in topographical gradient is present from the West to East side. These limitations posed some difficulties in the design and orientation of the building itself and also the surrounding access road.

The proposed development was downscaled when compared to the original design, primarily to increase the efficient use of available space, and with the intention of minimising its visual impacts. The proposal was compartmentalised into four interconnected areas with the use of bridges, which allowed the different areas to be located at varying heights, thus merging better with the existing slope. The proposal will utilise the same material excavated from the site to backfill areas which require raising to a certain level, further improving the resource efficiency of the proposal.

The areas adjacent to the building which could not be incorporated into the design due to the issue of the plot shape will be incorporated into an extensive landscaping plan, which will serve to incorporate transplanted trees and add further trees and shrubs as a compensatory measure.

Additional downscaling was carried out following a preliminary air dispersion model which resulted in minimising the stack height to the lowest length possible, due to this element being the highest structure within the proposal. Furthermore, where possible, elements of the design were semi submerged so that their visual importance is less substantial.

While the overall design was compacted to the extent possible, some elements were added at a later stage of the design to lighten the structure, such as glass within some areas of the building and bridges which add visual interest and lessen the industrial outlook of the overall design.

3.3.2 Zero Option (do-nothing scenario)

The current operations at the existing TTF in Marsa pose several disadvantages to the proposed development. These issues have been discussed in prior chapters.

In summary, the existing operations are more costly, and pose higher negative impacts on the sensitive receptors in terms of noise, air quality and traffic flows.

The CBA for the proposed development concluded that developing a new TTF within the ECOHIVE complex is a more cost-effective solution than retaining or upgrading the existing development in Marsa.

Furthermore, the current capacity at Marsa results in a large proportion of wastes that are exported to be processed in other countries, which is both contrary to EU principles and increases the environmental impact of such waste treatment.

Finally, consideration for relocating the site of the existing MTTF was included in the current LONG-TERM WASTE MANAGEMENT PLAN, therefore the do-nothing scenario would contradict local policy direction in this regard.

3.3.3 Hybrids/combination of the above

The project design stage considered various alternative layouts and technologies. The ultimate format of the proposal considers the most efficient alternative in terms of land use, costs, energy and materials usage; logistical and siting constraints, and the national demand. These elements are addressed while minimising the project impacts on the environment to the minimal extent possible. Future alternations may be done to further mitigate and minimise both visual and environmental impacts to the aforementioned end.

4 A DESCRIPTION OF SITE ASPECTS AND ITS SURROUNDINGS

The Areas of Influence (AOI) for the studies considered hereunder were adopted on buffer zones surrounding the scheme site as shown in Figure 27 and Figure 28.

FIGURE 27: PROPOSED TTF SITE (OUTLINED RED) WITH 100M BUFFER AOI-1 (OUTLINED BLUE)

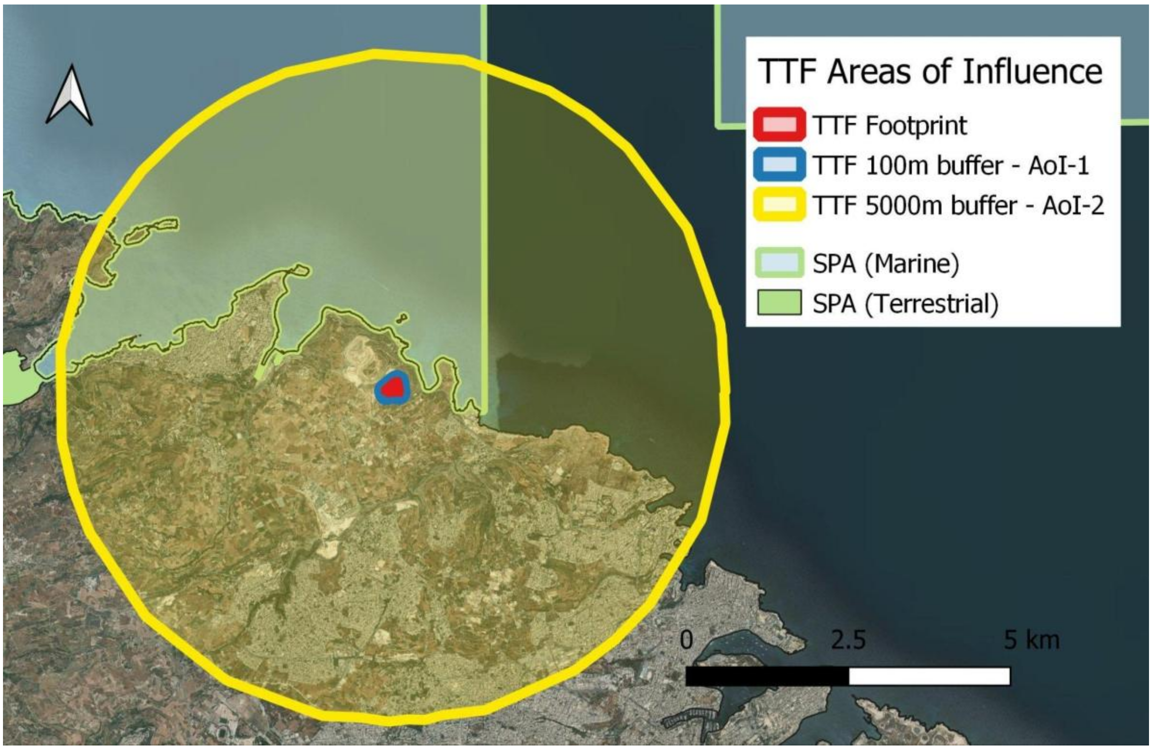

FIGURE 28: PROPOSED TTF SITE WITH 5000M BUFFER, AOI-2; MARINE AND TERRESTRIAL SPAS.

4.1 LAND/SEA COVER AND LAND/SEA USES

4.1.1 Policy review

The area proposed for development falls under the remit of the CENTRAL MALTA LOCAL PLAN, more specifically within the Baħar iċ-Ċagħaq region of the locality of Naxxar. The Local Plan designates the site as RURAL/ODZ LAND, AGRICULTURAL AREAS UNDER POLICY CG24 (Awaiting classification of agricultural value, and LISTED ECOLOGICAL AREA UNDER POLICY CG22 (PROTECTION OF AREAS OF SACS, SSIS, AEIS AND AHLSS).

CG24 – AGRICULTURAL AREAS AWAITING CLASSIFICATION OF AGRICULTURAL VALUE states that:

> *MEPA will designate and classify all Areas of Agricultural Value (AAVs) within the Local Plan area following confirmation of the quality of agricultural land by the Authorities… Within designated AAVs only buildings, structures and uses essential to the needs of arable agriculture will be permitted on condition that it can be demonstrated…. that they will not adversely affect the quality of water resources, soil and landscape, and that they will not conflict with scenic, ecological, scientific, archaeological and mineral interests….. In the interim period, until such designations have been fully confirmed, development proposals on agricultural land as indicated in the Environmental Constraints Maps will be required to comply with the relevant Structure Plan Policies and the relevant Policy and Design Guidance for Rural Development and Agriculture. The identification of the quality of agricultural land in the Central localities…. need to be identified and classified in accordance with Structure Plan Policies RCO1-3 and RCO7.*

STRUCTURE PLAN POLICY RC01 states that Rural Conservation Areas are designated in terms of their scenic value, with five sub-types, which include:

- Areas of Agricultural Value
- Areas of Ecological Importance
- Sites of Scientific Importance
- Areas of Archaeological Importance
- Sites of Archaeological Importance

POLICY RC02 states that within Rural Conservation Areas 'no form of urban development will be allowed'. However, applications for activities essential to agricultural, ecological or scenic interests will be considered.
POLICY RC03 reiterates the need for publishing Local Plans, which at the time of writing of the STRUCTURE PLAN (1990s) had not been finalised.

POLICY RC07 states that additional policies AHF1-3 are applicable to agriculture. When applying such policies, attention is needed particularly to Areas of Agricultural value and their importance in the resolution of conflicts with other Local Plan priorities.

THE CG22 Local Plan policy (PROTECTION OF AREAS OF SACS, SSIS, AEIS AND AHLSS) requires a 'general presumption against development'. The LOCAL PLAN states that proposals are to be vetted against STRUCTURE PLAN[5] relevant policies, particularly policy RC012 in this case, which designates these areas in to four levels:

- *Level 1 zones will include important habitat types present only in very small areas and/or sites with unique species or features*
- *Level 2 zones will include important habitat types present in relatively large areas and/or sites with rare species or features*
- *Level 3 zones will include areas where control is necessary to preserve habitat/species/features in adjacent sites*
- *Level 4 zones will include habitat and/or features of general interest*

Additionally, the proposals should consider the LANDSCAPE ASSESSMENT STUDY OF THE MALTESE ISLANDS (2004)[6], which identifies the proposed site's area (referred to by its local name 'Magħtab' in this report) as a 'detracting' feature of the region, and which requires addressing in terms of reducing its visual impact on the surroundings. The report considers the landfill itself and also spillover effects such as spontaneous fly-tipping surrounding the site, which further contributes to the visual impacts.

Figure 29 to Figure 31 below show the designation boundaries. Photographs providing a general overview of the main land cover and uses can be seen in Figure 32 to Figure 39. A map was created to depict the existing land cover and land uses within the Area of Interest (See Figure 40).

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[5] See: https://www.um.edu.mt/library/oar/bitstream/123456789/34196/1/Structure_plan_for_the_Maltese_islands_written_statement_November_1990.pdf

[6] See: https://era.org.mt/wp-content/uploads/2019/05/LandscapeAssessment-MalteseIslands-MEPA-2004.pdf

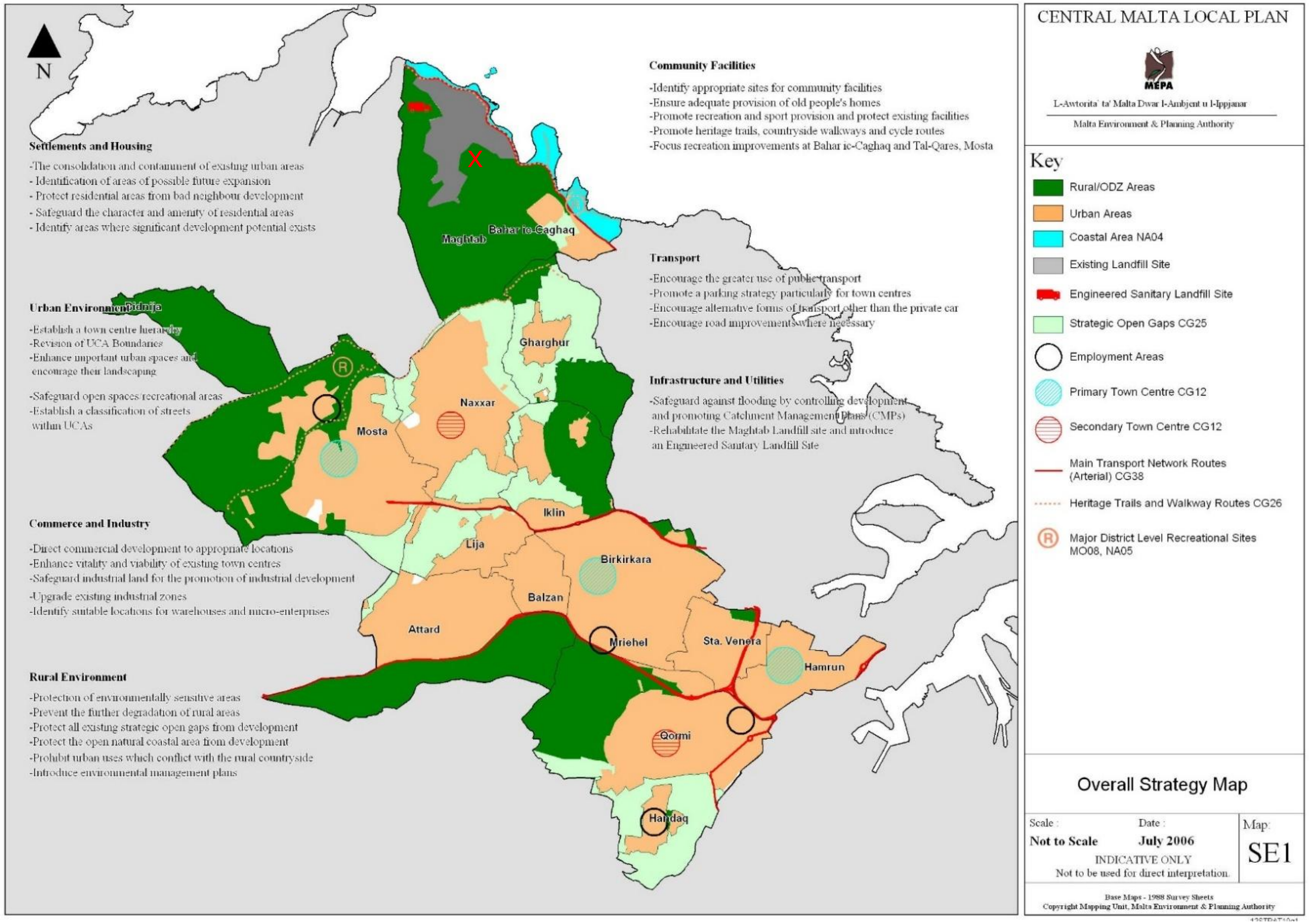

FIGURE 29: CENTRAL MALTA LOCAL PLAN STRATEGY MAP (SOURCE: CMLP,2006). SITE AREA MARKED WITH RED X

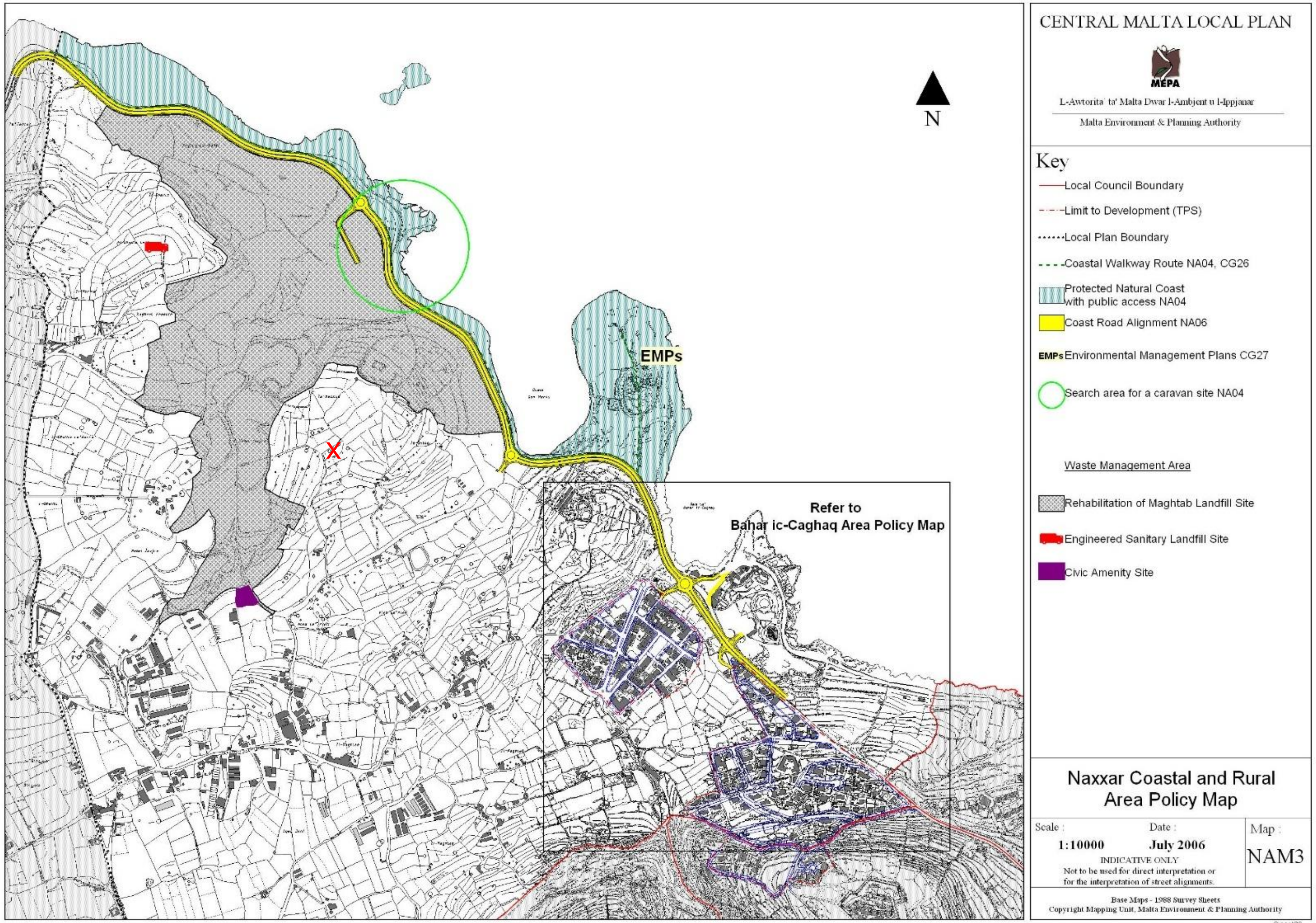

Figure 30: Naxxar Coastal and Rural Area Policy Map (source: CMLP, 2006). Site marked with red X.

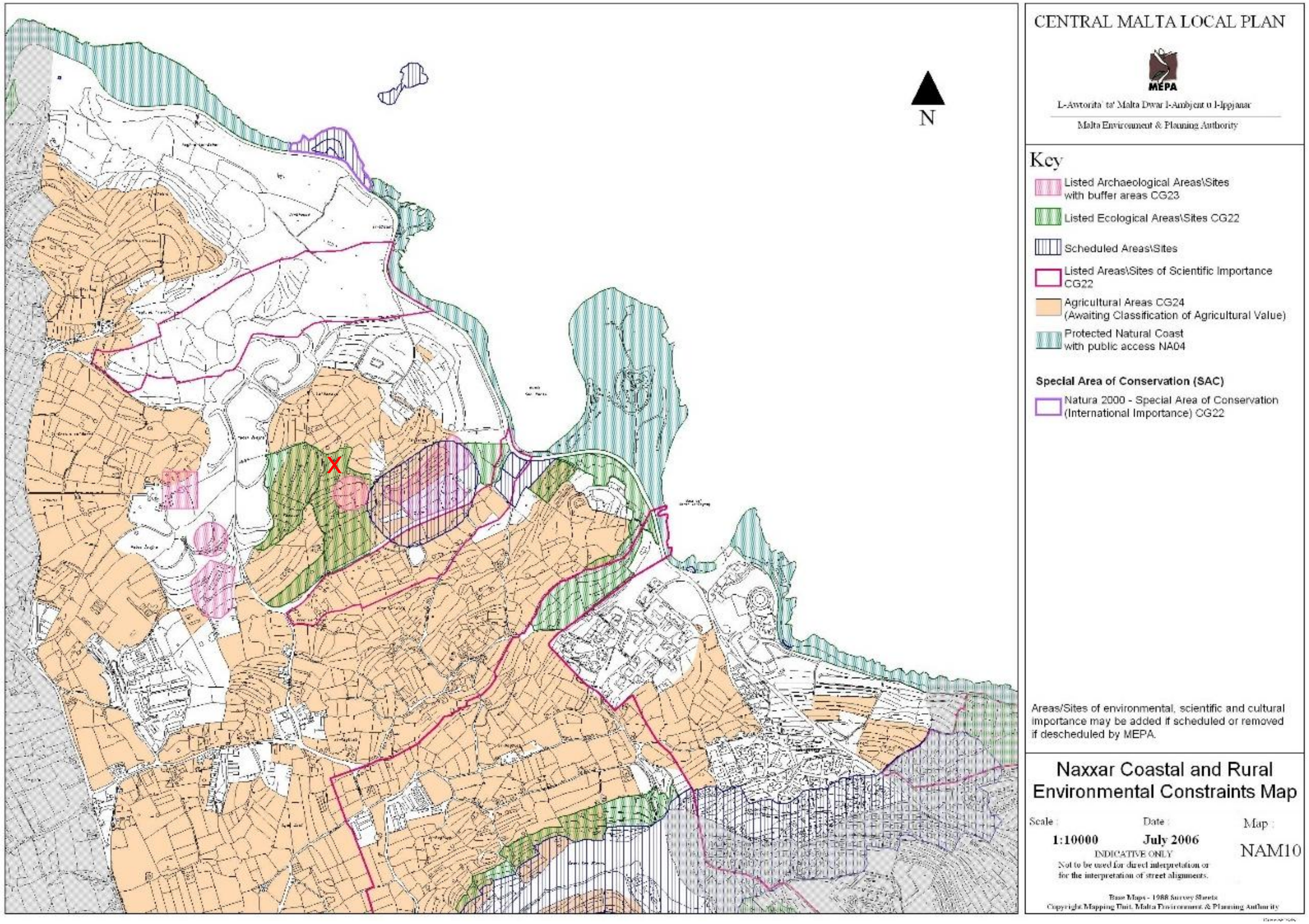

FIGURE 31: COASTAL AND RURAL POLICY MAP FOR BAĦAR IC-CAGĦAQ, NAXXAR (SOURCE: CMLP, 2006). SITE MARKED WITH RED X

4.1.2 Surrounding Land Uses at the AoI

Figure 40 presents a map of the current land cover and land uses within the Area of Interest.

The site is situated within the ECOHIVE complex managed by Wasteserv Malta. The complex can be accessed from two entrances, the main being the South gate which lies to the South West of the Area of Interest. Access into the site is restricted to registered waste carriers and permitted vehicles.

Vehicle use of the Wasteserv site is currently intensive, as the site contains various complexes where the storage and processing of various waste streams is carried out. The use of the main landfill (known as 'Għallis') will, in the near future, be discontinued and a landscaping plan put in place. In its stead, plans for the expansion of the complex are in place which include the proposed thermal treatment facility covered by this report, as well as a new waste-to-energy plant, engineered landfill, organic processing plant and materials recovery facility covered by a separate EIA.

FIGURE 32: ECOHIVE COMPLEX ADJACENT TO THE PROPOSED SITE

The perimeter of the existing anaerobic digester plant is landscaped with various species, including indigenous species such as carob and olive trees.

FIGURE 33: LANDSCAPED AREA AROUND THE EXISTING ANAEROBIC DIGESTER PLANT

The Scheme site is currently accessible via an unsurfaced dirt path, which winds across a number of bare fields and tree stands which currently surround the site.

FIGURE 34: DIRT ROAD ACCESS TO THE PROPOSED SITE

The site is surrounded by agricultural fields which are comprised predominantly of bare soil bordered by limited remnants of maquis species, and scattered agricultural and ornamental tree species. Some stands of mature eucalyptus trees, typical of hunting grounds, are also present in limited extents. The borders of the rubble walls which delineate each field contain plant species typical of disturbed ground.

FIGURE 35: BARE FIELDS FLANKED WITH ORNAMENTAL AND HUNTING COVER SPECIES

Indigenous species typical of Maltese maquis habitat are present arranged as dense patches scattered across the terrain. The tree stands are present within small pockets of the remaining soil surrounded by bare bedrock which has been cleared of its topsoil layer. The mature trees are interspersed with low-lying bushes and wild plants typical of disturbed habitats.

An extensive area of degraded land is observed on site at the location of the proposed Thermal Treatment Facility. The area is comprised of exposed bedrock following the removal of the soil layer as described in the earlier sections.

FIGURE 36: DENSE PATCHES OF INDIGENOUS SPECIES

FIGURE 37: EXPOSED BEDROCK DIRECTLY WITHIN THE SITE BOUNDARY

To the South-East of the site lie small patches of scattered rural buildings which appear to be residential in nature. This are can be accessed by a rural road with rubble walls on either side.

FIGURE 38: FARMHOUSES TO THE SOUTH-EAST OF THE PROPOSED SITE

FIGURE 39: ACCESS TO FARMHOUSES SOUTH-EAST OF THE PROPOSED SITE

FIGURE 40: LAND USES IN THE STUDY AREA (BASED ON WALKOVER SURVEY HELD IN JULY 2024)

4.2 LANDSCAPE CHARACTER AND VISUAL AMENITY

4.2.1 Landscape setting

According to the Structure Plan of the Maltese islands, Landscape is defined as the "*visual aesthetic component of the surrounding environment – that is, the views as appreciated and interpreted through the sense of sight*"[7]. The Landscape Assessment Study of the Maltese islands[8] divides the islands into 61 landscape character units. Each unit encompasses a number of characteristic features that are confined to a particular tract or region of land. The landscape units falling within the areas of influence of the Scheme are listed and described in Table 12.

TABLE 12: LANDSCAPE UNITS

SITE	GENERAL FEATURES	ENHANCING FEATURES	DETRACTING FEATURES
M9, M57, M58 St' Paul's Bay – Bugibba-Qawra	Formerly agricultural, now a densely built tourist area between St. Paul's Bay and Salina Bay. It features tall holiday flats, restaurants, and hotels, making it highly urbanized. The core area is less developed and visually hidden by taller buildings.	The entire coastline, especially the northeastern tip, is experiencing rapid development. However, the area near Il-Mahruq and Il-Ponta tal-Qawra remains relatively unspoiled. The promenade and colorful boats add vibrancy, while the villas in the north offer a break from mass tourism.	The area faces issues like excessive development, disorganized layout, and low-quality architecture. Construction debris litters the coast, dominated by unattractive structures and cluttered skylines. Traffic, waste, and pollution further degrade the area's appeal.
M14 Maghtab	This flat area near the eastern coast combines agriculture, garrigue, and scattered buildings. It's bordered by the coastal road, a key link between north and south, and is	The area is dotted with churches, chapels, coastal towers, and historical sites, adding character when seen up close. Though not prominent, archaeological remains are present. Well-kept farmland and carob	The Maghtab waste disposal site dominates the area, visually impacting it and emitting unpleasant odors. Industrial activities, farms, concrete processing plants, and quarries further

[7] Landscape Assessment Study of Maltese Islands (MEPA)

[8] https://era.org.mt/wp-content/uploads/2019/05/LandscapeAssessment-MalteseIslands-MEPA-2004.pdf

SITE	GENERAL FEATURES	ENHANCING FEATURES	DETRACTING FEATURES
	home to many farms and industrial units.	tree groves enhance the area's positive attributes.	degrade the scenery. Additionally, scattered tipping and the Maghtab Earth Station's contrast contribute to the negative visual impact.
M21/M22 Gharghur – San Gwann hinterland	An elevated area with a dramatic north-western escarpment merging into Bahar ic-Caghaq. Gharghur and Madliena are the main settlements, surrounded by picturesque valleys. Moderate slopes are developed with dwellings, while San Gwann is mostly flat with former quarries. The area features transmission towers and valleys draining towards Bahar ic-Caghaq and St. Julians.	Gharghur is surrounded by beautiful scenery and historic buildings, including military fortifications, caves, chapels, and country houses. Terraced fields with large carob trees adorn the valley sides intersecting the great fault escarpment. Additionally, there are archaeological sites in the area, best appreciated up close.	New developments at the edge of Gharghur and Madliena starkly contrast with the rural valleys. Dereliction occurs in rural and newly constructed areas, with little amenity. Industrial plants, storage depots, greenhouse complexes, and former quarries exist in the area, impacting the scenery.
M58 North-Eastern rocky coast	Stretching from Bugibba to Tigne Point, this low-lying coast features shallow bays, some ending in sandy beaches. The area around Pembroke-St. Julians-Sliema is heavily developed, while the Bahar ic-Caghaq stretch remains largely free	The undeveloped coast, including Qawra and Sliema, remains pleasant, offering a break from nearby development. The bays are splendid with colorful underwater features and marine activity. Upgraded promenades, coastal parks, and facilities enhance the area, but	The extensive development at Sliema, St. Julians, and Paceville detracts from the coastal stretch, with construction sites obstructing public access and beach facilities becoming eyesores. Coastal areas are marred by construction debris,

SITE	GENERAL FEATURES	ENHANCING FEATURES	DETRACTING FEATURES
	from permanent residential settlements. Natural coastal rock formations vary from rugged to smooth.	some beach facilities limit public enjoyment. Historic features have suffered from surrounding development. Recent coastal projects and landscaping are of higher quality than the early 1990s development.	littering, and degrading features like the nearby landfill and caravan sites.

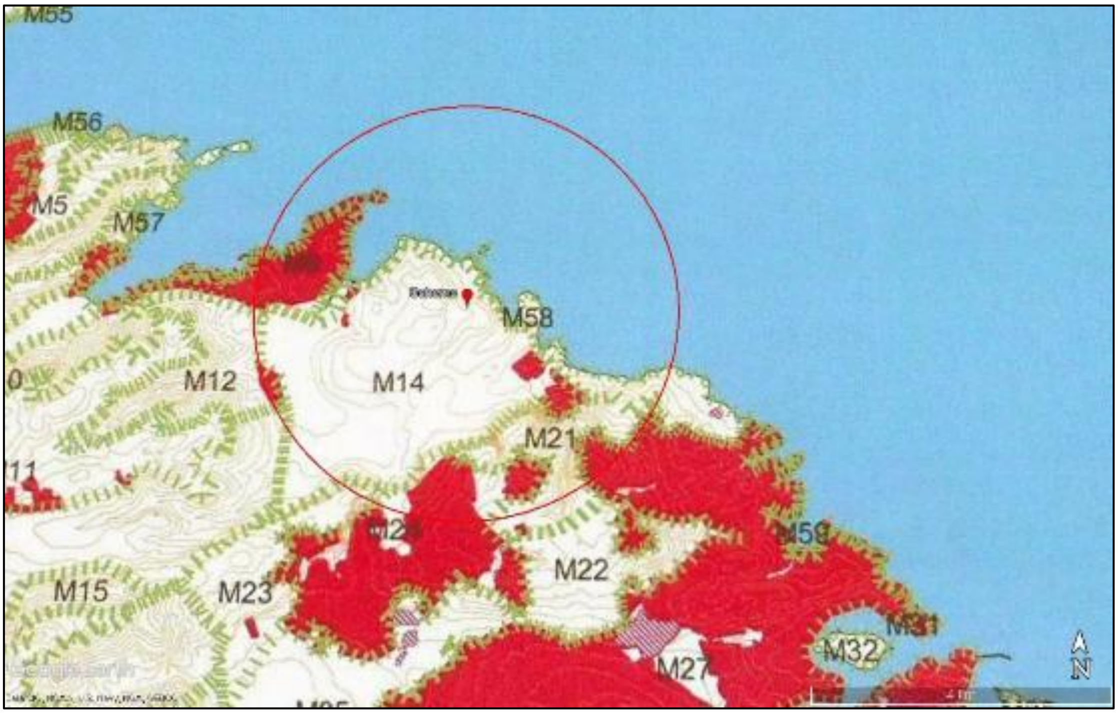

FIGURE 41: LANDSCAPE CHARACTER AREAS WITHIN 3KM FROM THE ECOHIVE COMPLEX[9]

The Scheme falls under the provisions of the CENTRAL MALTA LOCAL PLAN, 2006 (CMLP). CG22 defines a number of rural environments which are given protection due to their environmental and landscape importance. Of particular interest is the designation of Areas of High Landscape Sensitivity (AHLSs) forming part of CG22 (see Figure 42).

CG22 states: "*Proposed development located within AHLSs…are also to adhere to all the relevant provisions of MEPA's Supplementary Guidance document entitled 'Landscape Assessment Study of the Maltese Islands'. A general presumption against*

[9] Appendix IV Landscape and Visual Assessment OPP, 2023

development will apply on sites listed within the Local Plan as…AHLSs, particularly on crests and sides of faults, valleys and the edges of the coast…A general presumption also exists against any activities likely to introduce pollution and damage risks to…AHLSs. These listed sites also include buffer zones to further regulate development near and adjacent to…AHLSs. Development that affects AHLSs will be considered by MEPA following the requirements set by the Draft Landscape Assessment Study of the Maltese Islands (2004) and relative Structure Plan Policies."

Despite the Scheme site not being located within an Area of High Landscape Sensitivity, some of the viewpoints are located within such AHLSs.

FIGURE 42: AREAS OF HIGH LANDSCAPE SENSITIVITY (AHLSS) AROUND THE SCHEME SITE (RED CIRCLE) (SOURCE: PA MAPSERVER, 2024)

The potential visual receptors that may be affected by the proposed development include:

- Motorists/passengers travelling with their own vehicles and other means of transportation along the nearby roads.
- Residents residing within the ZTVI of the Scheme site. Residents living in high-altitude areas such as the outskirts of Gharghur, San Pawl tat-Targa and Madliena, as well as the nearby Maghtab hamlet are more exposed to the proposed development. The impact may also extend to short-stay tourists occupying nearby guest-houses and hotels.
- Swimmers, divers, fishermen, vessel users/owners, and/or visitors at the Bahar ic-Caghaq area.

The identified receptors in the ZTVI are not equally exposed to the potential impacts from the proposed development. The degree of exposure depends on the strategic location of the receptor when compared to the proposed Scheme, and the duration of the impact on the receptor. Shifting (non-fixed) receptors, such as motorists, passengers, pedestrians are less exposed to visual amenity impacts when compared to workers, residents and frequent visitors to the area.

4.2.2 Visual setting

4.2.2.1 Viewpoint 1

Viewpoint 1, located near Triq Dawret il-Wied in Mosta, provides a scenic overlook of Wied il-Għasel and a large adjacent quarry. This area, on the outskirts of Mosta near San Pawl tat-Tarġa, includes the ecologically and scientifically important Tal-Wej area, featuring a Dolmen and forming part of a protected high landscape value area. From this point, one can see long-distance views of Mellieħa and parts of Buġibba and St Paul's Bay, while the area is mainly dominated by the quarry and industrial complexes. Additionally, the view encompasses the plains of Burmarrad, part of the Magħtab Landfill (ECOHIVE Complex) including the future WtE and OPP plants, and a glimpse of the sea. On the opposite side, the viewpoint faces the Tal-Wej housing estate.

The view presents a mix of natural, historical, and industrial elements. Around fifty years ago, the area was a tranquil valley with distant sea views. The industrialization began with the establishment of a quarry complex, followed by the gradual expansion of a landfill near the coast. Agricultural land has given way to industrial and residential buildings, making it difficult to discern the fields. Ongoing construction, especially around the Magħtab complex, has further altered the landscape. The forthcoming waste management plants are expected to dominate the area. Unfortunately, these changes have led to the gradual degradation of the landscape. Notably, the historic Qalet Marku Tower and the Military Gunpost stand out as enduring historical features within the current surroundings.

The current state of the landscape can be characterized as ranging from poor to moderate. The once predominant agricultural land has largely succumbed to various developments, although the presence of sizable trees scattered throughout the valley mitigates the visual impact of these changes to some extent. The imposing presence of the Magħtab Complex in the background, coupled with the prominent large quarry complex in the foreground, significantly influences the overall landscape.

4.2.2.2 Viewpoint 2

Viewpoint 2 is situated atop the hill at Triq is-Salina, l/o Naxxar, and falls within an Area of High Landscape Sensitivity due to the presence of the Victoria Lines. The foreground view is characterized by numerous fields, while the background is dominated by the ECOHIVE Complex, including the WtE, MRF and OPP plants, with a conspicuous heap of excavated material adjacent to the landfill, creating a stark contrast with the surrounding landscape. Between the Complex and the viewpoint, there is a noticeable proliferation of buildings over time.

The sea provides a scenic backdrop, and the views while descending the hill offer an impressive vista of the northern parts of Malta, albeit marred by scattered construction amidst the agricultural fields. Clusters of large trees dot various areas, and glimpses of Mellieħa and Gozo are also visible. The historical elements in the vicinity comprise the Qalet Marku Tower along the Coast Road, the Military Gunpost further downhill, and the Il-Widna telecommunications center, originally utilized during the war. Additionally, the upper part of the hill adjacent to the viewpoint features several large villas overlooking the valley. On the left side of the steep hill, there is a sizable operational quarry that at times causes episodes of dust dispersion.

The presence of the landfill and associated waste management structures, along with ongoing expansion of various types of development in recent years, has led to the deterioration of the landscape from Viewpoint 2. Most of the buildings in this area are industrial, including those related to construction, alongside agricultural farms and sporadic farmhouse developments, creating a mixed environment. The construction activities in the area are also impacting air quality through the dispersion of dust, affecting visibility, agricultural output, and public health. Overall, the landscape can be considered to be in a moderate condition.

4.2.2.3 Viewpoint 3

Viewpoint 3 is situated along a road that connects Triq is-Salina and Triq il-Kosta. The view from this vantage point encompasses the ECOVHIVE Complex, and clearly indicates the sites of the WtE, MRF and OPP plants. In the foreground, one can note an abandoned field with a farmhouse on one side and several garages on the other side. Beyond the field, the Magħtab Interconnector building and the landfill are easily noticeable, along with a substantial heap of excavated waste deposited adjacent to the complex, creating a stark contrast. The rear of the viewpoint is characterized by a lengthy, tall wall belonging to a construction-related facility, with various metal structures visible in the facility's yard. Additionally, a small field and other buildings are observable on the same side of the road.

The primary features dominating the viewpoint are the ECOHIVE complex, and the walls of the nearby garages in the foreground. The overall condition of this landscape can be considered moderate.

4.2.2.4 Viewpoint 4

Located along Triq ir-Ramla, Viewpoint 4 offers a view of the landfill's rear entrance, adjacent to the Interconnector building. The area features two prominent material heaps within the ECOHIVE Complex: the old landfill and a contrasting heap of excavated waste. Additionally, the sites comprising of the future waste management plants and several disused stepped agricultural fields are notable in the immediate surroundings. The Interconnector building marks the road's end before reaching one of the ECOHIVE entrances. The backside of the viewpoint comprises agricultural land forming part of Wied Kieli, where various shielded industrial activities are observed.

The landscape in this area is primarily defined by a blend of agricultural and industrial activities. However, the WtE plant will emerge as the primary distinctive feature from this vantage point. The fields surrounding the expansive landfill are relatively unproductive, and in several instances, they have been repurposed for more lucrative uses. While some fields are still utilized by small-scale farmers, the area exhibits a degree of degradation.

The current state of the landscape is fairly satisfactory, particularly when taking into account the diverse range of activities taking place on the surrounding land.

4.2.2.5 Viewpoint 5

Viewpoint 5 along Triq il-Kosta, next to the Qalet Marku peninsula, offers a clear perspective of the area. The ECOHIVE Complex, including the landfill and a large heap of excavated waste, stands out behind a small hill. Once built, the WtE plant on the seaward side will become a noticeable feature. The recently reconstructed Triq il-Kosta has left visible marks in the form of excavated sides of the road and seaward concrete walls. Several caravans have taken up space alongside the road. The area is rocky with small bushes, and the bay of Qalet Marku is part of the foreground.

The Qalet Marku peninsula is mainly characterized by the historic Tower at its far end, and the opposite side is dominated by a rocky area with low bushes and trees. The road experiences heavy traffic, especially during the hot summer months when beach visitors contribute to the congestion.

In this landscape, anthropogenic evidence is evident through various caravans now occupying an area that was previously part of the road, further degrading the scenery. These caravans have become a common sight throughout the year, though not all of them are occupied at all times. The absence of retaining walls along the roads reflects a disregard for natural resources during the construction process, which may eventually impact the surrounding vegetation. The old landfill, covered with both wild and planted vegetation as part of a site rehabilitation process, blends relatively well with the surroundings. However, the addition of another heap of white excavated material contrasts with the semi-arid environment, further degrading the area. The forthcoming WtE plant, partially overshadowing the old landfill, will become a prominent feature in the existing landscape.

The current state of the landscape is fair but has worsened somewhat due to incomplete work during road construction. The new additions, like the WtE plant, also contribute to the deterioration. Additionally, the year-round parking of numerous caravans creates a makeshift village atmosphere, further contributing to the decline.

4.2.2.6 Viewpoint 6

Viewpoint 6 encompasses an Area of High Landscape Sensitivity and provides a downhill perspective from the side of the Coast Road at St Andrew's. When vehicles travel downhill through this route, they will have a clear view of the scheme and the adjacent WtE, MRF and OPP plant. The view on land from this point mainly includes the Splash and Fun Park on the seaward side, several buildings on the opposite side of the road, and the ECOHIVE landfill heap. Additionally, the area features the Qalet Marku peninsula and Tower, the sea, and a small part of Gozo in the background.

The recently rebuilt road is divided by a metal guardrail and electricity pylons, with a high "rubble wall" dominating the upper part near the viewpoint. The road experiences heavy use throughout the week and year.

The view includes a wide road with urban structures on the sides, contrasting with the Splash and Fun Park at the bottom. The old part of the ECOHIVE landfill has a similar texture to the surroundings, but recent interventions have exposed fresh surfaces. The large WtE structure will stand out, depending on the color schemes used, against the landfill behind it. There's a striking contrast between the earth colors of the dry land and the fresh colors of the blue sea and sky.

The existing landscape is in moderate to poor condition, lacking elements of high-quality characteristic landscapes. Over the years, interventions, especially the massive landfill and the proposed waste facilities at the ECOHIVE complex, have significantly altered the topography. Other human-made changes, such as buildings along the left side of the road and the colorful structures of the Splash and Fun Park, also impact the landscape, although not fully visible from this viewpoint.

4.2.2.7 Viewpoint 7

Situated at an area known as Top of the World due to its elevated position, this viewpoint offers a commanding outlook over Baħar ic-Cagħaq, the ECOHIVE Complex, and the distant Buġibba area, with views extending as far as the island of Gozo. The area below, primarily agricultural, also features various constructions interspersed among the fields, comprising residences, industrial garages, agricultural buildings, and the rapid expansion of the formerly seasonal residential area of Baħar ic-Cagħaq. The viewpoint, with its dominant views and associated heritage as part of the Victoria Lines, falls within an Area of High Landscape Sensitivity.

On the opposite side, the viewpoint overlooks a largely untouched garrigue area, with minimal human presence represented by parked vehicles, benches, and a small section of the Madliena residential area.

This panoramic view encompasses a blend of elements that have shaped the area over recent decades. Various constructions, including farms, industrial facilities, and residential buildings, have emerged throughout the valley, while the anaerobic digester at the ECOHIVE complex and preparations for the WtE plant are also visible from this vantage point. The impending WtE, MRF and OPP plants will notably alter the landscape, collectively contributing to the degradation of the area's natural elements. In the absence of these developments, the view from this point would have been exceptional, owing to its expansive vistas and sense of openness.

The existing landscape condition is currently moderate but declining. The area's once notable natural elements are rapidly diminishing due to the aforementioned intrusions. The activities at the ECOHIVE complex have played a part in this deterioration, further exacerbated by sporadic development across the valley floor.

4.2.3 Photomontages

Seven photomontages were created for each baseline viewpoint taken within the ZTVI. The following figures present the photomontages generated from this process.


Figure 43: Viewpoint 1 – Triq Dawret il-Wied, Mosta

Figure 44: Cumulative view showing photomontage of MRF, WtE and OPP plant only at viewpoint 1

Figure 45: Viewpoint 1 – The TTF superimposed on the MRF, OPP and WTE photomontages at Triq Dawret il-Wied, Mosta

Figure 46: Viewpoint 2 – Triq is-salina, San Pawl tat-targa

Figure 47: Cumulative view showing photomontage of MRF, WTE and OPP plant only at viewpoint2

Figure 48: Viewpoint 2 – the TTF superimposed on the MRF, OPP and WTE photomontages at Triq is-Salina, San Pawl tat-targa

Figure 49: Viewpoint 3 – Triq il-kappella ta' santa marija, maghtab

Figure 50: Cumulative view showing photomontage of the MRF, WtE and OPP plant only at viewpoint3

Figure 51: Viewpoint 3 -The TTF superimposed on the MRF, OPP and WTE photomontages at Triq il-Kappella ta' Santa Marija, Maghtab

Figure 52: Viewpoint 4 – Triq ir-ramla, Maghtab

Figure 53: Cumulative view showing photomontage of the MRF, WTE and OPP plant only at viewpoint4

Figure 54: Viewpoint 4 -The TTF superimposed on the MRF, OPP and WTE photomontages at Triq ir-Ramla, Maghtab

Figure 55: Viewpoint 5 – Triq il-Kosta, Qalet Marku

Figure 56: Cumulative view showing photomontage of the MRF, WTE and OPP plant only at viewpoint5

FIGURE 57: VIEWPOINT 5 -THE TTF SUPERIMPOSED ON THE MRF, OPP AND WTE PHOTOMONTAGES AT TRIQ IL-KOSTA, QALET MARKU

Figure 58: Viewpoint 6 – Triq il-Kosta, St Andrew's

Figure 59 : Cumulative view showing photomontage of the MRF, WTE and OPP plant only at viewpoint6

Figure 60: Viewpoint 6 - The TTF superimposed on the MRF, OPP and WTE photomontages at Triq il-Kosta, St Andrew's

Figure 61: Viewpoint 7 - Triq Ghaxet il-ghajn, Gharghur

FIGURE 62: CUMULATIVE VIEW SHOWING PHOTOMONTAGE OF THE MRF, WTE AND OPP PLANT ONLY AT VIEWPOINT 7

Figure 63: Viewpoint 7 - The TTF superimposed on the MRF, OPP and WtE photomontages at Triq Ghaxet il-ghajn, gharghur

4.3 GEOLOGY, GEOMORPHOLOGY, HYDROGEOLOGY AND SOILS

4.3.1 Geology

The site lies on Globigerina Limestone (GL) geological formation in between two faults of different orientation (Figure 64). Lower Coralline Limestone (LCL) is found outcropping surrounding the Scheme and within the AoI.

The GL formation is predominantly composed of the tests of planktonic foraminifera, specifically the genus Globigerina, which are microscopic marine organisms. The formation is recognized for its yellow to pale-grey colour and fine-grained texture, resulting from the accumulation of these tiny carbonate shells over time.

Globigerina Limestone is the second oldest rock formation in the Maltese Islands, covering approximately 70% of the land area. It typically forms a gently rolling landscape due to its erosion-resistant properties. The limestone varies in thickness, ranging from about 23 meters to over 200 meters in different locations, and is divided into three members: Lower, Middle, and Upper Globigerina Limestone, separated by layers of phosphorite pebbles.

This limestone formation plays a crucial role in local architecture and construction; it is commonly referred to as "franka" in Maltese and is extensively used for building materials across the islands.

The LCL is the oldest exposed rock formation in the Maltese Islands, primarily formed during the late Oligocene epoch. This limestone is characterized by its hard, pale grey texture and is predominantly composed of carbonate sediments, including the tests of coralline algae and various marine fossils.

The Lower Coralline Limestone forms steep cliffs along the western coastal areas of Malta and Gozo, creating dramatic landscapes that are resistant to erosion.

This limestone formation is divided into four members: Magħlaq, Attard, Xlendi, and Il-Mara, each named after the regions where they are predominantly found. The Lower Coralline Limestone is not only geologically significant but also economically important as it serves as a valuable resource for the construction industry in Malta.

Additionally, this formation plays a crucial role in local hydrology by holding freshwater reserves, making it essential for water supply in the region. Its hard and durable nature has made it a preferred material for building structures throughout Malta's history.

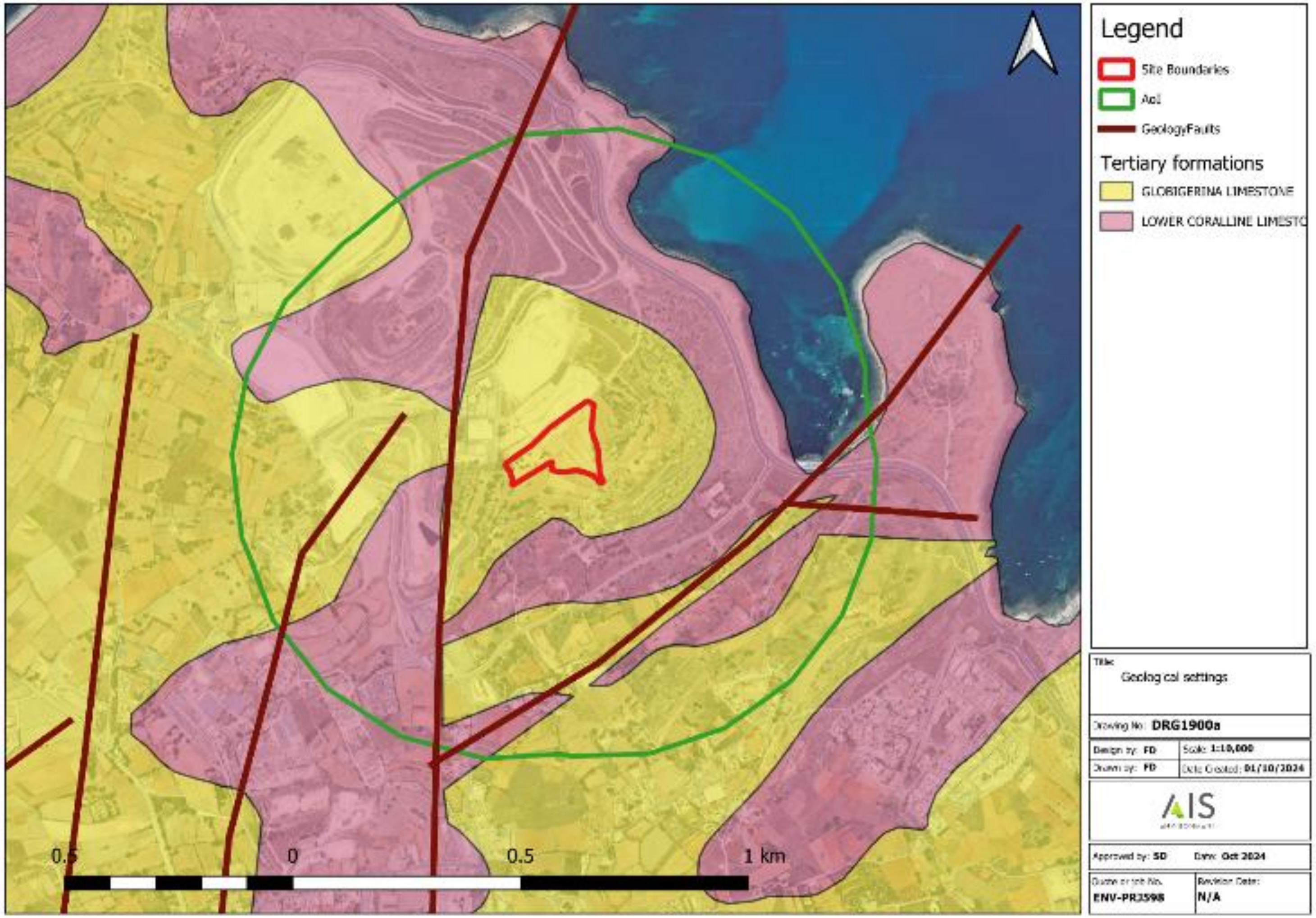

Figure 64: Geological map

The geological conditions at site were analysed through the drilling of five (5) exploratory boreholes and full recovery of rock core samples up to 6m in length for a total drilling of 22m. Six unconfined compressive tests on intact rock specimens from the retrieved borehole core, to ISRM suggested methods.

Additional results from drilling campaigns undertaken as part of other development zones within the ECOHIVE Complex were considered (Figure 65).

Bedrock pertaining to the Lower Member of the Globigerina Limestone Formation (LGL), is exposed at the surface in all five drilled boreholes. The retrieved LGL core material may be described as bioturbated, rust stained, fine grained, wackestones, which are associated with occasionally frequent calcified patches and core sections. When probed with a geological hammer, the LGL core material was observed to fall primarily within the 'moderately weak to moderately strong' strength category.

A considerable number of discontinuities were intersected in all boreholes. These discontinuities are evidenced through the presence of soil traces, red soil, caliche and caliche traces, calcite and calcite traces, white staining, black mottling, and rust staining.

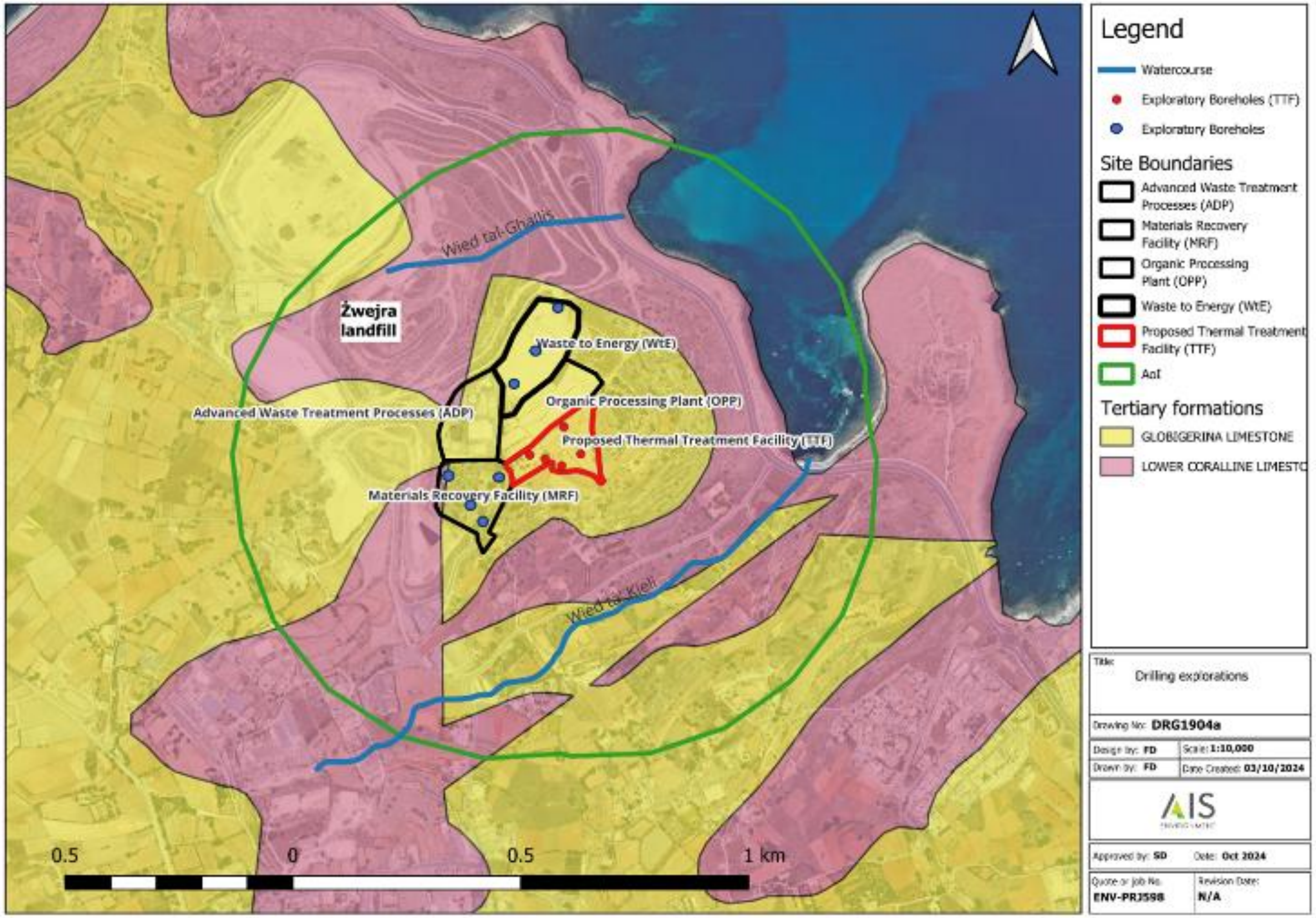

FIGURE 65: EXPLORATORY BOREHOLES DRILLED IN SITES ADJACENT TO THE PROPOSED TTF

Laboratory tests were carried out to assess the strength and pore structure characteristics of bedrock underlying the site. This was achieved by carrying out unconfined compressive strength measurements in accordance with the recommended methods of the International Society for Rock Mechanics (ISRM). The ultrasonic pulse velocity and the bulk density were measured for each test specimen, immediately before crushing the specimen in the compression machine. The moisture content was then determined from intact pieces of the crushed specimen by placing some of these in an oven for 24 hours.

Unconfined compression tests revealed that the average dry unit weight is 18.35kN/m^3 and the average porosity is 0.31. The corresponding void ratio is 0.45 and the degree of saturation varies between 34% and 75% across the drilled depth. Such variation is normal in this type of measurement, and could also be due to some of the cores drying out during transportation and processing in the laboratory.

The scatter of results for unconfined compression is wide, with strength values varying between 4.08MPa and 24.27MPa with an average of around 13.14MPa. The highest value of 24.27MPa is not typical of this material and should be considered as an outlier. Without this value, the average strength is 10.91MPa. Similar geotechnical results were found within other sites at the ECOHIVE Complex.

4.3.2 Soils

The Scheme site was stripped of the soil that supported arable land during preliminary archaeological investigations that were requested by the Superintendence of Cultural Heritage (SCH) Malta. A relatively thick layer of soil remains in the adjacent fields, which continue to be actively farmed. The soil present at the site, as well as that in the adjacent fields, is part of the L'Inglin complex. Additionally, Xaghra and San Biagio series soils are found within the AoI.

L'Inglin Complex primarily consists of clayey soils that are derived from the weathering of the underlying geological formations, particularly the limestone strata prevalent in the region. The L'Inglin Complex is notable for its high clay content, which contributes to its plasticity and water retention capabilities. This makes it suitable for various agricultural practices, as it can support crops while retaining moisture. The soil is typically dark in colour, indicating a rich organic matter content, which further enhances its fertility. In terms of geology, the L'Inglin Complex is associated with the underlying Lower Coralline Limestone and other limestone formations. These parent materials influence the soil's mineral composition and physical characteristics. The complex plays a crucial role in local agriculture, supporting the cultivation of various crops in the region.

Xaghra Series is primarily composed of clay loam and is derived from calcareous parent materials, particularly influenced by the weathering of the underlying geological formations, such as the Globigerina Limestone. This soil is typically recognized for its reddish-brown colour, which results from the presence of iron minerals within the soil. It generally exhibits a shallow depth, often ranging from 20 to 60cm, making it suitable for various agricultural practices. The soil is known for its good structure, although it can be prone to compaction under certain conditions. This soil type is commonly used for cultivating a variety of crops, including cereals and vegetables. However, its nutrient availability can be limited due to the high calcium carbonate content, which can affect plant growth by influencing nutrient uptake. Despite these challenges, the Xaghra Series remains an important agricultural resource in Malta, particularly in areas where traditional farming practices are employed. In terms of hydrology, the Xaghra Series has moderate water retention capabilities, allowing for effective moisture management in agricultural settings. Its properties make it suitable for terracing and other land management practices aimed at maximizing agricultural productivity while minimizing erosion.

San Biagio Series is primarily classified as a xerorendzina, which indicates that it has developed from the weathering of calcareous parent materials, particularly from the Globigerina Limestone. The San Biagio Series is distinguished by its light brown colour and silty loam texture, which contributes to its agricultural suitability. The soil typically exhibits a humus-deficient profile with a distinctive mull-like horizon, making it well-structured yet low in nutrient availability. This series is often found in terraced fields, where it supports various crops due to its ability to retain moisture moderately well. In terms of depth, the San Biagio Series generally has a shallow profile, ranging from 20 to 60cm, and is characterized by a relatively uniform texture from the surface down to the bedrock. The organic matter content in this soil type is typically low, averaging around 2% to 5%, which can limit its fertility but still allows for productive agricultural practices when managed properly.

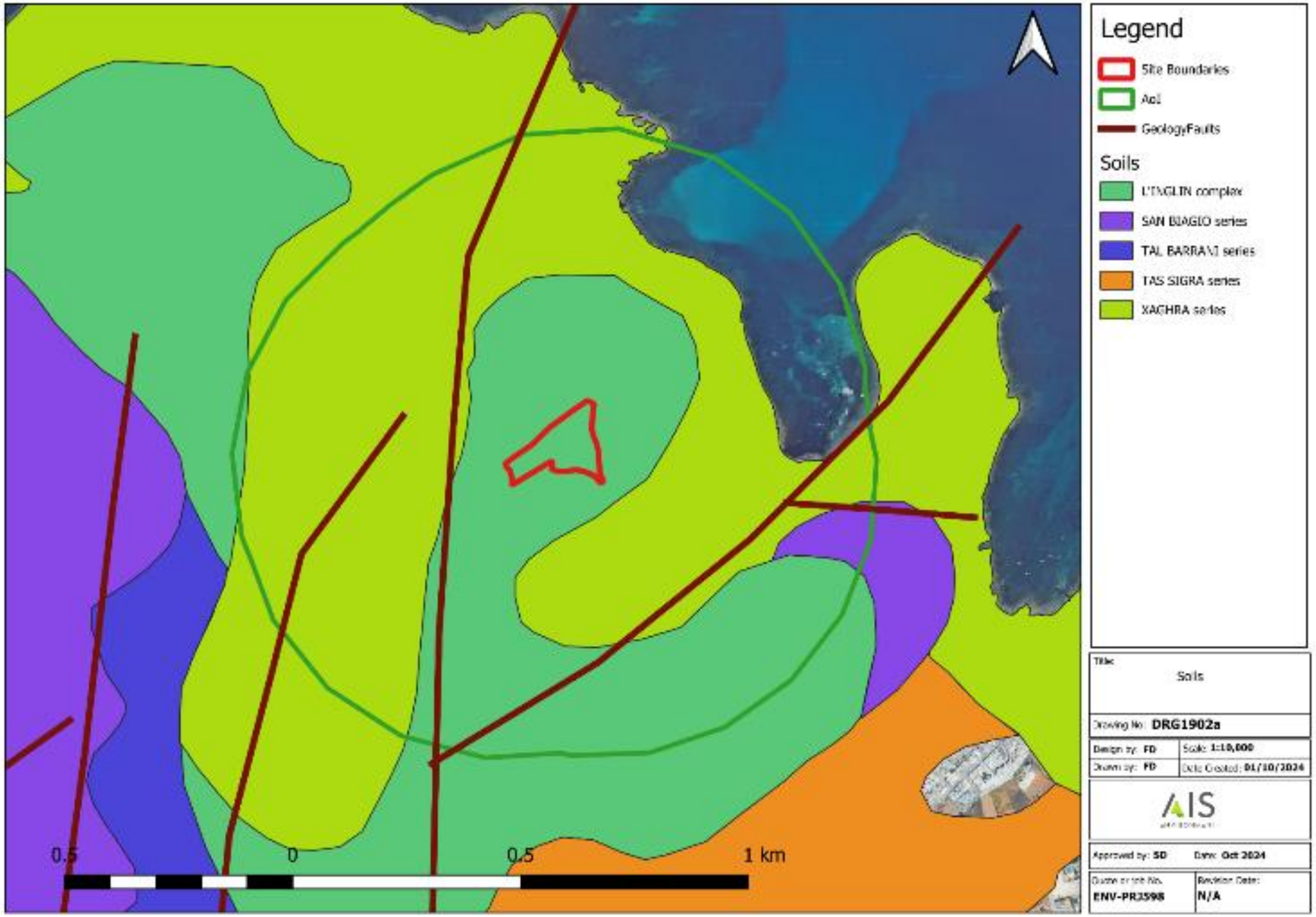

FIGURE 66: SOILS MAP

4.3.3 Geomorphological and Hydrological conditions

The Scheme is entirely encompassed by the water catchment basin of Wied ta' Kieli (Figure 67). Another watercourse is present within the AoI at the North of the site, namely Wied tal-Ghallis. Due to their limited aerial extent, neither of these catchment basins was included in the Preliminary Flood Risk Assessment (PFRA) or the Flood Hazard Maps and Flood Risk Management (FHRM) for the Malta River Basin District.

The topography of the site gently dips toward the Wied ta' Kieli watercourse, with an altitude ranging between 30 and 37 m above mean sea level (amsl). The highest elevations in the AoI, located to the West of the site, reach approximately 60 m amsl. This elevated terrain creates a watershed between two adjacent water catchment basins. Run-off is collected and directed through preferential stream paths, ultimately converging toward watercourses situated in the valleys with outlet to the sea. This topography is characteristic of the horst and graben structures that define the Northern region of Malta.

Rainfall precipitated on the hills or from the Scheme partly infiltrates underground, evaporates and another percentage generates run-off. Heavy rainfall is likely to generate intermittent surface water bodies in Wied ta' Kieli outflowing to Qalet Marku. Although specific historical data on flooding events in Wied ta' Kieli may not be extensively documented, the region's topography and hydrological conditions contribute to runoff that can lead to flash floods. The combination of steep slopes and urban development in the surrounding areas exacerbates the risk of flooding, as water is quickly funnelled into the watercourse. Climate change and urbanization highlights the increased vulnerability of this area to such natural events.

The outlet of Wied ta' Kieli corresponds to Qalet Marku where surface water is drained. The coastal area features flat limestone outcrops typical of the Eastern area of Malta. Qalet Marku is identified as a coastal unit limited by two cliffs at North and South. The intermittent surface water bodies generated during high precipitation events outflow into this coastal unit. In between these two outlets, a number of channels drain run-off throughout the coastline.

No natural freshwater resources are identified within the AoI. In fact, the groundwater qualitative status of freshwater-lens systems in areas near the coastline are highly saline due to seawater intrusion mechanisms and therefore not suitable for human or agricultural consumption. The only known source of groundwater is a public borehole located about 500m upstream from the site. The runoff or infiltration patterns generated from the site are unlikely to affect this borehole.

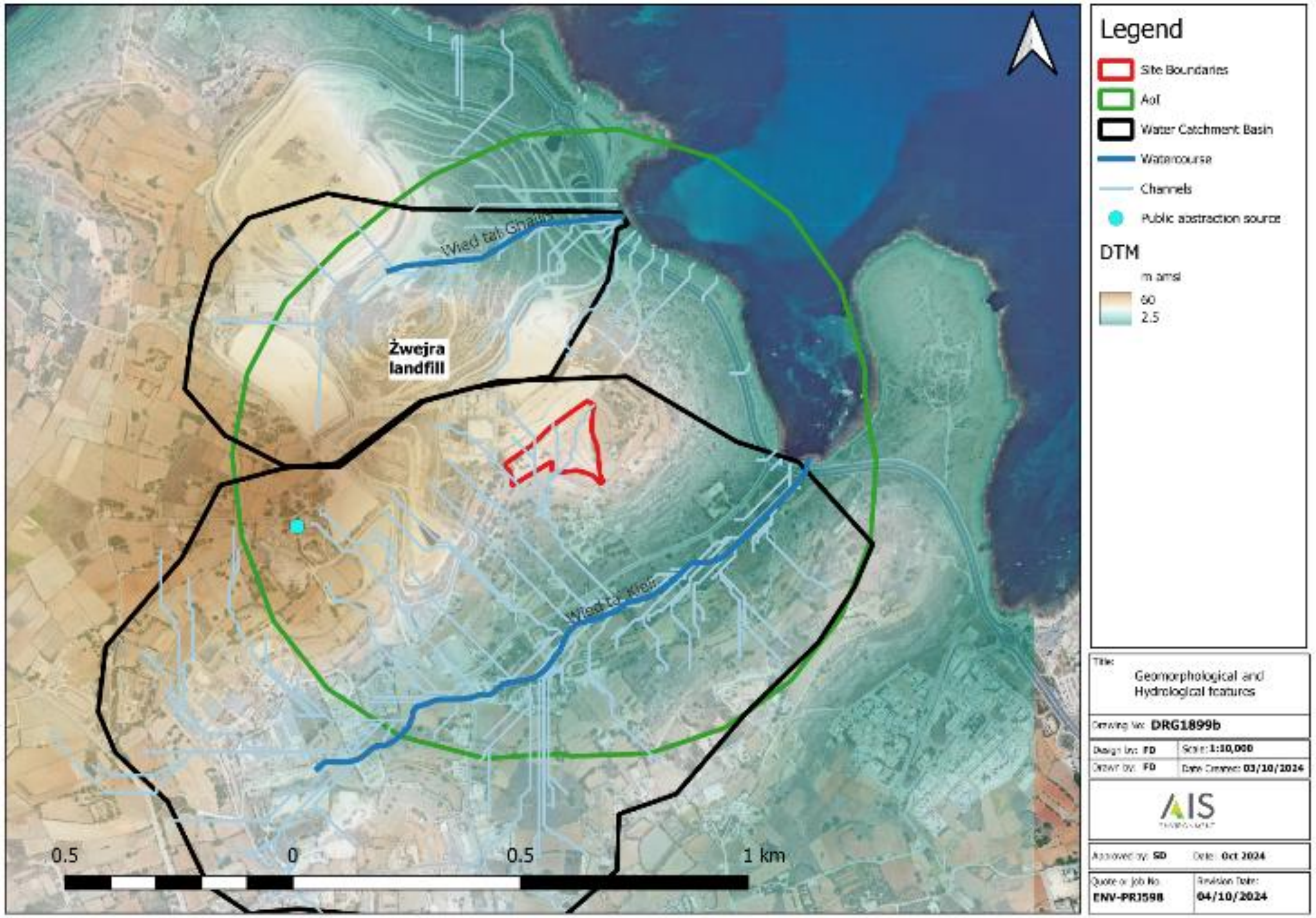

FIGURE 67: GEOMORPHOLOGICAL AND HYDROLOGICAL MAP

4.4 Water bodies

The Scheme is entirely encompassed by the water catchment basin of Wied ta' Kieli. Another watercourse is present within the AoI at the North of the site, namely Wied tal-Ghallis. Due to their limited aerial extent, neither of these catchment basins was included in the Preliminary Flood Risk Assessment (PFRA) or the Flood Hazard Maps and Flood Risk Management (FHRM) for the Malta River Basin District.

The topography of the site gently dips toward the Wied ta' Kieli watercourse, with an altitude ranging between 30 and 37m above mean sea level (amsl). The highest elevations in the AoI, located to the West of the site, reach approximately 60 m amsl. This elevated terrain creates a drainage divide between two adjacent water catchment basins. Runoff is collected and directed through preferential stream paths or channels, ultimately converging toward watercourses situated in the valleys with outlet to the sea. This topography is characteristic of the horst and graben structures that define the Northern region of Malta.

Rainfall precipitated on the hills or from the Scheme partly infiltrates underground, evaporates and another percentage generates runoff. Heavy rainfall is likely to generate intermittent surface water bodies in Wied ta' Kieli, outflowing to Qalet Marku. Although specific historical data on flooding events in Wied ta' Kieli may not be extensively documented, the region's topography and hydrological conditions contribute to runoff that can lead to flash floods. The combination of steep slopes and urban development in the surrounding areas exacerbates the risk of flooding, as water is quickly funnelled into the watercourse. Moreover, the impact of climate change in the Central Mediterranean region is expected to give rise to an increased prevalence of high intensity rain events in short timeframes, exacerbating the risk of flood events. Climate change and urbanization highlight the vulnerability of this area to such natural phenomena.

The outlet of Wied ta' Kieli corresponds to Qalet Marku where surface water is drained into the Mediterranean Sea. The coastal area features flat limestone outcrops typical of the Eastern area of Malta. Qalet Marku is identified as a coastal unit limited by two cliffs at North and South. The intermittent surface water bodies generated during high precipitation events outflow into this coastal unit. In between these two outlets, a number of channels drain run-off throughout the coastline.

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4.4.1 Hydrogeological conditions

The main geological formation bearing freshwater on the Maltese Island is the Lower Coralline Limestone (LCL). The LCL is a fissured and fractured formation with a porous matrix. In the LCL the main groundwater body is in equilibrium with brackish and seawater. If compared to the overlying Globigerina Limestone (GL) formation, LCL is more fissured and entails higher heterogeneity due to a different deposition environment. The only hydrogeological feature underlying the Scheme is the Malta Mean Sea Level Aquifer (MSLA). The MSLA is the main water body bearing freshwater on the island, relying on winter rainfall events to recharge its underground storage. This groundwater body functions as a freshwater-lens system, floating on higher salinity water both marginally and at depth, while its upper surface level is graded to the sea along the coast.

A numerical model of the MSLA groundwater flow[10] was developed through the LIFE16 IPE/MT/000008 project. Figure 68 indicates that the groundwater level heights around the Scheme are likely to range from 0.10 to 0.20m amsl. The hydraulic gradient generated by this difference in elevation forces groundwater to flow Northwest, opposing the surface water flow directed towards Wied Ta' Kieli. Due to its proximity to the coastline (approximately 500m), the qualitative status of the groundwater underlying the Scheme is likely to be brackish or salty. In fact, no groundwater abstraction sources are located downstream of the Scheme.

In accordance with the 3rd RIVER BASIN MANAGEMENT PLAN (RBMP) of the Maltese Islands, the Malta MSLA is characterized by poor quantitative and qualitative status. Nitrate and chloride pollution is sourced from excess use of fertilisers and nitrate, while over-pumping triggers groundwater height depletion and saltwater intrusion mechanisms. In order to achieve good status, mitigation measures are identified in the RBMPs. These measures include:

- Wastewater reuse in agriculture: wastewater treatment plants are designed to produce highly polished wastewater through Advanced Oxidation (AOPs) and Reverse Osmosis (RO) processes. The highly treated outflow, locally called New Water, can be reused in agriculture while taking over part of the groundwater demand.
- Managed Aquifer Recharge (MAR) techniques: freshwater can be injected underground to create a hydraulic barrier into aquifers which raises groundwater levels near the coast. New Water will be injected into the Pwales Valley aquifer system with the objective of flushing out nitrate pollution and creating a seawater intrusion barrier.

[10] Lotti et al., 2021, doi: 10.1007/s10040-021-02330-2 Accessed on 11/10/2024

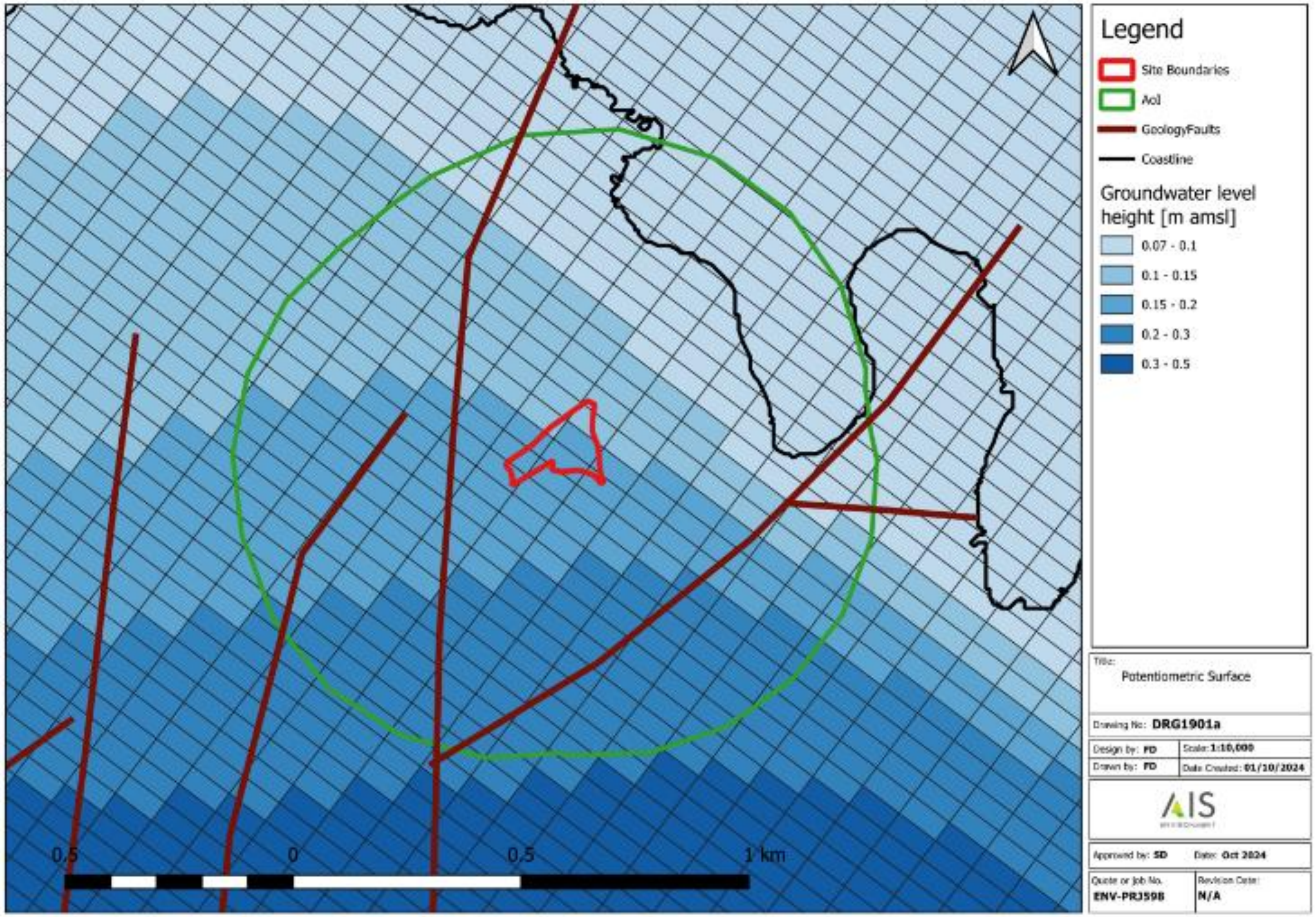

Figure 68: Mean Sea Level Aquifer (MSLA) hydraulic heads map

4.4.2 Protected Water Bodies within the AoI

Due to the topographical nature of drainage basins, valleys act as catchments for both water and sediment, generating nutrient-rich soils suitable for agriculture. The outlets of catchment basins are likely to give rise to wetlands rich in biomatter, contributing to the biodiversity of indigenous and endemic species.

At the discharge point of Wied ta' Kieli in Qalet Marku, there is a rectangular field which from the particularly profuse vegetation that covers this plot of land, it appears to form a transitional water body for some time during the rainy season. This intermittent wetland is locally called L-Għadira s-Safra (Figure 69).

L-Għadira s-Safra is a unique transitional coastal wetland supporting numerous rare organisms. It is particularly interesting since although primarily a saltmarsh it also supports animals normally found in freshwater. It is located between Qalet Marku and Għallis in Naxxar within a gently sloping rocky shore composed of Lower Coralline Limestone outcrops. It supports floral and faunal assemblages that are typical of freshwater habitats during the wet season. It is one of only two localities for the locally endangered prickle grass (*Crypsis aculeata*), and the only known locality for the rare and endangered liverwort (*Riella helicophylla*). The ponds represent small artificial circular catchments that fill with run-off water directed from an unsurfaced country road that also catches the runoff coming from the eastern slopes of the landfill (Figure 69).

ERA scheduled L-Għadira s-Safra as a *Level 1 Area of Ecological Importance* and Level 1 Site of Scientific Importance with an associated Level 3 buffer zone as per Government Notice No. 288/95 in the Government Gazette dated May 5, 1995.

FIGURE 69: PHOTOGRAPHS SHOWING PART OF THE WETLAND ALONG TRIQ IL-KOSTA AT THE DISCHARGE OF THE WATERCOURSE

4.4.3 Surface Vulnerability features

In order to identify the features that represent a threat to the sustainability of the water bodies described in the previous chapters, the degree to which Wied Ta' Kieli surface water body is connected to the Mean Sea Level Aquifer (MSLA) systems need to be considered.

Rainfall in a water catchment basin plays a crucial role in determining the hydrological dynamics of the area, including patterns of contaminants associated to the spillage on the ground of hazardous substances. Rainfall events can vary widely in intensity and duration. High-intensity, short-duration storms typical of summer seasons may lead to rapid surface runoff, while the low-intensity and prolonged rainfall events occurring during winter can enhance infiltration into the soil.

When rain falls on a catchment area, a portion infiltrates the soil, depending on factors such as soil type, moisture content, and vegetation cover, reaching the groundwater body. Excess rainfall that cannot infiltrate or evaporate contributes to surface runoff. This runoff flows over the land surface, collecting in streams and watercourses that eventually discharge into the sea. The speed of this runoff is influenced by topography; steep slopes tend to facilitate quicker movement toward water bodies. The hydraulic gradient created by elevation differences of water in different sections drives water toward lower areas, including coastal outlets.

The ability of rainfall to infiltrate into the ground is largely determined by soil characteristics. Conversely, impermeable surfaces, such as urban areas with concrete, lead to increased runoff and reduced infiltration. Infiltrated water contributes to groundwater recharge. This process provides a source of freshwater for human use. The presence of impermeable surfaces increases runoff volumes during rainfall events, reducing the amount of water that can infiltrate into the ground. This can lead to higher flood risks and negatively impact water quality as pollutants are washed into nearby water bodies.

In compliance with the WFD and GWD, each EU Member State is required to achieve and maintain a "good" qualitative status of groundwater bodies. However, the qualitative status of the MSLA is established to be affected by a poor status as assessed through the 3rd RBMP of the Maltese Islands. Contaminated runoff patterns flowing on the surface can find a quick way down to the underground through surface vulnerability features.

The vulnerability features identified within the AoI which represent a high connection from the surface to the groundwater body are shown in Figure 70 and listed below:

- **Geological faults:** can create pathways for water and contaminants to move rapidly from the surface into the groundwater. Faults disrupt the natural layers of soil and rock, allowing for increased permeability and direct connections between surface water and groundwater. This means that any pollutants on the surface can quickly infiltrate through these faults, posing a risk to groundwater quality.

- **Lower Coralline Limestone (LCL) outcrops:** due to its diagenetic conditions, the LCL formation results more fissured and fractured than the Globigerina Limestone (GL). When water flows, it can easily infiltrate through the LCL outcrops making this geological formation particularly vulnerable, as contaminants from surface runoff can easily percolate through these limestone formations into the groundwater.
- **Tributaries to Wied Ta' Kieli originated with the scheme:** channels that flow into watercourses like Wied ta' Kieli can serve as conduits for surface water to enter the groundwater system. If these tributaries are connected to areas where contaminants may be originated, there is a heightened risk of those contaminants reaching the groundwater with extended travel time.

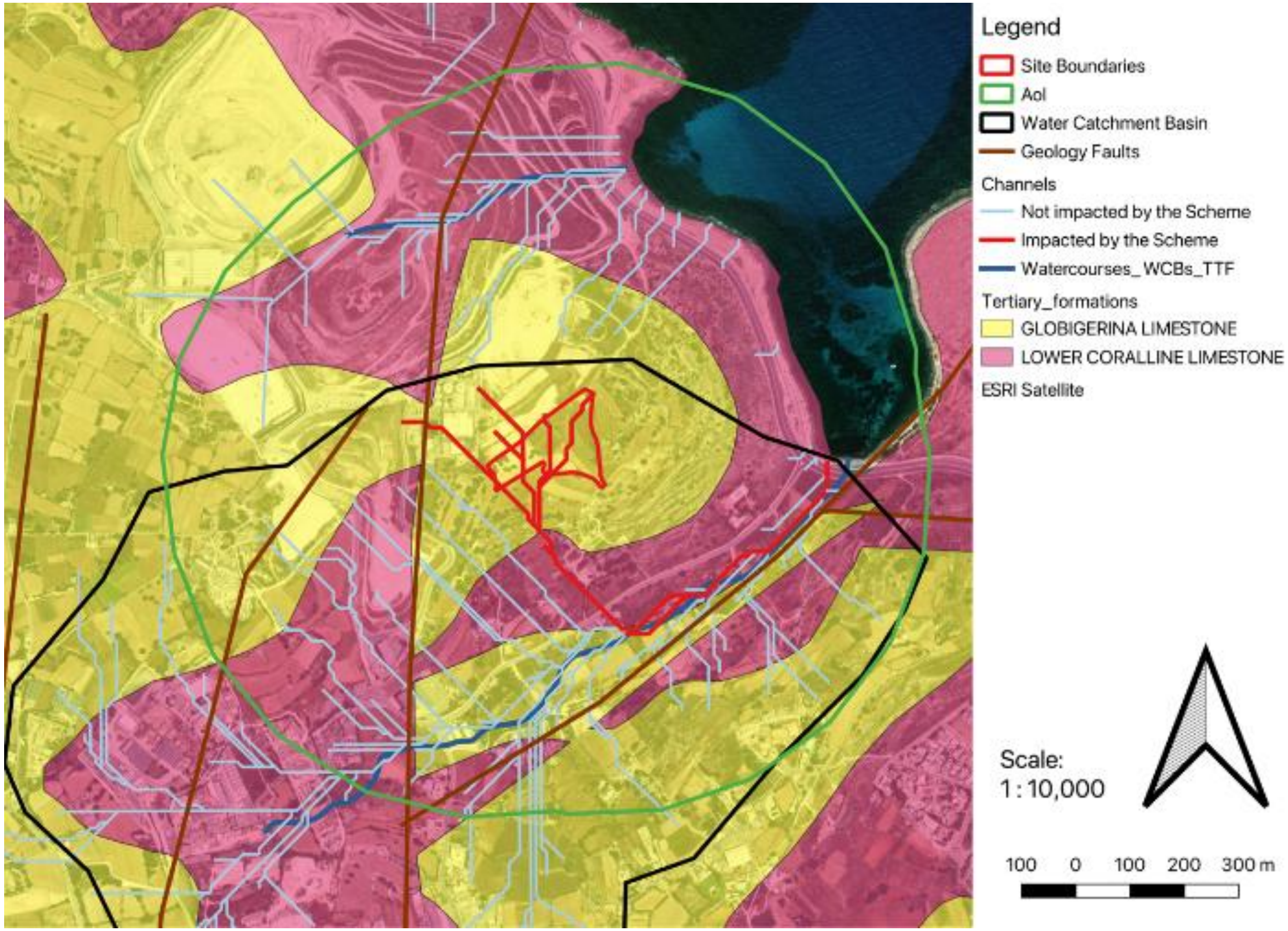

Figure 70: Vulnerability map of the proposed TTF. Runoff patterns impacted by the Scheme are highlighted in red

4.4.4 Runoff Rate Assessment

The water catchment basin of Wied Ta' Kieli encompasses a total area of about 1.4km^2. This catchment is characterized by a topographic gradient from Southwest to Northeast, while the watercourse (1.7km long) tilts in the same direction. The time of concentration of the basin is about 23 minutes. Currently, most of the catchment is rural (71%) while the 21% of the area is built-up. The remaining 8% is occupied by the landfill. This configuration corresponds to a CN value of 78. The cumulative impact of the development of the ECOHIVE Complex, including the proposed TTF will be analysed in the impact assessment chapter and is accounted for 5% of rural area.

In order to calculate the current runoff rate at the discharging outlet of Wied Ta' Kieli in Qalet Marku, the SCS-CN methodology was applied. Table 13 reports the flood discharge values at the outflow of the basin for return time periods of 5 years (high probability of occurrence), 50 years (medium probability) and 200 years (low probability). The return period value for a specific flood event is indicative given that flood events do not occur at fixed timeframes.

TABLE 13: DISCHARGING RATES OF WIED TA' KIELI CATCHMENT FOR DIFFERENT PROBABILITIES OF OCCURRENCE

Q(T = 5 YEARS)	Q(T = 50 YEARS)	Q(T = 200 YEARS)
3.45 m^3/s	13.82 m^3/s	21.62 m^3/s

4.5 ECOLOGY - TERRESTRIAL

The site currently comprises agricultural land cleared of its topsoil layer, dense patches of low-lying indigenous trees, scattered agricultural trees and remnants of local maquis/advanced garigue community.

The area surrounding the site is mostly rural in character, excluding the engineered landfills and waste management operations conducted by Wasteserv Malta. The ecological features nearest to the site area small pockets of afforested areas, coastal garigue and other natural communities reminiscent of garigue, steppe and degraded areas.

While the scheme site and buffer do not directly encroach any protected areas, several terrestrial and marine Natura 2000 sites are present within walking distance of the proposed development. The potential impacts on the habitats and species within these areas have been considered within the assessment.

Wasteserv Malta has commissioned an in-depth study carried out by a third-party consultant for a terrestrial ecology baseline study and impact assessment of a number of proposed developments within the ECOHIVE complex, including the Thermal Treatment Facility covered by this EIA but also for the proposal of an Organic Waste Processing Plant (OPP), Materials Recovery Facility (MRF), storage area and access road within the same complex. The full title is 'Terrestrial Ecology Baseline Study and

Impact Assessment in relation to the removal of soil in areas within the ECOHIVE Complex'.

The scope of the report was to assess whether the schemes will cause impacts on protected sites and natural ecosystems, habitats and species. The schemes' footprints as planned at the time of writing were presented within the report for all aforementioned proposals conjoined. The overall perceived impacts on the identified ecological receptors were discussed, mitigation measures proposed and residual impacts and compensatory measures stated within said report. The assessment addressed Terms of Reference for a terrestrial ecology baseline study and impact assessment (EIA) as put forward by the Environment and Resources Authority in July 2022.

The report identified a wide variety of flora and fauna recorded within the scheme site and/or observed passing through. The report concluded that impacts of the proposed schema are likely cumulative and will arise primarily from the loss of habitat and food availability for protected species during the construction phase, while during the operational phase, these impacts will persist and further impacts may arise through the illumination of the site and the surrounding area.

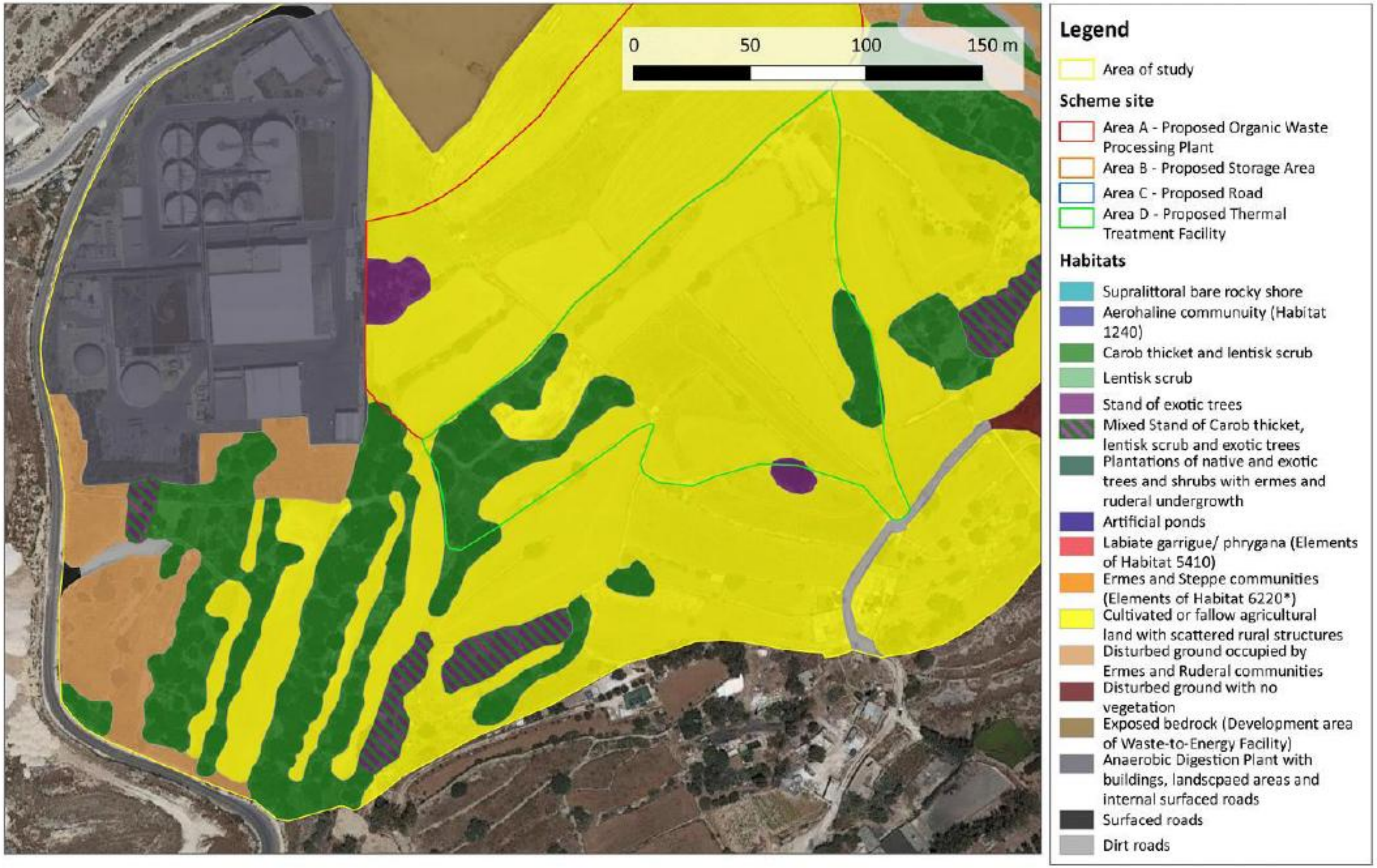

FIGURE 71: HABITAT MAP OF THE AOS – PROPOSED SCHEME SITE MARKED WITH GREEN BORDER (SOURCE: BASELINE AND IMPACT ASSESSMENT..., DOUBLET AND ZAMMIT, 2022)

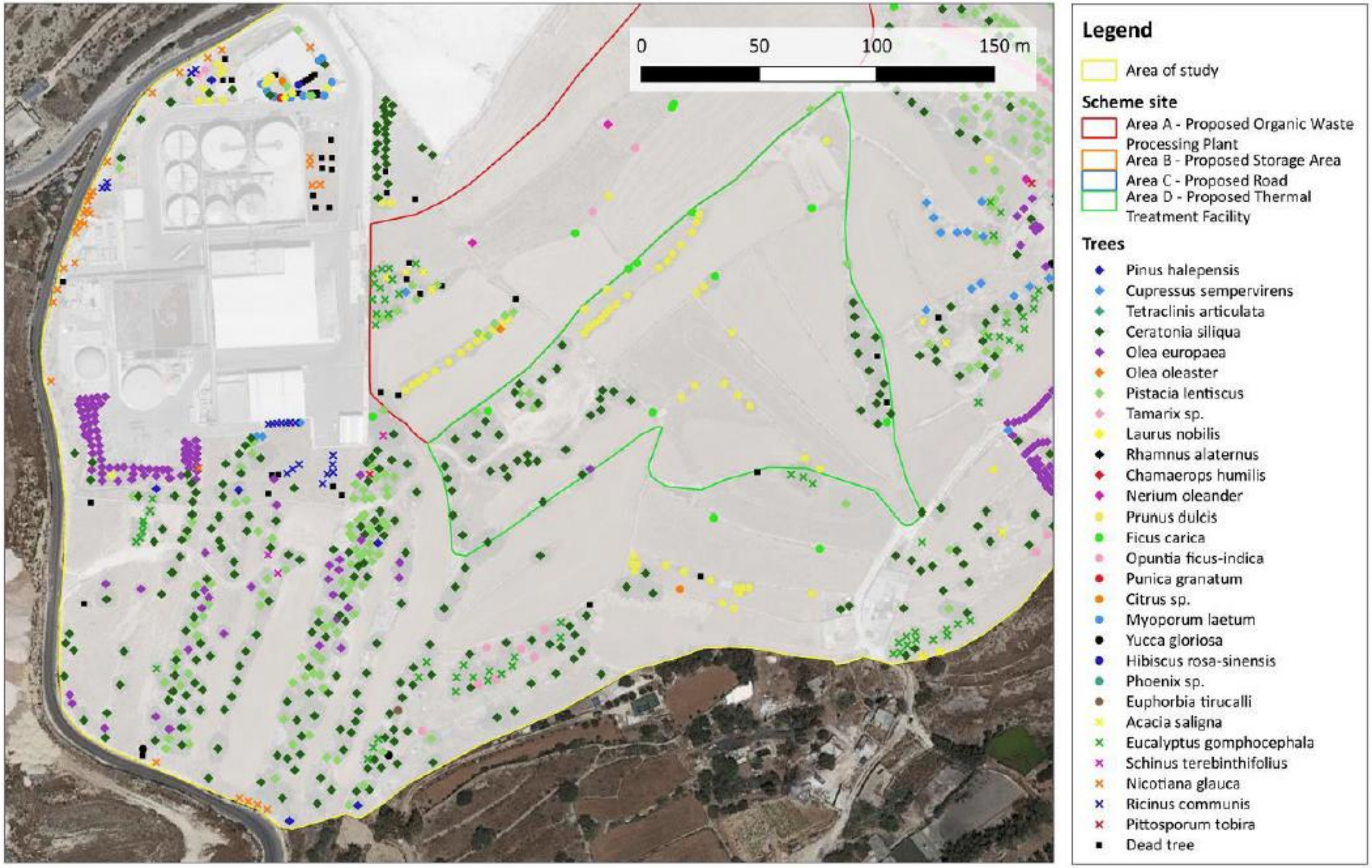

Figure 72: Trees in the AOS – Proposed scheme site marked with green border (Source: Baseline and impact assessment..., Doublet and Zammit, 2022

A broad-brush benthic (marine) habitat survey was carried out in relation to the Environmental Impact Assessment related to the then proposed Waste to Energy Facility, now approved within the ECOHIVE complex adjacent to the proposal covered by this EIA.

The study comprised an area of 275,000m^2, which was made up of a buffer of 100m flanking each side of the envisaged trajectory of the plant's cooling water system pipes. The benthic habitats surveyed were classified into nine assemblages using the EUNIS benthic habitat terminology, adapted for Maltese waters by Borg et al. (2013). One unique assemblage, characterised as "Low-density exposed bedrock outcrops colonised by turfing species interspersed with extensive unvegetated sandy seabed stretches," did not fit any EUNIS category. Benthic biocoenoses were grouped into 'complexes' based on their proximity within the surveyed area.

The shallowest areas (up to 3-4 meters deep) featured coralline limestone outcrops with turfing species and low growths of Phaeophyceae (e.g., *Padina pavonica*) and Chlorophyceae (e.g., *Acetabularia acetabulum*). These outcrops transitioned to flatter rocky platforms dominated by photophilic communities, particularly *Dictyopteris polypodioides* and *Stypocaulon scoparium*. Seaward of these communities, a narrow belt of *Posidonia oceanica* meadows was observed, leading to unvegetated infralittoral coarse sediment seabeds with occasional Chlorophyceae and *Rhodophyceae* species.

At depths greater than 15 meters, unvegetated sandy seabeds supported low- to medium-density *Cymodocea nodosa* meadows characterized by bioturbation features. The outer margins of the transects varied, with dense *Posidonia oceanica* meadows present at Transect 1 and reticulate meadows in the others.

The discharge and extraction points for two submarine pipelines were located within sandy seabeds featuring sparse *C. nodosa* meadows. The nearest *P. oceanica* meadows were approximately 30-40 meters from the pipeline infrastructure, with dense meadows located about 100 meters away.

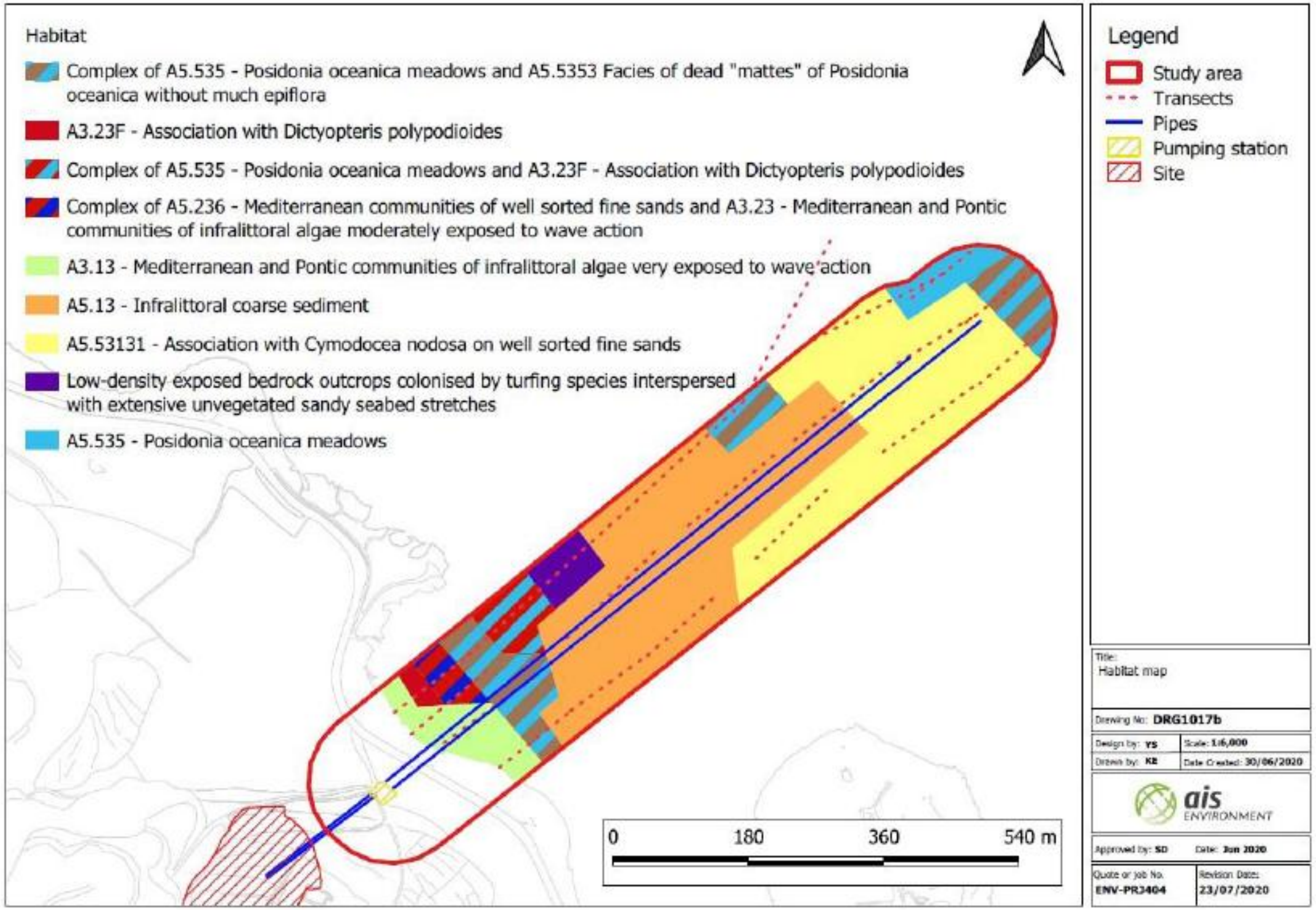

FIGURE 73: BENTHIC HABITAT MAP FOR THE SURVEYED AREA

A broad-brush terrestrial survey was also conducted within the AoI in July 2024. The main ecological components of the scheme site and surrounding AoI comprise of:

- soft landscaping around the existing bio-digester plant complex
- a considerable area of disturbed/excavated ground with sparse opportunistic plant species and dense pockets of native trees
- Bare fields bordered by agricultural tree species
- Small patches of alien/invasive tree species

Inside the ECOHIVE complex, the ecological landscape dynamics are considerably influenced by ongoing waste management operations.

The ECOHIVE complex is surrounded by soft landscaping which incorporates some notable tree species, including a predominance of *Olea europea* (Olive trees) and scattered Ceratonia siliqua (Carob trees). A number of opportunistic and/or invasive species have naturally colonised the spaces in between the native trees.

FIGURE 74: SOFT LANDSCAPING, PREDOMINANTLY OLIVE TREES AROUND THE EXISTING BIODIGESTER PLANT

Between the proposed site and the ECOHIVE complex lies a narrow plot of land which is currently dominated by invasive species such as *Arundo donax*.

FIGURE 75: NARROW STRIP OF LAND SURROUNDING THE EXISTING BIODIGESTER PLANT DOMINATED BY THE INVASIVE *ARUNDO DONAX*

The proposed site is comprised of a large area of severely degraded land. The area was excavated and cleared of any soil and remains predominantly void of vegetation cover. The native tree species were retained in small, dense pockets. The resulting landscape remains as an expanse of exposed bedrock, with scattered native tree pockets and bordered by agricultural tree species such as *Prunus dulcis* (Almond trees).

FIGURE 76: DEGRADED EXCAVATED LAND BORDERED BY ALMOND TREES

Figure 77: Bare land bordered by maquis community remnants including carob trees

Figure 78: Bare fields bordered by remnants of maquis communities including one olive tree

FIGURE 79: REMNANTS OF MAQUIS COMMUNITIES INCLUDED LENTISK SHRUBS

Several dead tree individuals were observed on site. These were potentially damaged during the excavation process and will be compensated in the proposed planting scheme or within a nearby location to be determined at a later stage.

FIGURE 80: SCATTERED PLANTS OF ST JOHN'S WORTH OBSERVED WITHIN THE EXCAVATED AREAS

The agricultural land within the AoI is encircled by low-lying rubble walls. Due to their historical and environmental importance, the conservation and maintenance of rubble walls is governed by LEGAL NOTICE 426 OF 2007 – RUBBLE WALLS AND RURAL STRUCTURES (CONSERVATION AND MANAGEMENT). Rubble walls contribute to soil retention against the effects of surface water runoff and provide shelter for small mammals, reptiles and invertebrates which use agricultural land as their habitat. The majority of the rubble walls observed within the buffer zone were quite degraded, with the exception of the boundary wall South of the existing biodigester plant.

FIGURE 81: RUBBLE WALLS WITHIN THE AOI (PHOTO TAKEN JULY 2024)

Vegetation species which were observed along rubble walls include *Ferula communis* (Common fennel), *Sonchus oleraceus* (Crown daisy), *Asparagus aphyllus* (Mediterranean Asparagus), one-offs of *Capparis orientalis* (Capers) as well as several monocot grasses such as *Piptatherum miliaceum* (Smilograss).

FIGURE 82: VEGETATION GROWING WITHIN DEGRADED RUBBLE WALLS AND RUBBLE STRUCTURES (PHOTO TAKEN JULY 2024)

The AoI outside of the site boundary particularly to the East – South-East of the site comprises fallow fields bordered by trees typical of agriculture, primarily Almond trees and in some cases stands of the alien Eucalyptus tree. The fallow fields were observed as bare in the summer months, appearing to be previously used for the cultivation of wheat which had likely been cut down following the winter months. Regrowth of native plant species was nearly non-existent in these areas.

FIGURE 83: AGRICULTURAL TREE SPECIES BORDERING BARE FIELDS AND EXCAVATED AREA (PHOTO TAKEN JULY 2024)

A list of floral species encountered during the broad-brush survey within the AoI is provided in the Ecology Technical Studies. The protected tree species found directly within the site footprint are listed in Table 14.

TABLE 14: PROTECTED TREE SPECIES WITHIN THE SITE FOOTPRINT

SPECIES NAME	ENGLISH NAME	PROTECTION	TYPICAL HABITAT IN AOI	RECORDED AMOUNT
Capparis orientalis	Caper bush	Schedule VIII of S.L. 549.44	Soft landscaped areas and excavated area	Scattered individuals
Ceratonia siliqua	Carob tree	Schedule I Part A Table 2 S.L.549.123	Excavated area	45 (of which 5 are dead)

Species Name	English Name	Protection	Typical habitat in AoI	Recorded amount
Olea europaea	Olive tree	Schedule I Part A Table 2 S.L. 549.123	Excavated area	1
Pistacia lentiscus	Lentisk tree	Schedule I Part A Table 2 S.L. 549.123	Maquis	4
Total protected trees directly affected by the proposed development				50

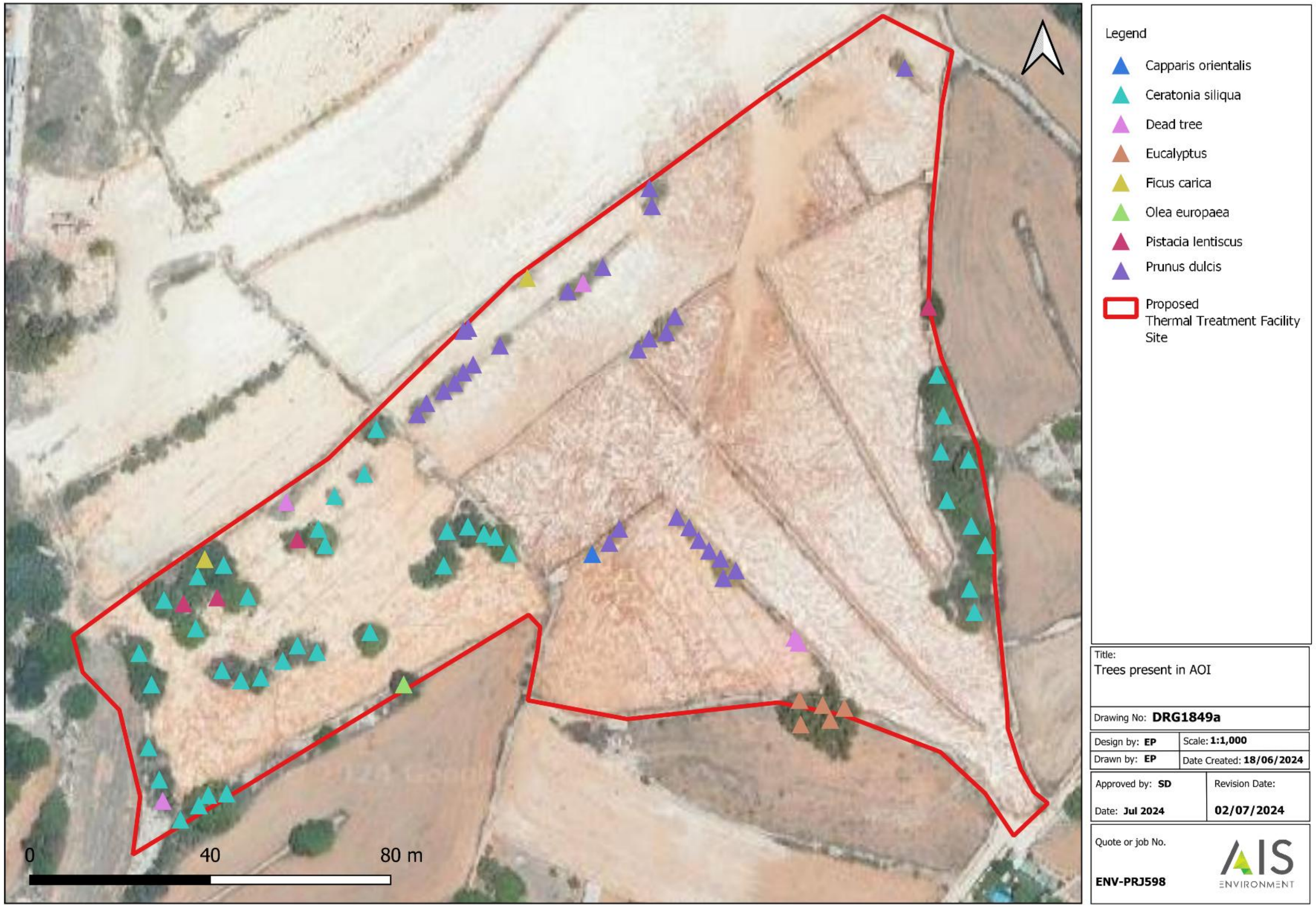

Figure 84: Trees and shrubs present within the site footprint (Site survey held July 2024)

No fauna species were observed during the survey; however, the habitat likely supports a variety of mammalian, reptile and insect species. Previous studies[11] with a seasonal sampling frequency recorded the presence of the following species: the Algerian Hedgehog (*Atelerix algirus*), the Western whip snake (*Coluber viridflaviorus)*, the Leopard snake (*Elaphe situla)*, the Moorish wall gecko (*Tarentola mauritanica)* and the Oscillated skink (*Chalcides ocellatus)* among others.

The presence of bats cannot be excluded from this area, as old dilapidated farmland buildings in the vicinity of the AoI can provide attractive roosting sites, and the maquis and agricultural land may offer foraging opportunities. No roosts are documented publicly within the AoI at the time of writing, however previous studies[11] recorded the presence of four species using the general area as feeding or commuting grounds.

4.6 ECOLOGY - AVIFAUNA

Five bird species have been reported breeding within the AoI-1 or its direct vicinity according to the Malta Breeding Bird Atlases of 2008[12] and 2018[13], considering the breeding seasons 2008, 2017 and 2018. None are listed under Annex I of the EU Birds Directive and none have an unfavourable conservation status in Malta, the EU, or globally. None of the five species hold significant breeding populations in the AoI-1, and none are specifically sensitive to infrastructure such as the planned development, aside from the effects of habitat loss. Three of the five species regularly choose anthropogenic structures as nest sites.

[11] Terrestrial Ecology Baseline Study and Impact Assessment by Mr Doublet and Mr Zammit (2022)

[12] *Raine, A., Sultana, J., and Gillings, S. (2009) Malta Breeding Bird Atlas 2008. Malta: BirdLife Malta*

[13] *Epsilon Malta Ltd, Nature Conservation Consultants (2019). Malta Breeding Bird Atlas 2018. Malta: Wild Birds Regulation Unit, Ministry for the Environment, Sustainable Development and climate Change*

TABLE 1: LIST OF BREEDING BIRD SPECIES IN THE AOI-1 AND THEIR STATUS

SPECIES	BREEDING STATUS IN AOI-1	ABUNDANCE STATUS	TREND IN MALTA	TREND IN EUROPE	CONSER-VATION STATUS	ANNEX I (EU BIRDS DIRECTIVE)
Common Swift *A. apus*	Probable	Scarce	Increasing	Stable	Least Concern	No
Blue Rock Thrush *Monticola solitarius*	Possible	Frequent	Stable	Unknown	Least Concern	No
Sardinian Warbler *Curruca melanocephala*	Probable	Common	Decreasing	Stable	Least Concern	No
Zitting Cisticola *C. juncidis*	Probable	Abundant	Stable	Increasing	Least Concern	No
Spanish Sparrow *Passer hispaniolensis*	Confirmed	Abundant	Stable	Decreasing	Least Concern	No

Three pelagic seabird species from the order Procellariiformes – the Yelkouan Shearwater *Puffinus yelkouan*, Scopoli's Shearwater *Calonectris diomedea*, and Mediterranean Storm-petrel *Hydrobates pelagicus melitensis* – nest on the Maltese Islands and inhabit Maltese waters in significant population numbers from a global and European population perspective. All three species are listed in Annex I of the EU Birds Directive. One of them, the Yelkouan Shearwater, is listed as Vulnerable on the IUCN's Redlist. In addition to these, Malta hosts a breeding population of Yellow-legged Gulls *Larus michahellis*, not listed in Annex I of the EU Birds Directive. The designation of the marine SPA Żona fil-baħar madwar Għawdex (MT0000112), partially overlapping with the AoI-2, was triggered by two of the above-mentioned species: The Yelkouan Shearwater and the Scopoli's Shearwater.

Scopoli's Shearwater *Calonectris diomedea – Least Concern, Annex I*

The Scopoli's Shearwater is currently listed as Least Concern by the IUCN. It is listed under Annex I of the EU-Birds Directive. The species is endemic (breeding) to the Mediterranean basin, with major colonies in the Central Mediterranean. The global population size was last estimated in 2013 at 28500 – 446000 mature individuals equating to 142478 – 222886 breeding pairs, showing a decreasing trend. For the Maltese islands, the total population estimate in 2018 was 2670 – 3605 breeding pairs according to Malta's second assessment report for the MSFD, roughly equating to around 1.6 – 1.9 % of the global breeding population. Previous figures reported in 2013 had estimated the total Maltese population to be 3046 – 3962 breeding pairs. The available data suggests a decreasing population trend. Birds only approach land to breed, entering and leaving the colonies under the cover of darkness. Adults in and near the colonies and fledglings are sensitive to light pollution[14]. The closest breeding colony to the proposed development is Irdum tal-Madonna (SPA MT0000009) – this is not expected to be impacted directly by noise and sound pollution from the development.

The Scopoli's Shearwater inhabits Maltese waters from February to November, with the highest activity at and in front of the colonies mainly from March to October. The species is strictly pelagic, foraging frequently together in large numbers on shoaling fish and squid by plunge-diving and pursue-diving, up to 15m deep. During the breeding period, Scopoli's Shearwaters congregate in large flocks, sitting on the water's surface exhibiting 'rafting' behaviour within a 4 km radius in front of the colonies in the evenings[15], as described by Sultana et al. 2011. GPS-tracking of individuals from Maltese colonies during the chick-rearing period (July - October) shows that Scopoli's Shearwaters utilise at-sea areas relatively close to shore, also within the AoI-2. The partially coastal distribution of foraging Scopoli's Shearwaters has furthermore been confirmed by shore- and boat-based counts. Up to 7300 individuals of the species make regular use of the SPA MT0000112, Żona fil-Baħar madwar Għawdex during the reproductive season as foraging ground and rafting areas in front the colonies. Frequent passage occurs through the SPA by birds commuting between breeding grounds and foraging areas. While Scopoli's Shearwaters have not been reported breeding inside the AoI-2, they make regular use of the marine part of the AoI-2.

Yelkouan Shearwater *Puffinus yelkouan – Vulnerable, Annex I*

The IUCN lists the Yelkouan Shearwater as Vulnerable. It is furthermore listed under Annex I of the EU-Birds Directive. The Yelkouan Shearwater is endemic to the

[14] *Rodríguez et al. (2017). Seabird mortality induced by land-based artificial lights. Conservation Biology, 31(5), 986-1001.*

Crymble et al. (2020): Identifying light-induced grounding hotspots for Maltese seabirds. Il-Merill 34, 23-43.

[15] *BirdLife International (2010). Marine Important Bird Areas toolkit: standardised techniques for identifying priority sites for the conservation of seabirds at sea. BirdLife International, Cambridge UK. Version 1.2: February 2011.*

Mediterranean basin. The global population size, estimated in 2011, is 15337 – 30519 pairs, roughly equating to 46000 – 92000 individuals, although the quality of this estimate is moderate due to data gaps. According to the IUCN the global population trend is decreasing. The latest total population estimates of Yelkouan Shearwaters for the Maltese Islands (2016 - 2018) is 1795 – 2635 breeding pairs, roughly equating to 10 % of the global breeding population. While previous figures reported in 2013 in the initial MSFD report suggest a short-term increase for Maltese population, the report stresses the fact that the apparent short-term increase of the Maltese Yelkouan Shearwater population is rather a result of intense research in recent years with the result of higher monitoring capacity rather than an actual increase in population numbers[16]. The long-term trend indicates a stable population. By-catch is likely to be responsible for low adult survival rates[17] as shown for Maltese Yelkouan Shearwaters. Birds only approach land to breed, entering and leaving the colonies under cover of darkness. Adults and fledglings are sensitive to light pollution[18]. The largest Yelkouan Shearwater colony in Malta is situated at Irdum tal-Madonna (MT0000009), well outside the AoI-2. The colony closest to the planned development is situated on Selmunett (MT0000022), within the 5 km radius of the AoI-2. This colony is currently estimated at 45 to 70 breeding pairs.

The Yelkouan Shearwater inhabits Maltese waters, including the SPA MT0000112. It can be found in the colonies from October to July. Outside the breeding season, the birds disperse more widely across the Central Mediterranean and a significant part of the population migrates East to the Aegean and into the Black Sea[19]. Yelkouan Shearwaters are strictly pelagic, foraging frequently together in flocks of shoaling fish and squid mainly by pursuit-diving, up to 50m deep. Like Scopoli's Shearwaters, Yelkouan Shearwaters congregate in flocks exhibiting rafting behaviour within a 7 km radius in front of the colonies in the evenings, according to GPS-tracking data. The individual rafts tend to be further out at sea than those of the Scopoli's Shearwaters and made up of fewer individuals.

GPS-tracking of individuals during chick-rearing from the two main Maltese colonies (2012 - 2014)[20] suggests that Yelkouan Shearwaters forage predominantly in waters

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[16] *Maltese Environment and Resources Authority - ERA (2020): Update of Articles 8, 9 and 10 of the Marine Strategy Framework Directive (2008/56/EC) in Malta's Marine Waters. Second Assessment Report, pp.321-344.*

[17] *Oppel et al. (2011): Is the Yelkouan shearwater Puffinus yelkouan threatened by low adult survival probabilities? Biological Conservation, 144(9), 2255-2263.*

[18] *Crymble et al. (2020): Identifying light-induced grounding hotspots for Maltese seabirds. Il-Merill 34, 23-43.*

[19] *Raine, A. F., Borg, J. J., Raine, H., & Phillips, R. A. (2013): Migration strategies of the Yelkouan Shearwater Puffinus yelkouan. Journal of Ornithology, 154(2), 411-422.*

[20] *Metzger, B., Oppel, S., Carroll, M., Meirinho, A., Dias, M. P., Barbara, N., & Lago, P. (2015). Malta Marine IBA Inventory Report. https://birdlifemalta.org/wp-content/uploads/2018/03/LIFE10NATMT090-MSP-A8_mIBA_Report_final.pdf*

further offshore and partially outside Maltese waters. Like other shearwater species, Yelkouan Shearwaters avoid crossing over land. The Yelkouan Shearwater is one of the trigger species for the designation of the marine SPA at hand (MT0000112). 3270 - 4650 individuals of the species make regular use of this SPA during the reproductive season as foraging ground and rafting areas in front of the colonies. Frequent passage occurs through the SPA by birds commuting between breeding grounds and foraging areas. To summarise, Yelkouan Shearwaters are breeding inside the AoI-2, are expected to be passing through the marine part of this area regularly and can be expected to also forage and rest/ raft there.

Mediterranean Storm-petrel *Hydrobates pelagicus melitensis – Least Concern, Annex I*

The Mediterranean Storm-petrel *Hydrobates pelagicus melitensis* is a Mediterranean subspecies, clearly separated both genetically[21] and morphologically[22] from the Atlantic breeding population of the European Storm-petrel. Neither IUCN/BirdLife International nor the EU-Birds Directive has assessed this taxonomic unit separately. The IUCN lists the species overall as Least Concern. It is listed under Annex I of the EU-Birds Directive. The Mediterranean subspecies *H. pelagicus melitensis* is endemic to the Mediterranean basin and therefore has a relatively restricted distribution range. The global estimated population size of the entire species is 430000 – 519999 mature individuals. However, the data quality is poor (estimated in 2015). The most recent population size estimates for the Mediterranean sub-species are 8500 – 15200 pairs, roughly 2 – 3 % of the global population. While the global population trend is unknown, the population trend of Mediterranean sub-species is decreasing according to EU Birds Directive. The closest breeding colony to the proposed development is Irdum tal-Madonna (MT0000009) – this is not expected to be impacted by noise and light pollution from the planned development.

This most recent population assessment through capture mark recapture led to an overall population size estimate of 8575 breeding pairs, around 7 % of the estimated global population of the species and at least 56 % of the entire population of the Mediterranean subspecies. The short-term trend (2008 - 2018) and the long-term trend (1980 - 2018) for the Maltese population (2008 - 2018) are both reported to be stable[23].

The species is found in the Maltese FMZ year-round and in the colonies from February to October. It is by far more commonly seen in Maltese waters during the

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[21] *Cagnon et al. (2004): Phylogeographic differentiation of storm petrels (Hydrobates pelagicus) based on cytochrome b mitochondrial DNA variation. Marine Biol. 145(6): 1257–1264.*

[22] *Lalanne et al. (2001): Morphological differentation between European Storm-petrel subspecies: new results regarding two Mediterranean populations. Alauda 69(4): 475–482.*

[23] *Maltese Environment and Resources Authority - ERA (2020): Update of Articles 8, 9 and 10 of the Marine Strategy Framework Directive (2008/56/EC) in Malta's Marine Waters. Second Assessment Report, pp.321-344.*

breeding season, and more frequently and in higher numbers southeast and south of Malta. Adults and fledglings are sensitive to light pollution[24].

The 70 % KDE of seven Storm-petrels from the Filfla colony GLS-tracked during the breeding season indicate that the birds make use of the entire Maltese FMZ, but also of areas further offshore between Malta and Libya.

Despite not being a trigger species for the designation of the marine SPA MT0000112, Storm-petrels are commonly making use of this area year-round, and more so during the breeding season. During the day, the species is mainly found far offshore, but especially with high wind velocities directed towards the shore, birds can be observed passing relatively close to the coast. Furthermore, Storm-petrels are known to forage close to coast during the night[25]. While Storm-petrels have been observed in the AoI-2, foraging in and travelling through MT0000112 and prospecting potential breeding sites on Selmunett (MT0000022) at night (B. Metzger, pers. observations), they have not been confirmed breeding inside the AoI-2.

Yellow-legged Gull *Larus michahellis – Least Concern*

The IUCN lists the Yellow-legged Gull as Least Concern with an increasing population trend. The Global population numbers are unknown. The European population is estimated at 409000 – 534000 pairs equating to 819000 - 1070000 mature individuals, with an increasing trend. The latest assessment of the Maltese YLG population for Malta's Article 12 reporting to the EU[26] lists 250 breeding pairs for the Maltese islands with an increasing trend. The largest colony, approximately 202 ± 24 apparently occupied nests (5-year mean) is located on Filfla. Similar numbers have been reported from Filfla before. Smaller colonies at Ta' Ċenċ, Dingli and Wardija might have expanded in the last years and the species has established new breeding locations such as Comino, Għarb and Selmunett (MT0000022) recently[27].

Western to Central Mediterranean populations are mainly sedentary and dispersive but some populations are partially migratory. In the Maltese Islands a large number of non-breeders are present year-round. Ring recoveries show that birds ringed on Filfla as chicks utilise other locations in Malta and abroad, mainly Sicily and Southern Italy[28]. Yellow-legged Gulls are highly opportunistic feeders and benefit from human activities, such as fishing, discard from fisheries and other vessels, food-waste,

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[24] *Crymble et al. (2020): Identifying light-induced grounding hotspots for Maltese seabirds. Il-Merill 34, 23-43.*

[25] *D'Elbee, J. & Hemery, G. (1998) Diet and foraging behaviour of the British Storm Petrel* Hydrobates pelagicus *in the Bay of Biscay during summer. Ardea 86:1-10*

[26] *https://circabc.europa.eu/sd/a/4e807e1b-8aa1-4ede-ac48-a13cdd32889f/MT_A12NatSum_20141031.pdf*

[27] *Crymble et al. (2020): New breeding sites of Yellow-legged Gull around the Maltese Islands. Il-Merill 34, 72-80.*

[28] *Sultana et al. (2011): The Breeding Birds of Malta. Birdlife Malta. Malta.*

landfills, aquaculture and agriculture. In the Maltese islands, they occur in their highest densities and largest abundances in the harbour areas, around the largest colony (Filfla), around areas with large aquaculture facilities, especially tuna pens such as in the vicinity of St Paul's Island and the wider area off Selmun. Large numbers can be observed circling in/above the AoI-1. In the AoI-2 up to a couple of thousands can be observed feeding at the Magħtab landfill. Large numbers regularly make use of the adjacent land and sea areas in the AoI-2 for feeding, resting, roosting, preening etc. including the SACs MT0000002 (L-inħawi ta' Pembroke), MT0000007 (Is-Salini), MT0000008 (L-Għadira s-Safra u l-Iskoll tal-Għallis), MT0000022 (Il-Gżejjer ta' San Pawl - Selmunett) and the SPA MT0000112 (Żona fil-Baħar ta' madwar Għawdex).

4.7 AGRICULTURAL LAND

The area where the proposed works will be carried out consists of a series of seven terraced fields adjoining each other. Stubble present on the soil surface indicates that most of the land was used for cultivating cereals. In a few locations almond trees, *Prunus dulcis*, were present alongside the rubble walls to act as windbreaks. A handful of vines was present on a rubble wall. There are no signs of irrigation. The western stretch of land primarily consists of a maquis habitat dominated by low wind-swept carob trees, *Ceratonia silqua*. Close to the east is the garigue area along the coast road, while the Maghtab landfill complex is to the west.

FIGURE 85: OVERVIEW OF THE SITE PROPOSED FOR DEVELOPMENT (SOURCE: GOOGLE EARTH)

FIGURE 86: SOIL PROFILE OF FIELDS CLOSEST TO THE OPP SEASHORE (LEFT) AND ADJOINING SECOND FIELD (RIGHT)

FIGURE 87: SOIL PROFILE OF ADJACENT LOWER FIELDS GETTING SHALLOWER IN DEPTH

Figure 88: Vines and almonds on field borders

Figure 89: Deeping soil profiles on the easternmost fields

FIGURE 90: INCREASING ROCKS AND STONES IN SHALLOWER SOIL CLOSE TO GARIGUE AND CAROB AREA

FIGURE 91: CAROBS WITH HEIGHT CONTROLLED BY WIND

The majority of the fields have a very compact shallow topsoil with a depth ranging from a few centimetres to a maximum of 45 cm - with a 30 cm average depth. Given that these are sloped fields, there is a tendency for deeper soils towards the east. The subsoil is stonier and rockier in the shallower areas, though eastwardly, it was up to 120 cm deep. The shallow topsoil and compact subsoil, some of which are very stony, do not facilitate root access and would require rotavating before seeding. This arable land's dry and compact nature limits returns, particularly when prone to sea spray and when rainfall can be insufficient. The low wind-swept carob trees also indicate that wind is an influencing factor. Given the unavailability of water, the area may primarily be used for cereal cultivation for fodder production. In the best scenario, the probability is that this land will remain marginally productive. The fields envisaged for development are typically marginal due to poor soil properties. Most fields showed traces of cereal stalks, except for the carob garigue stretch, indicating the practice of wheat cultivation.

The locality under study is an agricultural fringe caught between the landfill complex and the coastline garigue. Most of the fields in the study area are terraced, not irrigated, and support one dry crop. Dryland cultivation is mainly typical of this area and the limited depth of soil in some areas makes production very marginal. The attribute of minimal soil cover, together with the influence of sea spray limits cultivation practices.

FIGURE 92: AREA IN 1998 (SOURCE: HTTP://GEOSERVER.PA.ORG.MT/PUBLICGEOSERVER)

FIGURE 93: AREA IN 2018 (SOURCE: HTTP://GEOSERVER.PA.ORG.MT/PUBLICGEOSERVER)

The time series area photos confirm that, for the agricultural area under study, the pattern of agricultural practices consistently practised was that of dryland agriculture. This indicates that in the areas under study, the agriculture practised is that for more marginal dry land areas as the soil typology, climatic regime and lack of stored rainfall allow only one crop per year, namely cereals, very often wheat, sown in October/November and harvested dry, latest in May. The limiting soil factor, in conjunction with prevailing cultivation techniques, together with the lack of crop rotation, and even much more limited fertilizer inputs would indicate a minimal crop yield. The climate change trend for an increasing number of consecutive dry days and associated drought conditions will further contribute to a negligible yield.

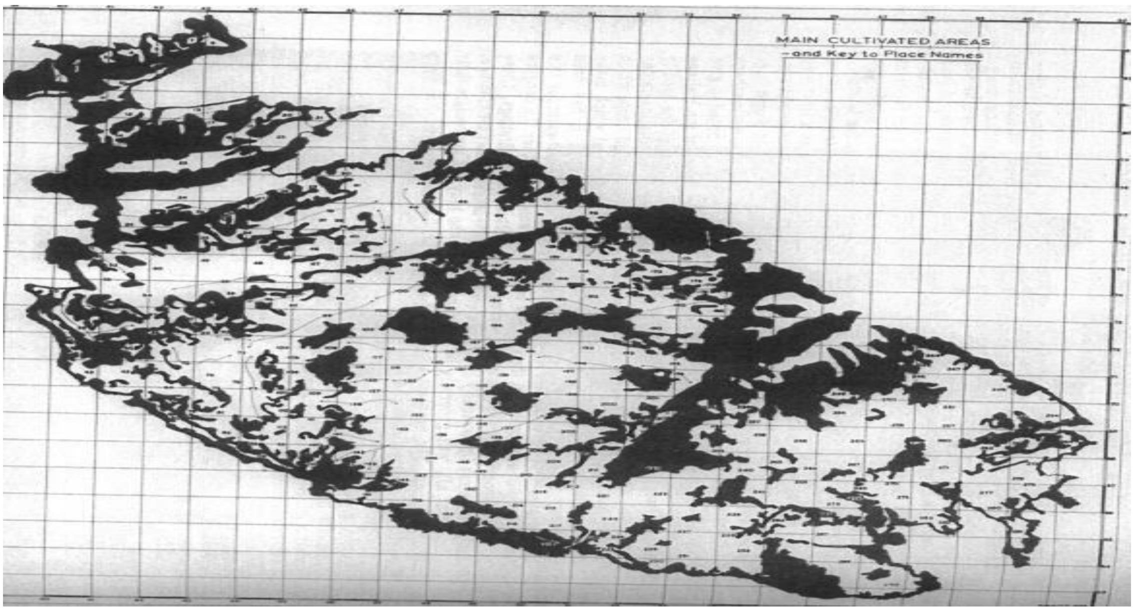


FIGURE 94: BOWEN-JONES 1961 MALTA'S MAIN CULTIVATED AREAS

The locality under study was considered a cultivated area with cereals and was probably tilled and not left fallow, according to historical findings published Bowen-Jones in 1961. This publication also suggests that no vegetables, no viticulture and no fruit trees were grown in this area. The locality could have bordered on wasteland.

Reference to Bowen-Jones et al. (1961) indicates that, in the area under study, agriculture was, and still is, primarily governed by the prevalent lack of a water regime. Without irrigation, the prevailing soils may only support cereal production in a year with adequate rainfall, and there is no evidence that vegetables or fruit trees were grown here. The added closeness to the sea even makes the success of dry land cereal crop yield more questionable. Bowen-Jones et al. further indicate, concerning the Għallis region, that the distribution of wasteland corresponded to the surface exposure of Lower Coralline rocks and the degree of exposure to northerly winds was the second factor controlling agriculture, however the less exposed inland depression at Magħtab facilitated a better farming pattern.

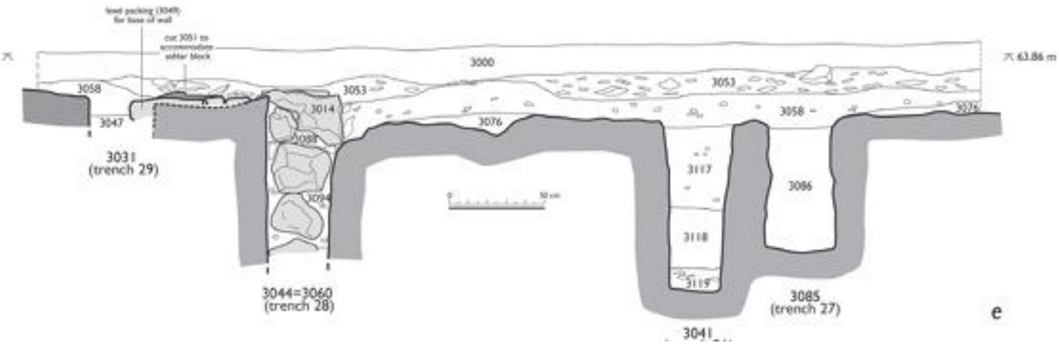
The absolute lack of water, combined with the occurrence of winds for over 90% of the year, plus the prevailing hours of sunshine create a marked evapotranspiration factor. When considered in conjunction with available soil type this does not leave much of a choice for crops. The growing of cereals, primarily wheat and barley, has possibly been one of the few available options to eke out anything from this environment. This is not always successful given that the growth of cereals requires adequate follow-up rainfall to cater to the 'break of season' water requirement. Changing precipitation, temperature, and evapotranspiration are likely to have the largest impacts on crop production in locations that are already subject to heat and drought stresses, thus the area under study is typical of a dryland agricultural system continuously subject to climatic and economic uncertainty.

Evaluation of the surrounding fields of the area shows that fields with adequate soil depth are cultivated, while shallower ones are abandoned. Cassar & Lanfranco, 2003 observed that long-derelict agricultural areas at Maghtab were characterised by topsoil that was generally shallow and discontinuous. It was also noted that the refuge and structural diversity provided by the Carobs and sub-dominants generated a microclimate that varied substantially from the surrounding habitat. The carob trees further indicate the effect of northerly winds - in that they are lower on the northern side and more profuse southward. The size of the carob trees indicates that they have been present for decades. The fields are not irrigated, but can support cereal production. The studies carried out by Bowen-Jones in 1961 show that the agricultural land within the proposed development site has been consistently used as agricultural land at least for the past 64 years.

FIGURES 95 & 33: VINE AND WATER TRENCHES

In areas where the soil has been removed, there is evidence of antique soil troughs for vines plus water channelling. These fields were comparatively shallow. Borg (1922), whilst noting the early introduction of vines in Malta, dating back to the time of the first Phoenician settlers, further indicates that, towards 1870, the planting of vines was commonplace. However, between 1919 and 1920 the spread of the Phylloxera insect pest devastated viticulture.

Attard et al. (2024) quote Borg on trench-like excavations carved into the bare rock on the barren stretches of the garigue landscape. The trenches were shaped as troughs, filled with soil that was most probably collected from shallow deposits in the vicinity, and finally planted with vines. In places that contained friable rock, trough-like ditches 1.5 to 2 metres long, and up to 1 metre deep and 0.5 metres wide, were excavated with a pickaxe. This was considered a modification to contain the sparse soil resource, while also functioning as minute terrace pockets that also trapped runoff rainwater. The dug-out channels served to convey rainwater from the higher to lower fields to a collection point in this sloped area. The excavations at Maghtab are shallower, however their presence confirms early agricultural adaptations that addressed the difficulties of agricultural production on this marginal land.



FIGURES 96: VINE TRENCHES (SOURCE: VELLA ET AL. 2017)

Rock-cut trenches encouraging deep root growth where limited soil depth prevailed have been associated with the growing of vines. Vella et al. (2017) have discovered at Zejtun a vineyard that was abandoned sometime in the 2nd/1st century BCE and excavations indicated trenches that pre-date the construction of the villa-type establishment and confirmed that the planting of vines in trenches conformed to agronomic practices of planting in holes or pits practised in nearby Italy throughout the Hellenistic and Roman periods, but which could also date back to the Punic period.

The landscape is an undulating Globigerina hilly area typical of this northern part of Malta. The soils are typically mainly brownish with limited soil depth. Soils of Malta are currently classified using the WRBS classification system (MALSIS, 2003). Referring to this system, this location at Magħtab comprises an area of Regosols as per Figure . The landscape is that of low shallow moderate terraces on Globigerina limestone – GTm.

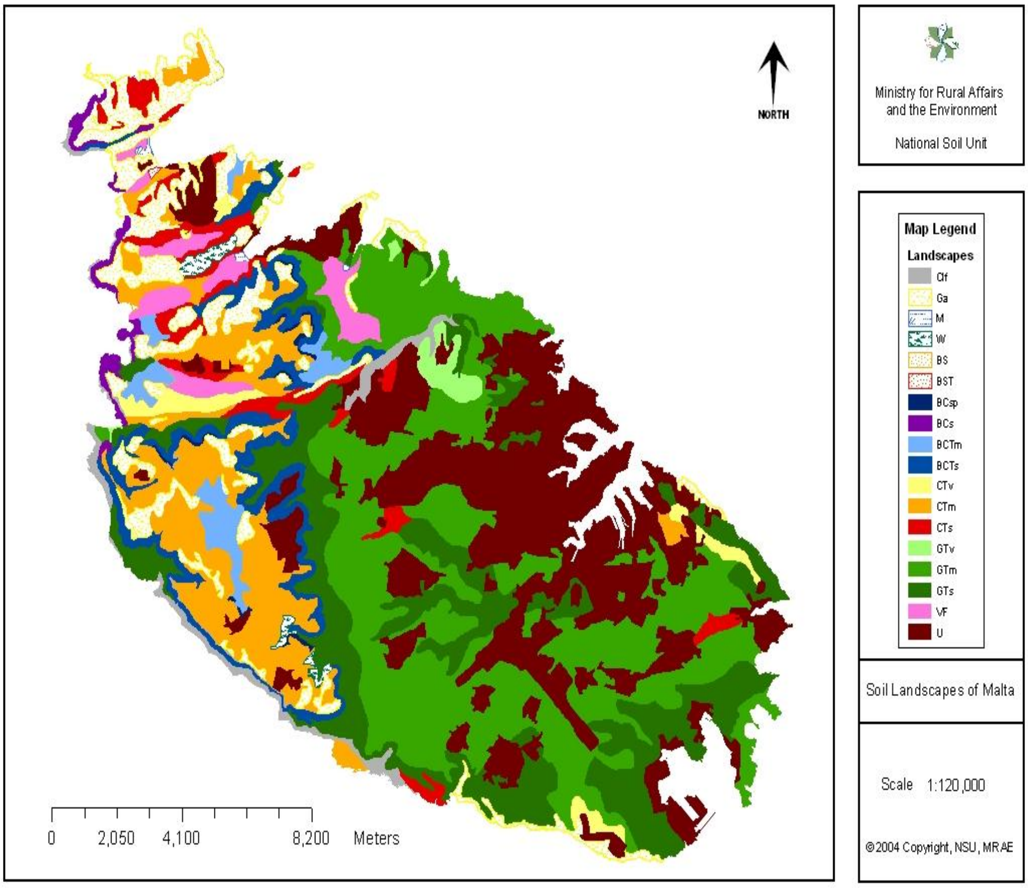


FIGURE 35: MALSIS SOIL LANDSCAPES (SOURCE: MALSIS)

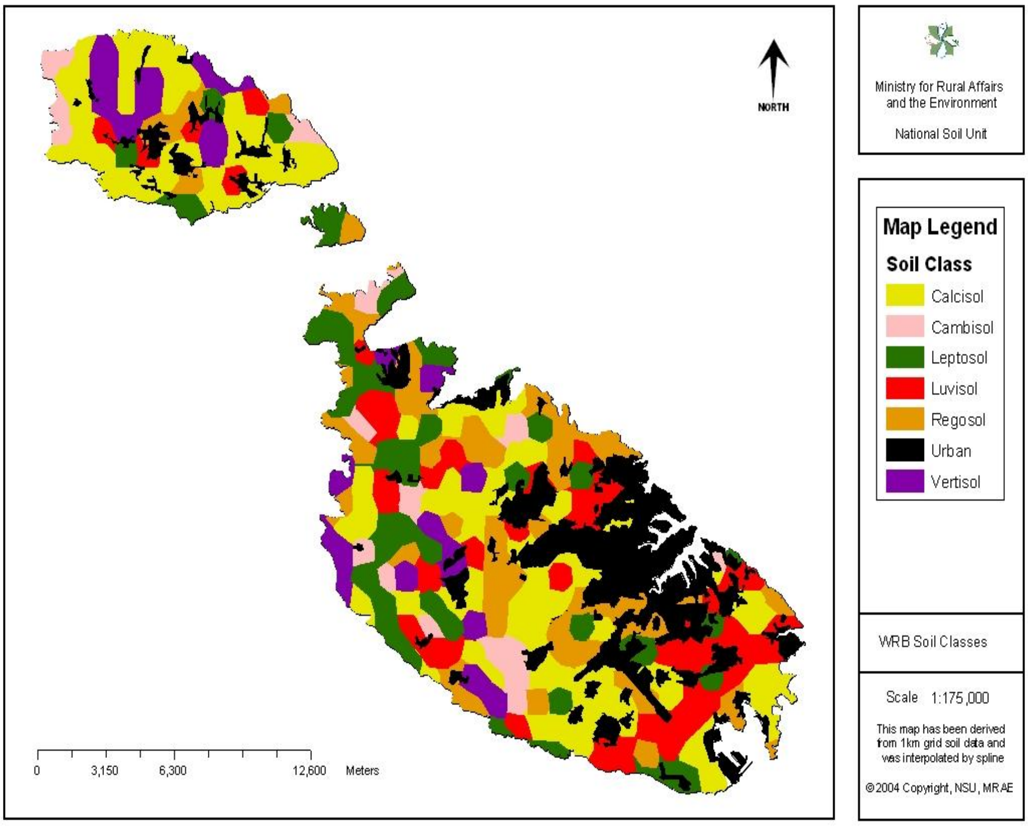


FIGURE 36: MALSIS SOIL CLASSES (SOURCE: MALSIS)

From an agricultural viewpoint, a Regosol is a very weakly developed mineral soil in unconsolidated materials with only a limited surface horizon having formed. Limiting factors for soil development range from low soil temperatures, prolonged dryness, characteristics of the parent material, or erosion. Ultimately, parent material and climate dominate the morphology of regosols, however, their low water-holding capacity and their higher permeability to water make them sensitive to drought. Thus quality and the low water-holding capacity of these soils would require frequent applications of irrigation water and fertilizer. Although this would result in better yields, it is rarely economical.

In 1960, a survey conducted by Lang, using the Kubiena classification system, placed these soils as complexes and designated them as the Inglin Complex soils. As many local reports, even recent ones still use the Kubiena classification system when referring to soils; it would be appropriate to also describe the soils of this locality using the system used by Lang (1960). According to Lang, the soils of this location have been classified as Inglin Complex. The soil is a pale brown to red, shall to moderately deep, with light to heavy textured soil that resembles the Xagħra soil series from which it has been largely derived but is effectively more disturbed.

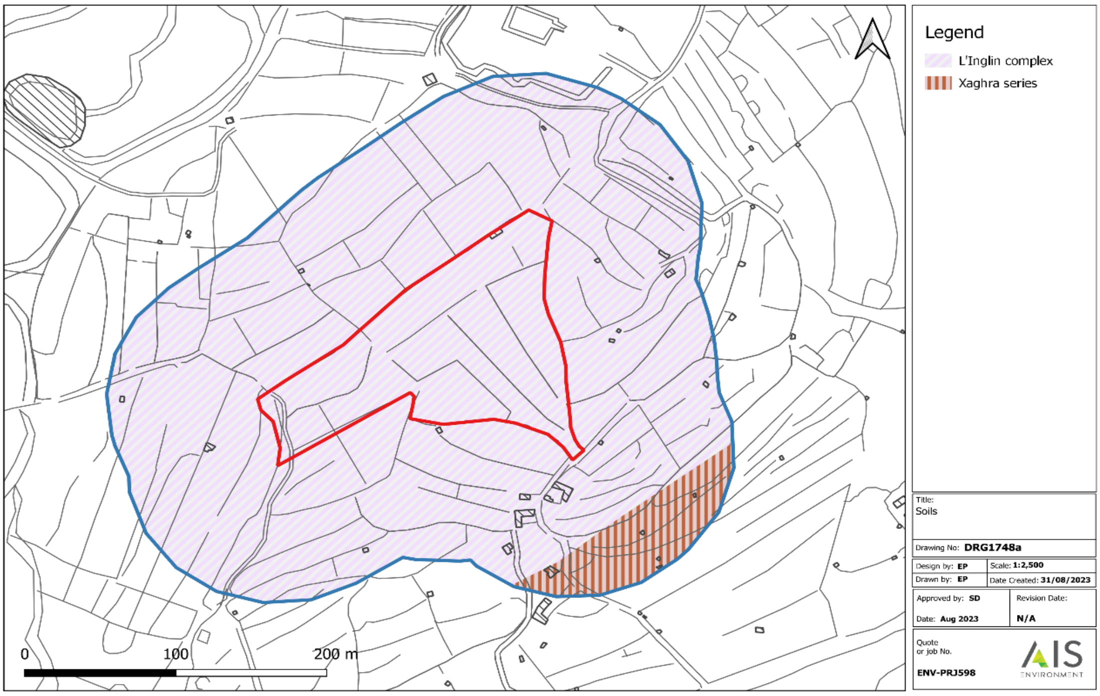


Figure 97: Soil in the area of study

The Inglin Complex soils found in this location are typical anthropogenic soils. The rubble content, presence of broken rock surfaces, and lack of natural horizons typify this soil. These soils are mainly artificial, and this characterises their variability, being much disturbed and mixed in their formation process. Often the soil structure could be weakly developed, resulting in low fertility. Additionally, crops grown on these soils could be prone to pests and diseases, and the shallower soils would also be prone to erosion and drought.

In agroecosystems, agricultural management practices affect native soil biota through cultivation, irrigation, and application of agrochemicals. Soil is a critical component in the structure and function of agroecosystems, and the condition of the soil biological communities is important to both the structure and function of soils. Maintaining soil fertility is important to promote sustainable agriculture. Farmers' management approaches influence soil fertility. In natural ecosystems, soil minerals undergo limited change, however, through farming, the introduction of a crop and its harvesting before the minerals can be passed back to the soil creates imbalances. With good crop rotation and appropriate fertilizer application, such losses are minimised. An even more environmentally oriented approach would be the practising of crop rotations that utilise inoculated legumes to increase nitrogen availability. The utilisation of different crops, as opposed to monoculture, would further help to ensure better mineral utilisation rather than loss of elements associated with a single crop, though irrigation could be necessary. Farmers could also leave crop stubble or other residue on the field after harvest. In the case of cereal stubble, decomposition returns some minerals while limiting the effects of erosion. Retention of crop stubble is now a more common practice because of EU Rural Development measures.

Maintaining a sustainable agroecosystem will also necessitate balanced soil pH and salinity. Monocropping creates an artificial ecosystem that alters field pH. Changes in pH also influence soil organisms, and these, in turn, affect crop yields, but most relevant to plant growth, the pH of soil influences the availability of nutrients. The best range for nutrient uptake is between pH 6.0 and 7.0. At an average pH of 8.3, most Maltese soils indicate saturation with bases as the dry climate soils do not provide sufficient rainfall to leach away the bases, thus limiting the supply of nutritive elements.

This situation is further exacerbated during the dry period when evaporation exceeds precipitation with consequent limited water movement through the soil resulting in a high concentration of salts close to the surface. Very few species tolerate increasing salinity and crop plants growing in saline soil will have dwarfed root systems, reduced absorption, and transpiration with limited water resulting in a decrease in growth and yield. Salinization can be restricted by leaching of salt from the root zone, changed farm management practices, and the use of salt-tolerant plants.

The presence of water is the most essential component for ecosystem functioning and plays a key role in sustaining crop production. Daubenmire (1974) explains that water is retained by soils as films that coat the surface of particles, as wedges held in angles between the grains, and as moisture imbibed by colloids. In fine-textured soils, there is a greater general propensity to hold water when compared to coarser soils. Yet although fine textured soils can comparatively hold more water, they hold much of it in the upper layers which are highly vulnerable to drying and, furthermore,

1. do not admit water readily, so lose more by runoff,
2. retard root penetration so seedlings may not be able to reach deep moisture before the surface dries,
3. tend to be poorly aerated at lower levels, thus obliging shallow rooting and making plants susceptible to drought.

The porosity of coarse-textured soils and of heavy soils that are well aggregated tends to support a condition of equilibrium between the soil, the atmosphere, and temperature because of the lower moisture capacity and the freer gas exchange for which fine-textured soils are less favoured.

Since the Maltese Islands are characterized by a very high human population density and correlated high land use, most habitats have all been affected to some extent by anthropogenic factors and hence no part of the islands can be said to be in a truly natural state. The main vegetation assemblages are maquis, garigue, and steppe; minor ones include patches of woodland, coastal wetlands, sand dunes, freshwater, and rupestral communities. Human impact is significant. The present landscape is a result of the interaction of geology and climate, coupled with the intense human exploitation of the environment over many thousands of years, which has altered the original condition of the vegetation cover, principally through the diversion of vast tracts of land to cultivation, plus the development of land for buildings and industry. The scantiness of the soil, combined with the erratic rainfall and the periodic disturbance of the vegetation cover, has resulted in extensive erosion as well as loss of the original vegetation.

The agricultural landscape in this locality is one of very small parcels of land, frequently arranged in terraces and surrounded by rubble walls along which grow a variety of wild flora and fauna that contribute significantly to Malta's biodiversity. There are no distinctive livestock activities taking place. There is also no evidence of water reservoirs and irrigation practices and all fields around the area of study indicate dryland agriculture. From an ecosystem standpoint, the principal threats to the soils in this locality may be described as erosion, soil sealing, the decline in soil organic matter, soil contamination, and soil salinization although no specific data is available.

Effectively agroecosystems are ecological systems modified by farmers to produce crops. Unsuitable agricultural practices can cause a loss in soil quality and erosion to consequently increase or trigger desertification, particularly under Mediterranean conditions. Sustainable agricultural management will allow the soil to recover, and the use of straw mulching is a very effective management strategy in soil improvement both for increased water retention, nutrient recycling, and improved soil structure. The use of a cover, either through cropping, or even temporary fallow will contribute to reducing the risk of erosion and increase soil quality. Similarly, the presence of well-maintained rubble walls will not only help to contain soil loss but also serve as a niche for microflora and microfauna. However, at the same time, these would establish weed seed and pest banks near productive agricultural areas.

4.8 Archaeology & Cultural Heritage

Any archaeological remains discovered during the course of the desk-based assessment within the Area of Influence are shown in Figure 98.

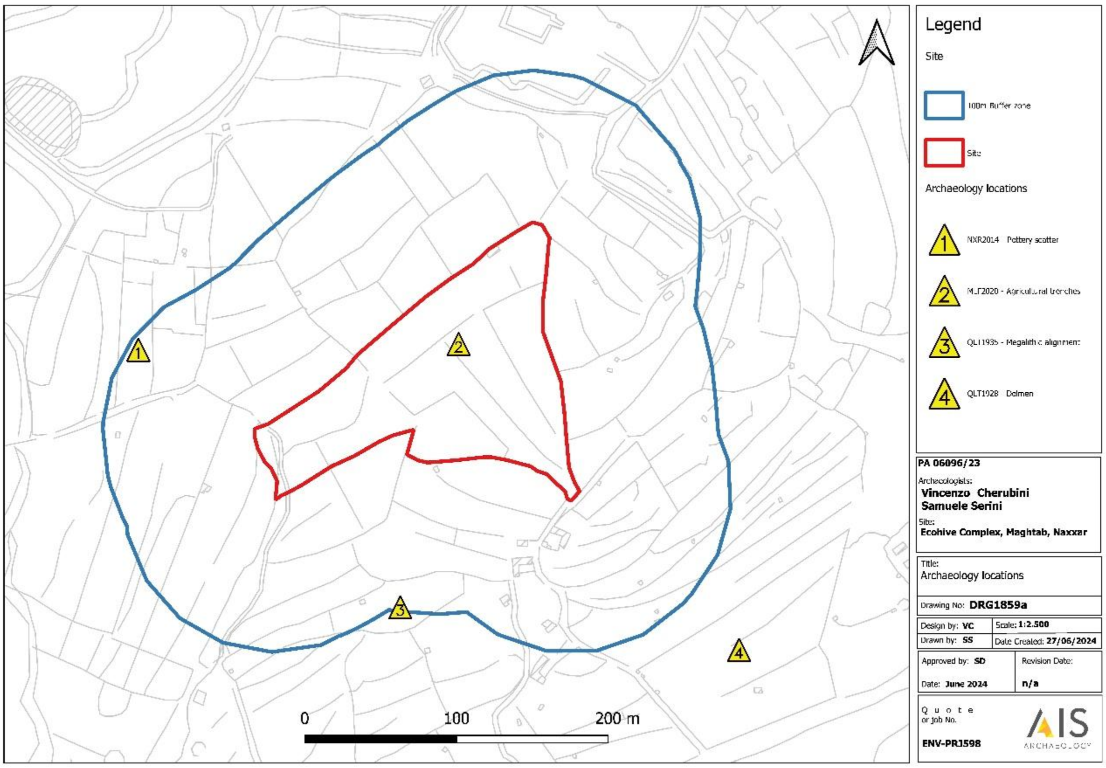


FIGURE 98: LOCATION OF LISTED ARCHAEOLOGICAL SITES WITHIN AOI

The 100m buffer zone around the AoI encompasses three scheduled cultural heritage features.

- Located N-West and S-East to the Wasteserv main Entrance, a pottery scatter was discovered during archaeological monitoring work which has not yet been published (SCH site code: NXR2014);
- a Megalithic alignment (SCH site code: QLT1935), scheduled as Class B Taz Zebbugija megalithic remains, recorded by MARs (MAR 1927-8:3-4; MAR 1935-6:18); and
- 1,100 rock-cut features (numerous alignments of agricultural trenches, post-holes…) located within the site possibly subjected to development and surrounding area, discovered during archaeological evaluation (SCH site code: MLF2020) not yet published but included in the SCH Annual Report (SCH Annual Report 2021:23).

It is also worth mentioning another important Prehistoric site known in the vicinity, the Class A scheduled Ta'Hammud megalithic dolmens, which are located approximately 140m from the S-East limit of the site, approximately 40m towards SE from the limits of the AoI buffer zone, down a minor road (Triq ir-Ramla) leading from the coastal road at Qalet Marku.

TABLE 15: LIST OF SCHEDULED SITES WITHIN AOI BUFFER ZONE

PROPERTY ADDRESS	CATEGORY	SCH SITE CODE AND FEATURE TYPE	DEGREE OF PROTECTION	REFERENCE TO FIGURE 7
Tul il-Kosta Naxxar	Archaeology	NXR2014 - Pottery scatter	N/A	1
Tul il-Kosta Naxxar	Archaeology	MLF2020 - Agricultural trenches	N/A	2
Taz Zebbugija, Naxxar	Archaeology	QLT1935 - Megalithic ruins	B	3

According to the SCH Annual Report (2021:23) the aforementioned archaeological evaluation of the TTF site was carried out by the Superintendence of Cultural Heritage in two phases:

1. Fieldwalking exercise and excavation of 19 trial trenches. The results of this first phase indicated the presence of an ancient agricultural landscape mainly characterized by agricultural trenches. Some Classical Period pottery was also recovered, mostly mixed with more modern fill/material.
2. Open area excavation with full soil stripping of the site resulted in the discovery of a total of 1,100 rock-cut features consisting of numerous alignments of agricultural trenches, post-holes, quarrying activity and tree pits, as shown in Figure 99 and Figure 100.

FIGURE 99: AERIAL PHOTO WITH AREAS SUBJECTED TO ARCHAEOLOGICAL EVALUATION. AREA OF INTEREST IN BLUE (SOURCE: COURTESY OF SCH)

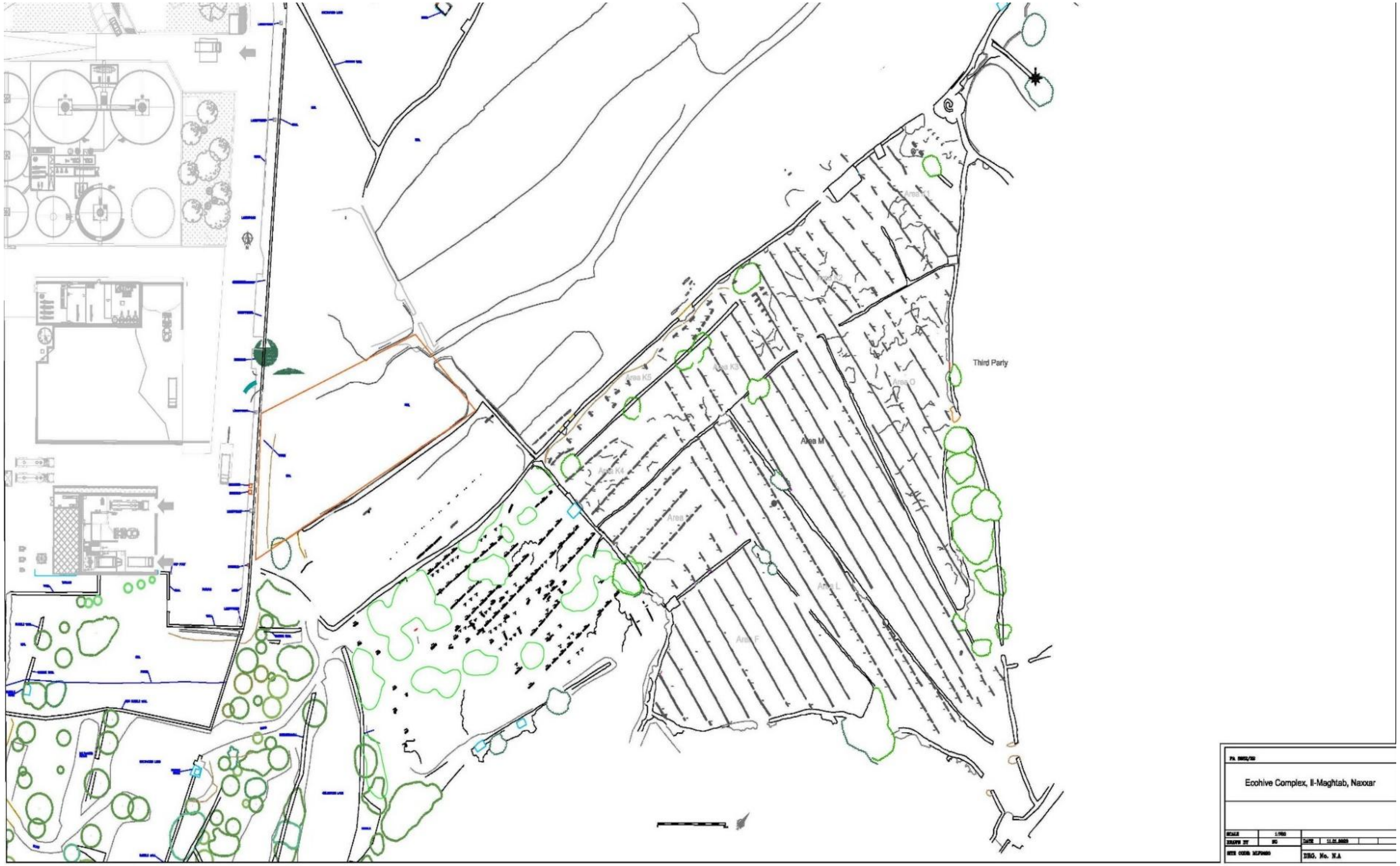


FIGURE 100: ARCHAEOLOGICAL DRAWING OF AOI WITH FEATURES DISCOVERED (SOURCE: COURTESY OF SCH)

The area proposed for development is found within a rural landscape East and S-East of the Maghtab landfill, containing a number of agricultural fields no longer in use with typical rural structures and rubble walls. The AoI is delimited on its North by a modern landfill and on its West by the WasteServ treatment facilities. This is separated by a fence and rubble walls (Figure 101). Its East and South side are composed by agricultural fields which include rural vernacular features typical of a Maltese landscape and all related to agricultural activity. The site appears totally stripped of the original soil, due to recent excavations, and includes:

- boundary drystone/rubble walls from fair to poor/very poor state of conservation;
- modern structures (hunting observation posts),
- a dilapidated farmhouse and
- a stone hut still in good state of conservation buttressed to a E-W oriented rubble wall in the southern limit of the site.

Archaeological rock-cut features exposed are still visible on the rock surface. These include:

1. Various agricultural trenches: isolated sub-rectangular features; approx. N-S oriented trench alignments and approx. W-S oriented trench alignments. Different orientations indicate multiple periods of use of land for agricultural purposes, datable from Classical period to modern period. Some of these trenches are not oriented with the rubble boundary walls, which are built on top of them;
2. Various Post hole alignments, probably related to aforementioned agricultural trenches since they seem to follow the same orientations;
3. Possible cart-ruts E-W oriented with concave sides and gradual break of slope to a flat base. Located in the central/S-West area.

Figure 101: Western access to site, Rubble boundary wall between site and WasteServ Treatment facilities, looking North

Figure 102: Western access to site. area stripped of soil with two agricultural trenches exposed. looking East

FIGURE 103: CENTRAL-SOUTH AREA, NE-SW ORIENTED AGRICULTURAL TRENCH, LOOKING N-EAST

FIGURE 104: EXPOSED AGRICULTURAL TRENCHES AND POST HOLES ALIGNMENT IN THE CENTRAL AREA OF SITE, LOOKING EAST

Figure 105: Possible Cart ruts, looking West

Figure 106: Stone hut (Girna) on southern side of rubble boundary wall, looking S-West

FIGURE 107: OVERALL PHOTO OF SOUTHERN-EAST LIMIT OF SITE, LOOKING S-EAST

Figure 108: Dilapidated farmhouse in the northern part of site, looking North

No pottery or cultural material was noted during the landscape assessment at the location and surrounding areas.

Figure 109 shows the location of the Cultural Features within the AoI identified during the site assessment in Maghtab, Naxxar, while Table 16 lists these features. As per ERA terms of reference, Data capture sheets for any identified Cultural Heritage/archaeological features are presented in the respective technical study.

Table 16: List of cultural features within AOI

Reference to 59	Typology	Function	State of Conservation
A	Vernacular – dry stone Hut	Agricultural	Fair/Good
B	Vernacular – Farmhouse	Agricultural	Poor/Very Poor

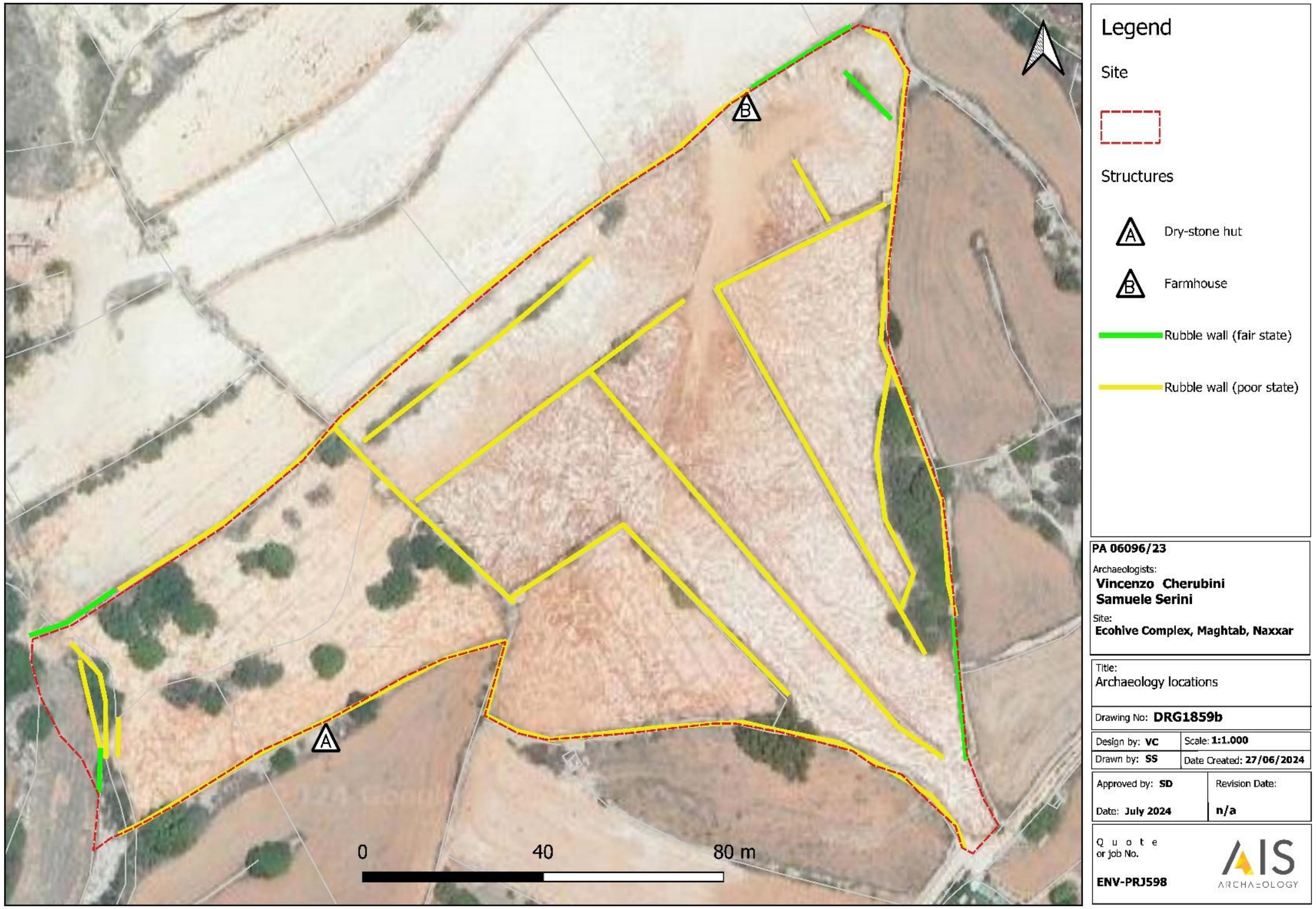


FIGURE 109: LOCATION AND STATES OF CULTURAL FEATURES IDENTIFIED WITHIN AOI

4.9 Air Quality

A specific spatial processing of the data obtained from the model was carried out, in order to assess the probability of significant effects on the quality of the ambient air (including exceeding the environmental limit values) as well as on the deposition levels of particular components. The analysis focused on an area of influence estimated within a radius of 6 km from the chimney.

The "Area of Influence – AOI" has been defined as the largest area around the plants obtained considering the areas where the contribution of the plant to the annual environmental levels of NO_2, PM_{10} or $PM_{2,5}$ is as follows, whichever results in the largest AoI. If the AoI is <11.3km^2 then the AoI shall be assumed to be a circle of 6km radius centred on the chimney:

- PM_{10} → 0.3 µg / m^3
- NO_2 → 0.3 µg / m^3
- $PM_{2.5}$ → 0.19 µg / m^3

The consultants have identified a number of sensitive receptors that could potentially be affected by the proposed development. The list of sensitive receptors has been derived by adopting a risk-based approach based on the pollution contours presented by the ERA's NO_2 passive diffusion tube network in 2023 as depicted below.

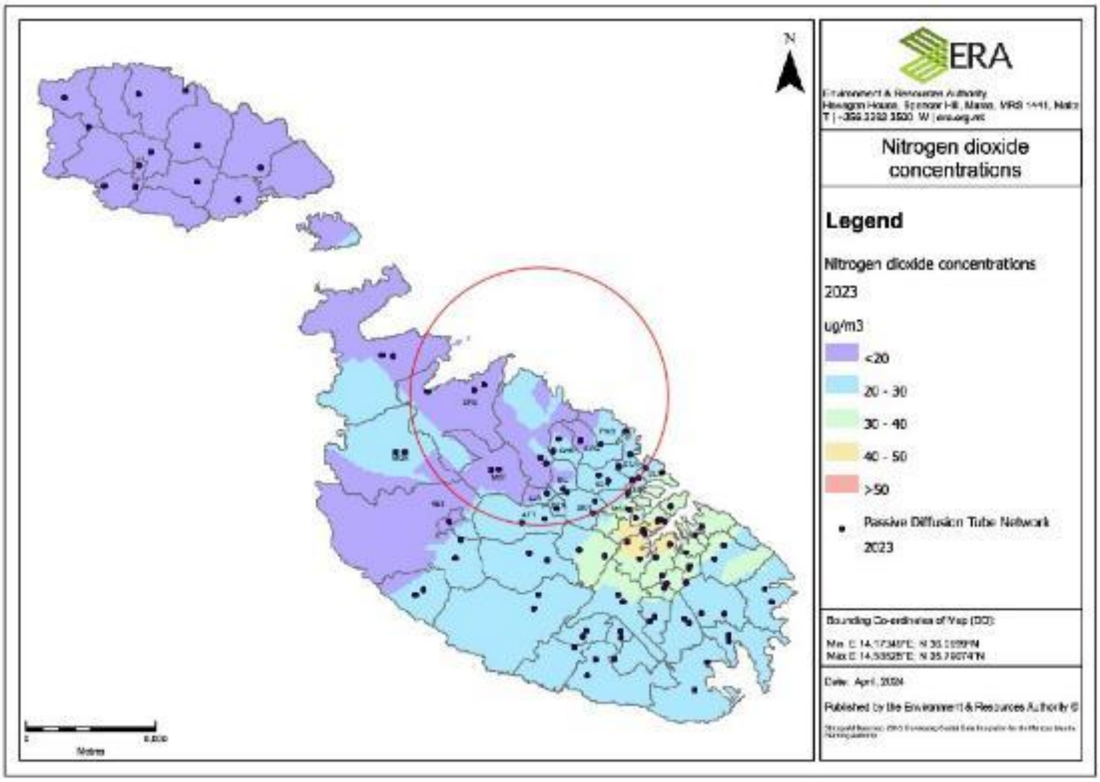


FIGURE 1. NO_2 CONTOUR MAP BASED ON 2023 DATA OBTAINED FROM ERA AND SUPERIMPOSITION OF THE 6KM AOI

The local council boundaries which fall within the 6km radius AoI are: SPB – St' Paul's Bay; NXR – Naxxar; MST – Mosta; GHR – Gharghur; LJA – Lija; ATT – Attard; BZN –

Balzan; IKL – Iklin; BKR – Birkirkara; SGN – San Gwann; MSD – Msida; SWQ – Swieqi; PMB – Pembroke; STJ – St Julians; SLM – Sliema; GZR – Gzira; RBT – Rabat; MGR – Mgarr.

A risk-based approach has been adopted to select the sensitive receptors considered the distance away from the source and the current pollution levels (as shown in the contour map). Consequently, a hierarchy of risk level has been adopted to establish the location of the sensitive receptors.

TABLE 17: DEFINITION OF CRITERIA USED FOR THE RISK-BASED APPROACH TO IDENTIFY SENSITIVE RECEPTORS

Criterion	Level	Definition
Closest Distance	Short (3)	Located at <2km away from the scheme site
	Medium (2)	Located at 2-4km away from the scheme site
	Far (1)	Located at >4km away from the scheme site
Current pollution	High (3)	Ambient 2019 pollution levels are >40 μg/m^3 NO_2
	Medium (2)	Ambient 2019 pollution levels are 30-40 μg/m^3 NO_2
	Low (1)	Ambient 2019 pollution levels <30 μg/m^3 NO_2
Risk Level	Major (5-6)	Risk level is considered major when sum of current pollution and closest distance is equal to Level 5-6
	Moderate (3-4)	Risk level is considered moderate when sum of current pollution and closest distance is equal to Level 3-4
	Low (2)	Risk level is considered low when sum of current pollution and closest distance is equal to Level 2

From the risk-assessment carried out above, one can conclude that the following localities pose the highest level of risk (Moderate – Level 4): Naxxar, Gharghur, Pembroke, Swieqi and San Gwann. Therefore, the consultant has identified a number of specific sensitive receptors within the aforementioned localities, that include: residential areas, schools, clinics, old people's home and hospitals. For the lower risk localities, a minimum of one sensitive receptor has also been included.

TABLE 18: RISK ASSESSMENT FOR EACH LOCALITY IN THE AOI

LOCALITY	DISTANCE [KM]	CURRRENT POLLUTION	RISK LEVEL
SPB	1.6 – Short (3)	< 20 μg/m3 – Low (1)	Moderate (4)
NXR	0.0 – Short (3)	20 - 30 μg/m3 – Low (1)	Moderate (4)
MST	2.6 – Medium (2)	< 20 μg/m3 – Low (1)	Moderate (3)
LJA	4.2 – Far (1)	< 20 μg/m3 – Low (1)	Low (2)
BZN	4.6 – Far (1)	20 - 30 μg/m3 – Low (1)	Low (2)
ATT	5.0 – Far (1)	20 - 30 μg/m3 – Low (1)	Low (2)
IKL	3.0 – Medium (2)	20 - 30 μg/m3 – Low (1)	Moderate (3)
BKR	4.6 – Far (1)	20 - 30 μg/m3 – Low (1)	Low (2)
GHR	1.5 – Short (3)	20 - 30 μg/m3 – Low (1)	Moderate (4)

LOCALITY	DISTANCE [KM]	CURRRENT POLLUTION	RISK LEVEL
PMB	1.9 – Short (3)	< 20 µg/m3 – Low (1)	Moderate (4)
SWQ	1.5 – Short (3)	< 20 µg/m3 – Low (1)	Moderate (4)
SGN	3.6 – Medium (2)	20 - 30 µg/m3 – Low (1)	Moderate (3)
MSD	5.2 – Far (1)	20 - 30 µg/m3 – Low (1)	Low (2)
STJ	4.7 – Far (1)	20 - 30 µg/m3 – Low (1)	Low (2)
SLM	5.6 – Far (1)	20 - 30 µg/m3 – Low (1)	Low (2)
GZR	5.6 – Far (1)	20 - 30 µg/m3 – Low (1)	Low (2)
RBT	5.3 – Far (1)	< 20 µg/m3 – Low (1)	Low (2)
MGR	5.3 – Far (1)	20 - 30 µg/m3 – Low (1)	Low (2)

TABLE 19 –SENSITIVE RECEPTORS

RECEPTOR NO.	NAME	COORDINATES	DISTANCE
R1	Verdala International School, Pembroke	35°55'33.67"N 14°28'49.07"E	3.80 km
R2	Chiswick House School, San Gwann	35°54'26.02"N 14°29'0.87"E	5.36 km
R3	St Catherine's High School, Pembroke	35°55'30.98"N 14°28'24.17"E	3.31 km
R4	St Michael's School, Pembroke	35°55'31.24"N 14°28'34.19"E	3.52 km
R5	St Michael's Foundation, San Gwann	35°54'43.73"N 14°27'53.62"E	3.92 km
R6	St Francis School, San Gwann	35°54'27.88"N 14°28'48.44"E	5.10 km
R7	St Clare Primary College, Pembroke	35°55'40.57"N 14°28'40.21"E	3.50 km
R8	Karmnu Sant Primary School, Gharghur	35°55'25.82"N 14°27'5.60"E	2.22 km
R9	Bice Mizzi Vassallo Primary School, Pembroke	35°55'29.92"N 14°28'27.30"E	3.40 km

Receptor No.	Name	Coordinates	Distance
R10	St Clare Secondary, Pembroke	35°55'47.69"N 14°28'19.09"E	2.93 km
R11	Sprachcaffe Language School, Pembroke	35°55'30.60"N 14°28'41.83"E	3.69 km
R12	San Miguel Resource Centre, Pembroke	35°55'41.26"N 14°28'30.65"E	3.28 km
R13	M.U.S.E.U.M Pembroke	35°55'35.46"N 14°28'42.10"E	3.62 km
R14	Risen Christ Church, Pembroke	35°55'34.72"N 14°28'39.08"	3.56 km
R15	National Sports School, Pembroke	35°55'27.69"N 14°28'26.35"E	3.42 km
R16	Simblija Care Home, Naxxar	35°54'42.13"N 14°26'50.75"E	3.49 km
R17	Golden Care Retirement Home, Naxxar	35°55'3.49"N 14°26'54.07"E	2.85 km
R18	Primary School, Naxxar	35°54'50.02"N 14°26'47.09"E	3.24 km
R19	MRC Middle School, Naxxar	35°54'37.01"N 14°26'52.35"E	3.65 km
R20	Giovanni Curmi Higher Secondary, Naxxar	35°54'35.28"N 14°26'48.54"E	3.69 km
R21	Naxxar Parish Church, Naxxar	35°54'52.52"N 14°26'39.98"E	3.16 km
R22	St Clare's Primary College, San Gwann	35°54'32.44"N 14°28'31.27"E	4.72 km
R23	San Gwann Parish Chruch, San Gwann	35°54'27.65"N 14°28'36.81"E	4.93 km
R24	Immaculate Mother of the Church, Swieqi	35°55'15.51"N 14°28'27.78"E	3.69 km

RECEPTOR No.	NAME	COORDINATES	DISTANCE
R25	St Bartholomew Parish Church, Gharghur	35°55'25.49"N 14°27'12.52"E	2.31 km
R26	Clubclass English School, Swieqi	35°55'10.80"N 14°28'50.10"E	4.20 km
R27	Agricultural land, Magħtab	35°56'22.21"N 14°26'45.34"E	0.43 km
R28	Żona fil-Baħar madwar Għawdex - MT0000112	35°56'52.41"N 14°27'0.53"E	0.79 km
R29	Żona fil-Baħar bejn Il-Ponta ta' San Dimitri (Għawdex) u Il-Qaliet (MT0000105)	35°56'54.63"N 14°27'17.86"E	1.18 km
R30	L-Għadira s-Safra (MT0000008)	35°57'2.52"N 14°26'43.28"E	0.86 km
R31	Is-Salini (MT0000007)	35°56'38.19"N 14°25'20.58"E	1.94 km
R32	Triq ir-Ramla, Magħtab Residential & Industrial Area	35°56'9.33"N 14°26'32.99"E	0.78 km
R33	Triq Jules Verne, Naxxar Residential Area	35°55'26.90"N 14°26'21.72"E	2.13 km
R34	Triq Fidel Zarb, Għargħur Residential Area	35°55'39.42"N 14°27'9.29"E	1.88 km
R35	Dawret il-Qawra, Qawra Residential Area	35°57'0.72"N 14°25'24.15"E	2.01 km
R36	Triq Napuljun Tagliaferro, Pembroke Residential Area	35°55'39.77"N 14°28'39.18"E	3.48 km
R37	Triq M. Pulis, Birkirkara Residential Area	35°53'57.91"N 14°27'55.10"E	5.21 km
R38	Constitution Road, Mosta Residential Area	35°54'34.35"N 14°25'34.08"E	4.04 km
R39	Triq San Guzepp, San Gwann Residential Area	35°54'26.90"N 14°28'37.06"E	4.95 km

RECEPTOR NO.	NAME	COORDINATES	DISTANCE
R40	Parish Street, St Paul's Bay Residential Area	35°56'55.42"N 14°24'8.97"E	3.78 km
R41	Triq il-Maghsar, Burmarrad Residential Area	35°55'59.70"N 14°24'49.00"E	2.93 km
R42	Triq Preziosi, Lija Residential Area	35°54'13.20"N 14°26'42.79"E	4.37 km
R43	Triq Balaguer, Balzan Residential Area	35°53'59.04"N 14°27'4.81"E	4.85 km
R44	Triq Annabelle Preca, Attard Residential Area	35°53'49.31"N 14°26'15.74"E	5.13 km
R45	Triq il-Harruba, Iklin Residential Area	35°54'42.16"N 14°27'8.16"E	3.56 km
R46	Triq L.Apap, St Julian's Residential Area	35°55'16.57"N 14°29'22.03"E	4.78 km
R47	Mater Dei Hospital, Msida	35°54'4.63"N 14°28'35.51"E	5.49 km
R48	Tower Road, Sliema Residential Area	35°55'1.99"N 14°29'59.81"E	5.81 km
R49	Farm at Triq il-Katakombi, Salina	35°56'44.52"N 14°25'45.23"E	1.35 km
R50	Farm at Sqaq Habel Zwejra, Maghtab	35°56'15.73"N 14°26'8.07"E	0.95 km
R51	Farm and fields at Triq Burmarrad, Burmarrad	35°55'33.18"N 14°25'12.83"E	2.86 km
R52	Farms at Bahar ic-Caghaq	35°56'2.57"N 14°26'53.43"E	1.06 km
R53	Agricultural land at Triq il-Wardija, Wardija	35°56'18.06"N 14°24'38.77"E	3.02 km
R54	Agricultural land at Triq is-Sagra Familja, Bidnija	35°55'33.91"N 14°23'31.26"E	5.03 km

RECEPTOR NO.	NAME	COORDINATES	DISTANCE
R55	Agricultural land, Triq Sir Temi Zammit, Mosta	35°54'33.82"N 14°24'6.01"E	5.32 km

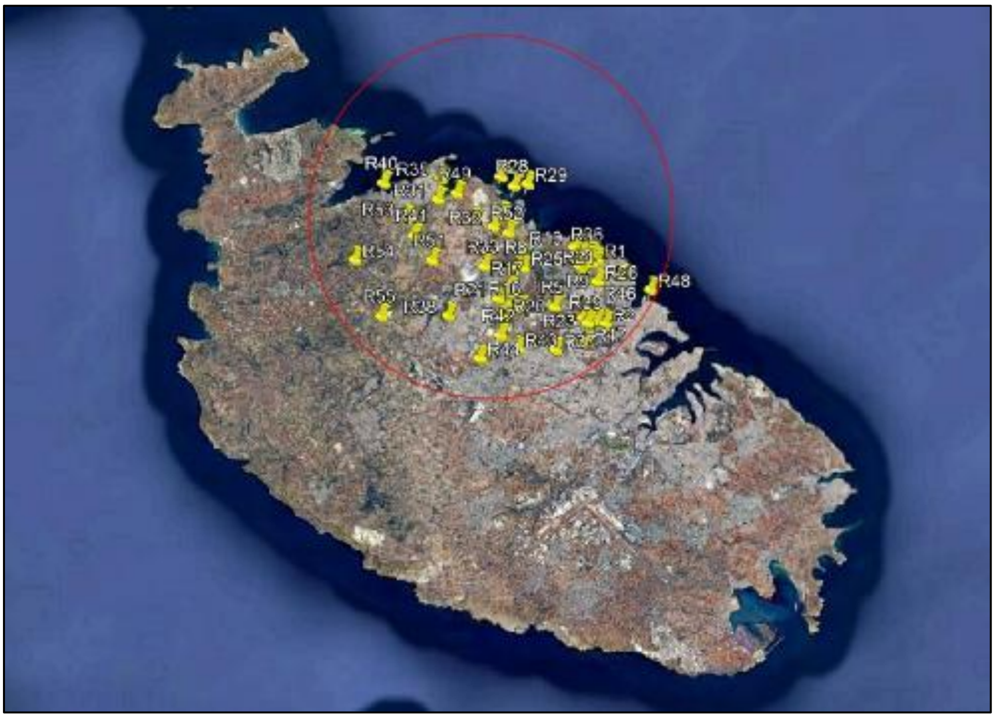


FIGURE 2. MAP OF THE IDENTIFIED SENSITIVE RECEPTORS

The area of influence - AOI, area around the plant in which the contribution of the plant to the annual ambient levels of NO_2, PM_{10} or $PM_{2.5}$ is 0.3 µg/m^3 for NO_2 or 0.3 µg/m^3 for PM_{10} or 0.19 µg/m^3 for $PM_{2.5}$, whichever results in the largest AOI. If the area of the AOI is < 11.3 km^2 then the AOI shall be assumed to be a circle of radius 6 km center on the chimney.

Below are the results obtained by the model for the three scenarios considered:

Scenario A

a. NO_2, the simulated concentrations are lower than 0.3 µg/m^3 on entire calculation domain and receptors. The maximum concentrations have been estimated in a radius centered on chimney equal to about 0.78 km;
b. PM_{10}, the simulated concentrations are lower than 0.3 µg/m^3 on entire calculation domain and receptors. The maximum concentrations have been estimated in a radius centered on chimney equal to about 0.78 km;
c. $PM_{2.5}$, the simulated concentrations are lower than 0.19 µg/m^3 on entire calculation domain and receptors. The maximum concentrations have been estimated in a radius centered on chimney equal to about 0.78 km.

Scenario B

a. NO_2, the simulated concentrations are lower than 0.3 µg/m^3 on entire calculation domain and receptors. The maximum concentrations have been estimated in a radius centered on chimney equal to about 0.78 km;
b. PM_{10}, the simulated concentrations are lower than 0.3 µg/m^3 on entire calculation domain and receptors. The maximum concentrations have been estimated in a radius centered on chimney equal to about 0.78 km;
c. $PM_{2.5}$, the simulated concentrations are lower than 0.19 µg/m^3 on entire calculation domain and receptors. The maximum concentrations have been estimated in a radius centered on chimney equal to about 0.78 km.

Scenario C

a. PM_{10}, the simulated concentrations are lower than 0.3 µg/m^3 on entire calculation domain and receptors. The maximum concentrations have been estimated in a radius centered on chimney equal to about 0.78 km;
b. $PM_{2.5}$, the simulated concentrations are lower than 0.19 µg/m^3 on entire calculation domain and receptors. The maximum concentrations have been estimated in a radius centered on chimney equal to about 0.78 km.

The isoconcentration maps have been created in order to define in detail the areas in which the calculated concentrations expressed as µg/m^3. A color gradient between orange and red was used to highlight areas with higher concentrations. All maps are shown in the respective technical study.

The simulations have revealed that the concentration of NO_2, PM_{10} and $PM_{2.5}$ are lower than the established thresholds. Consequently, an AoI with a radius of 6km has been established. The models and the spatial analysis was developed with the aim of obtaining a spatial data resolution of 5 × 5 m^2.

In accordance with the ERA TOR's, the 90.4th percentile of concentrations for PM_{10} and the 99.8th percentile of concentrations for NO_2 were estimated. With the aim of obtaining a comparable dataset, these statistical parameters have been calculated at the receptors for each parameter relation to a year (as shown in table 1 and table 2).

Part II of Schedule 7 to Regulation 29 of S.L. 549.59 sets the following (legally binding limit values):

- an annual limit value of 40 µg/m^3 for PM_{10}, a daily limit value for PM_{10} of 50 µg/m^3 which cannot be exceed on more than 35 calendar days (90.4% of the daily readings in a calendar year should be < 50 µg/m^3);
- an annual limit value of 40 µg/m^3 for NO_2 and an hourly limit value of 200 µg/$m^{3,}$ which cannot be exceeded more than 18 times per calendar year (99.8 % of the hourly readings in a calendar year should be < 200 µg/m^3.

From the model results it emerges that:

- in the ***Scenario A*** the 90.4th percentile of concentrations for are below the regulatory limits of 50 µg/m^3 which cannot be exceed on more than 35 calendar days and are below an annual limit value of 40 µg/m3; also, the 99.8th percentile of concentrations for NO_2 in the Scenario A are below an hourly limit value of 200 µg/m^3 which cannot be exceed on more than 35 calendar days and are below an annual limit value of 40 µg/m^3;
- in the ***Scenario B*** the 90.4th percentile of concentrations for are below the regulatory limits of 50 µg/m^3 which cannot be exceed on more than 35 calendar days and are below an annual limit value of 40 µg/m3; also, the 99.8th percentile of concentrations for NO_2 in the Scenario A are below an hourly limit value of 200 µg/m^3 which cannot be exceed on more than 35 calendar days and are below an annual limit value of 40 µg/m^3;
- in the ***Scenario C*** the 90.4th percentile of concentrations for are below the regulatory limits of 50 µg/m^3 which cannot be exceed on more than 35 calendar days and are below an annual limit value of 40 µg/m^3; Also the 99.8th percentile of concentrations for NO_2 in the Scenario A are below an hourly limit value of 200 µg/m^3 which cannot be exceed on more than 35 calendar days and are below an annual limit value of 40 µg/m^3 (evaluated in the Scenario B).

TABLE 20: MAXIMUM VALUES OF FALLOUT TO THE RECEPTORS (PM_{10}) FOR THREE SCENARIOS

RECEPTORS		Distance from the chimney [km]	SCENARIO A PM10 Avarege hourly value Annual limit value [40 μg/m3]	SCENARIO A PM10 Percentile 90.4 (PM10) Daily Limit Value [50 μg/m3]	SCENARIO B PM10 Avarege hourly value Annual limit value [40 μg/m3]	SCENARIO B PM10 Percentile 90.4 (PM10) Daily Limit Value [50 μg/m3]	SCENARIO C PM10 Avarege hourly value Annual limit value [40 μg/m3]	SCENARIO C PM10 Percentile 90.4 (PM10) Daily Limit Value [50 μg/m3]
R1	Verdala International School Pembrok	3,80 km	0.00023	0.00072	0.00039	0.00121	0.01170	0.03620
R2	Chiswick House School San Gwann	5,36 km	0.00009	0.00028	0.00016	0.00047	0.00464	0.01410
R3	St Catherine?s High School Pembroke	3,31 km	0.00032	0.00096	0.00054	0.00161	0.01610	0.04830
R4	St Michael?s School Pembroke	3,52 km	0.00032	0.00096	0.00053	0.00161	0.01590	0.04820
R5	St Michael?s Foundation San Gwann	3,92 km	0.00007	0.00024	0.00012	0.00040	0.00348	0.01190
R6	St Francis School San Gwann	5,10 km	0.00009	0.00028	0.00015	0.00047	0.00444	0.01420
R7	St Clare Primary College Pembroke	3,50 km	0.00025	0.00078	0.00041	0.00130	0.01240	0.03900
R8	Karmnu Sant Primary School Gharghur	2,22 km	0.00008	0.00024	0.00013	0.00039	0.00379	0.01180
R9	Bice Mizzi Vassallo Primary School P	3,40 km	0.00031	0.00093	0.00051	0.00156	0.01540	0.04690
R10	St Clare Secondary Pembroke	2,93 km	0.00043	0.00138	0.00073	0.00231	0.02180	0.06920
R11	Sprachcaffe Language School Pembroke	3,69 km	0.00022	0.00065	0.00037	0.00109	0.01100	0.03280
R12	San Miguel Resource Centre Pembroke	3,28 km	0.00038	0.00117	0.00063	0.00196	0.01880	0.05890
R13	M.U.S.E.U.M Pembroke	3,62 km	0.00023	0.00069	0.00039	0.00115	0.01160	0.03460
R14	Risen Christ Church Pembroke	3,56 km	0.00023	0.00069	0.00038	0.00116	0.01140	0.03480
R15	National Sports School Pembroke	3,42 km	0.00029	0.00090	0.00049	0.00151	0.01470	0.04540
R16	Simblija Care Home Naxxar	3,49 km	0.00001	0.00004	0.00002	0.00006	0.00060	0.00176
R17	Golden Care Retirement Home Naxxar	2,85 km	0.00002	0.00006	0.00003	0.00011	0.00082	0.00323
R18	Primary School Naxxar	3,24 km	0.00001	0.00004	0.00002	0.00006	0.00060	0.00185
R19	MRC Middle School Naxxar	3,65 km	0.00001	0.00003	0.00002	0.00006	0.00058	0.00171
R20	Giovanni Curmi Higher Secondary Naxx	3,69 km	0.00001	0.00003	0.00002	0.00006	0.00056	0.00169
R21	Naxxar Parish Church Naxxar	3,16 km	0.00001	0.00003	0.00002	0.00006	0.00054	0.00171
R22	St Clare?s Primary College San Gwann	4,72 km	0.00009	0.00026	0.00014	0.00043	0.00428	0.01300
R23	San Gwann Parish Chruch San Gwann	4,93 km	0.00009	0.00027	0.00014	0.00046	0.00431	0.01370
R24	Immaculate Mother of the Church Swie	3,69 km	0.00024	0.00074	0.00040	0.00124	0.01190	0.03710
R25	St Bartholomew Parish Church Gharghu	2,31 km	0.00011	0.00042	0.00019	0.00070	0.00564	0.02100
R26	Clubclass English School Swieqi	4,20 km	0.00016	0.00042	0.00026	0.00071	0.00777	0.02120
R27	Agricultural land Mag?tab	0,43 km	0.00003	0.00012	0.00005	0.00020	0.00156	0.00595
R28	?ona fil-Ba?ar madwar G?awdex - MT000	0,79 km	0.00017	0.00062	0.00029	0.00103	0.00875	0.03100
R29	?ona fil-Ba?ar bejn Il-Ponta ta? San	1,18 km	0.00017	0.00057	0.00028	0.00095	0.00833	0.02860
R30	L-G?adira s-Safra (MT0000008)	0,86 km	0.00022	0.00082	0.00037	0.00137	0.01120	0.04110
R31	Is-Salini (MT0000007)	1,94 km	0.00015	0.00057	0.00025	0.00095	0.00744	0.02850
R32	Triq ir-Ramla Mag?tab Residential &	0,78 km	0.00002	0.00007	0.00003	0.00011	0.00100	0.00335
R33	Triq Jules Verne Naxxar Residential	2,13 km	0.00003	0.00009	0.00005	0.00015	0.00148	0.00434
R34	Triq Fidel Zarb G?arg?ur Residential	1,88 km	0.00018	0.00065	0.00030	0.00109	0.00885	0.03280
R35	Dawret il-Qawra Qawra Residential Ar	2,01 km	0.00020	0.00065	0.00033	0.00109	0.00980	0.03270
R36	Triq Napuljun Tagliaferro Pembroke R	3,48 km	0.00024	0.00075	0.00040	0.00125	0.01190	0.03750
R37	Triq M. Pulis Birkirkara Residential	5,21 km	0.00003	0.00012	0.00005	0.00020	0.00161	0.00589
R38	Constitution Road Mosta Residential	4,04 km	0.00004	0.00011	0.00006	0.00018	0.00195	0.00541
R39	Triq San Guzepp San Gwann Residentia	4,95 km	0.00009	0.00027	0.00014	0.00046	0.00429	0.01370
R40	Parish Street St Paul?s Bay Resident	3,78 km	0.00010	0.00033	0.00017	0.00056	0.00500	0.01670
R41	Triq il-Maghsar Burmarrad Residentia	2,93 km	0.00013	0.00040	0.00022	0.00067	0.00671	0.02010
R42	Triq Preziosi Lija Residential Area	4,37 km	0.00001	0.00003	0.00001	0.00005	0.00045	0.00137
R43	Triq Balaguer Balzan Residential Are	4,85 km	0.00001	0.00005	0.00002	0.00008	0.00058	0.00231
R44	Triq Annabelle Preca Attard Resident	5,13 km	0.00001	0.00004	0.00001	0.00006	0.00045	0.00191
R45	Triq il-Harruba Iklin Residential Ar	3,56 km	0.00002	0.00007	0.00003	0.00012	0.00095	0.00350
R46	Triq L.Apap St Julian?s Residential	4,78 km	0.00020	0.00059	0.00034	0.00099	0.01010	0.02960
R47	Mater Dei Hospital Msida	5,49 km	0.00007	0.00023	0.00011	0.00038	0.00337	0.01140
R48	Tower Road Sliema Residential Area	5,81 km	0.00018	0.00054	0.00031	0.00090	0.00926	0.02710
R49	Farm at Triq il-Katakombi Salina	1,35 km	0.00031	0.00117	0.00052	0.00196	0.01570	0.05890
R50	Farm at Sqaq Habel Zwejra Maghtab	0,95 km	0.00021	0.00077	0.00036	0.00130	0.01070	0.03890
R51	Farm and fields at Triq Burmarrad Bu	2,86 km	0.00010	0.00034	0.00016	0.00057	0.00480	0.01700
R52	Farms at Bahar ic-Caghaq	1,06 km	0.00008	0.00028	0.00014	0.00047	0.00422	0.01400
R53	Agricultural land at Triq il-Wardija	3,02 km	0.00011	0.00034	0.00018	0.00057	0.00537	0.01700
R54	Agricultural land at Triq is-Sagra Fa	5,03 km	0.00008	0.00023	0.00013	0.00038	0.00380	0.01130
R55	Agricultural land Triq Sir Temi Zamm	5,32 km	0.00006	0.00019	0.00009	0.00031	0.00280	0.00934

TABLE 1. MAXIMUM VALUES OF FALLOUT TO THE RECEPTORS (NO_2) FOR TWO SCENARIOS

RECEPTORS		Distance from the chimney(km)	SCENARIO A NO_2		SCENARIO B NO_2	
			Avarege hourly value Annual limit value [40 μg/m3]	Percentile 99.8 (NO2) Hourly Limit Value [200 μg/m3]	Avarege hourly value Annual limit value [40 μg/m3]	Percentile 99.8 (NO2) Hourly Limit Value [200 μg/m3]
R1	Verdala International School Pembrok	3,80 km	0.00652	0.07920	0.01090	0.13300
R2	Chiswick House School San Gwann	5,36 km	0.00257	0.04750	0.00431	0.07960
R3	St Catherine?s High School Pembroke	3,31 km	0.00898	0.11100	0.01510	0.18600
R4	St Michael?s School Pembroke	3,52 km	0.00886	0.10300	0.01480	0.17200
R5	St Michael?s Foundation San Gwann	3,92 km	0.00197	0.06370	0.00331	0.10700
R6	St Francis School San Gwann	5,10 km	0.00246	0.04850	0.00413	0.08120
R7	St Clare Primary College Pembroke	3,50 km	0.00691	0.08740	0.01160	0.14700
R8	Karmnu Sant Primary School Gharghur	2,22 km	0.00218	0.18700	0.00365	0.31300
R9	Bice Mizzi Vassallo Primary School P	3,40 km	0.00860	0.10800	0.01440	0.18100
R10	St Clare Secondary Pembroke	2,93 km	0.01220	0.12700	0.02050	0.21300
R11	Sprachcaffe Language School Pembroke	3,69 km	0.00611	0.08170	0.01020	0.13700
R12	San Miguel Resource Centre Pembroke	3,28 km	0.01060	0.10900	0.01770	0.18400
R13	M.U.S.E.U.M Pembroke	3,62 km	0.00647	0.08360	0.01080	0.14000
R14	Risen Christ Church Pembroke	3,56 km	0.00637	0.08490	0.01070	0.14200
R15	National Sports School Pembroke	3,42 km	0.00822	0.10800	0.01380	0.18100
R16	Simblija Care Home Naxxar	3,49 km	0.00035	0.02770	0.00059	0.04640
R17	Golden Care Retirement Home Naxxar	2,85 km	0.00048	0.03880	0.00080	0.06500
R18	Primary School Naxxar	3,24 km	0.00035	0.02900	0.00059	0.04860
R19	MRC Middle School Naxxar	3,65 km	0.00034	0.02680	0.00057	0.04500
R20	Giovanni Curmi Higher Secondary Naxx	3,69 km	0.00033	0.02660	0.00055	0.04460
R21	Naxxar Parish Church Naxxar	3,16 km	0.00032	0.02780	0.00053	0.04650
R22	St Clare?s Primary College San Gwann	4,72 km	0.00239	0.05060	0.00401	0.08480
R23	San Gwann Parish Chruch San Gwann	4,93 km	0.00240	0.04940	0.00402	0.08280
R24	Immaculate Mother of the Church Swie	3,69 km	0.00662	0.10300	0.01110	0.17200
R25	St Bartholomew Parish Church Gharghu	2,31 km	0.00324	0.18500	0.00543	0.31000
R26	Clubclass English School Swieqi	4,20 km	0.00431	0.06420	0.00723	0.10800
R27	Agricultural land Mag?tab	0,43 km	0.00090	0.06640	0.00152	0.11100
R28	?ona fil-Ba?ar madwar G?awdex - MT000	0,79 km	0.00503	0.29900	0.00844	0.50000
R29	?ona fil-Ba?ar bejn Il-Ponta ta? San	1,18 km	0.00480	0.28100	0.00805	0.47000
R30	L-G?adira s-Safra (MT0000008)	0,86 km	0.00645	0.35800	0.01080	0.60000
R31	Is-Salini (MT0000007)	1,94 km	0.00428	0.18200	0.00718	0.30500
R32	Triq ir-Ramla Mag?tab Residential &	0,78 km	0.00059	0.03900	0.00098	0.06540
R33	Triq Jules Verne Naxxar Residential	2,13 km	0.00084	0.12300	0.00141	0.20600
R34	Triq Fidel Zarb G?arg?ur Residential	1,88 km	0.00509	0.22800	0.00853	0.38200
R35	Dawret il-Qawra Qawra Residential Ar	2,01 km	0.00562	0.18500	0.00943	0.31000
R36	Triq Napuljun Tagliaferro Pembroke R	3,48 km	0.00664	0.08740	0.01110	0.14600
R37	Triq M. Pulis Birkirkara Residential	5,21 km	0.00091	0.04480	0.00153	0.07510
R38	Constitution Road Mosta Residential	4,04 km	0.00109	0.05700	0.00183	0.09560
R39	Triq San Guzepp San Gwann Residentia	4,95 km	0.00239	0.04930	0.00401	0.08260
R40	Parish Street St Paul?s Bay Resident	3,78 km	0.00283	0.07260	0.00475	0.12200
R41	Triq il-Maghsar Burmarrad Residentia	2,93 km	0.00380	0.11000	0.00637	0.18500
R42	Triq Preziosi Lija Residential Area	4,37 km	0.00026	0.02340	0.00044	0.03920
R43	Triq Balaguer Balzan Residential Are	4,85 km	0.00034	0.03250	0.00056	0.05450
R44	Triq Annabelle Preca Attard Resident	5,13 km	0.00026	0.02160	0.00044	0.03630
R45	Triq il-Harruba Iklin Residential Ar	3,56 km	0.00055	0.05420	0.00092	0.09080
R46	Triq L.Apap St Julian?s Residential	4,78 km	0.00555	0.05760	0.00931	0.09660
R47	Mater Dei Hospital Msida	5,49 km	0.00188	0.04570	0.00315	0.07660
R48	Tower Road Sliema Residential Area	5,81 km	0.00506	0.04940	0.00849	0.08280
R49	Farm at Triq il-Katakombi Salina	1,35 km	0.00904	0.31300	0.01520	0.52400
R50	Farm at Sqaq Habel Zwejra Maghtab	0,95 km	0.00617	0.40900	0.01030	0.68600
R51	Farm and fields at Triq Burmarrad Bu	2,86 km	0.00271	0.10800	0.00454	0.18100
R52	Farms at Bahar ic-Caghaq	1,06 km	0.00243	0.23200	0.00408	0.39000
R53	Agricultural land at Triq il-Wardija	3,02 km	0.00306	0.10000	0.00513	0.16800
R54	Agricultural land at Triq is-Sagra Fa	5,03 km	0.00210	0.04870	0.00352	0.08160
R55	Agricultural land Triq Sir Temi Zamm	5,32 km	0.00154	0.04580	0.00258	0.07680

The dispersion model was used to define and calculate the areas in which the mass deposition rates on an annual daily basis are higher. The results obtained were then compared with the limits indicated in the TOR's and shown below in the table.

TABLE 21: LIMIT OF POLLUTANT

POLLUTANT	LIMIT
Dioxin/Furans	4 pg WHO-TE/m^2· day (bulk deposition)
Cd	2 μg/m^2 ·day (bulk deposition)
As	4 μg/m^2 ·day (bulk deposition)
Hg	1 μg/m^2 ·day (bulk deposition)
Pb	100 μg/m^2 ·day (bulk deposition)
Tl	2 μg/m^2.day (bulk deposition)

Corine land cover was used for the definition of the type of soil cover, this allowed to define the site-specific parameters for the calculation of the depositions. The results obtained are listed below with the individual conservative assessments:

- **Scenario A**
    - *Metals Group 1*

From the model results it emerges that the maximum daily concentrations (calculated as the sum of hourly deposits for a single day) are equal to 0.0098 μg/m^2-day, a much lower value than:

- the deposition limit imposed for Cadmium equal to 2 μg/m^2-day;
- the deposition limit imposed for Thallium equal to 2 μg/m^2-day;

This result is conservative because it comprises the total of Cd and Tl concentrations – metal of group 1-).

- *Metals Group 2*

From the model results it emerges that the maximum daily concentrations (calculated as the sum of hourly deposits for a single day) are equal to 0.0069 μg/m^2-day, a much lower value than:

- the deposition limit imposed for mercury equal to 1 μg/m^2-day.

- *Metals Group 3*

From the model results it emerges that the maximum daily concentrations (calculated as the sum of hourly deposits for a single day) are equal to 0.00486 μg/m^2-day, a much lower value than:

- the deposition limit imposed for Arsenic equal to 4 μg/m²-day;
- the deposition limit imposed for Nickel equal to 15 μg/m²-day;
- the deposition limit imposed for Nickel equal to 100 μg/m²-day.

This result is a conservative result because it comprises the total of Sb-As-Pb-Cr-Co-Cu-Mn-Ni-V concentrations –metal of group 3-).

- *Polychlorinated dibenzo-p-dioxins/ polychlorinated dibenzofurans (PCDD/F) + dioxin – like polychlorinated biphenyls (PCBs)*

From the model results it emerges that the maximum daily concentrations (calculated as the sum of hourly deposits for a single day) are equal to 0.0339 pg WHO-TE/m²-day, a much lower value than:

- the deposition limit imposed for Polychlorinated dibenzo-p-dioxins/ polychlorinated dibenzofurans (PCDD/F) equal to 4 pg WHO-TE/m²-day.

TABLE 22: COMPARISON OF THE TABLE LIMITS IN EIA TORS WITH THE MAXIMUM CONCENTRATIONS – SCENARIO A

POLLUTANT	LIMIT TABLE NO.4 OF TORS 08/05/2024	MASS DEPOSITION RATES ON ANNUAL DAILY BASIS MAX CONC DOMAIN	DISTANCE FROM THE CHIMNEY (KM) MAX CONC DOMAIN	HOURLY AVERAGE VALUE - MAX CONC ON RECEPTORS	DISTANCE FROM THE CHIMNEY (KM) MAX CONC ON RECEPTORS
Cd [μg/m².day]	2	0.0098	2.45	0.0085	2.93
Tl [μg/m².day]	2	0.0098	2.45	0.0085	2.93
Hg [μg/m².day]	1	0.0069	0.21	0.0009	1.18
Ni [μg/m².day]	15	0.0486	2.45	0.0414	2.93
As [μg/m².day]	4	0.0486	2.45	0.0414	2.93
Pb [μg/m².day]	100	0.0486	2.45	0.0414	2.93
PCDD/F + PCB [pgWHO-TE/m².day]	4	0.0339	2.45	0.0286	2.93

- Scenario B
  - *Metals Group 1*

From the model results it emerges that the maximum daily concentrations (calculated as the sum of hourly deposits for a single day) are equal to 0.0164 μg/m^2-day, a much lower value than:

- the deposition limit imposed for Cadmium equal to 2 μg/m^2-day;
- the deposition limit imposed for Thallium equal to 2 μg/m^2-day;

This result is conservative because it comprises the total of Cd and Tl concentrations –metal of group 1-).

- *Metals Group 2*

From the model results it emerges that the maximum daily concentrations (calculated as the sum of hourly deposits for a single day) are equal to 0.0115 μg/m^2-day, a much lower value than:

- the deposition limit imposed for mercury equal to 1 μg/m^2-day.
    - *Metals Group 3*

From the model results it emerges that the maximum daily concentrations (calculated as the sum of hourly deposits for a single day) are equal to 0.0814 μg/m^2-day, a much lower value than:

- the deposition limit imposed for Arsenic equal to 4 μg/m^2-day;
- the deposition limit imposed for Nickel equal to 15 μg/m^2-day;
- the deposition limit imposed for Nickel equal to 100 μg/m^2-day.

This result is conservative because it comprises the total of Sb-As-Pb-Cr-Co-Cu-Mn-Ni-V concentrations –metal of group 3-).

- *Polychlorinated dibenzo-p-dioxins/ polychlorinated dibenzofurans (PCDD/F) + dioxin – like polychlorinated biphenyls (PCBs)*

From the model results it emerges that the maximum daily concentrations (calculated as the sum of hourly deposits for a single day) are equal to 0.0568 pg WHO-TE/m^2-day (scenario 1), a much lower value than:

- the deposition limit imposed for Polychlorinated dibenzo-p-dioxins/ polychlorinated dibenzofurans (PCDD/F) equal to 4 pg WHO-TE/m^2-day.

TABLE 23: COMPARISON OF THE TABLE LIMITS IN EIA TORS WITH THE MAXIMUM CONCENTRATIONS – SCENARIO B

POLLUTANT	LIMIT TABLE NO.4 OF TORS 08/05/2024	MASS DEPOSITION RATES ON ANNUAL DAILY BASIS MAX CONC DOMAIN	DISTANCE FROM THE CHIMNEY (KM) MAX CONC DOMAIN	HOURLY AVERAGE VALUE - MAX CONC ON RECEPTORS	DISTANCE FROM THE CHIMNEY (KM) MAX CONC ON RECEPTORS
Cd [µg/m².day]	2	0.0164	2.45	0.0142	2.93
Tl [µg/m².day]	2	0.0164	2.45	0.0142	2.93
Hg [µg/m².day]	1	0.0115	0.21	0.0015	1.18
Ni [µg/m².day]	15	0.0814	2.45	0.0694	2.93
As [µg/m².day]	4	0.0814	2.45	0.0694	2.93
Pb [µg/m².day]	100	0.0814	2.45	0.0694	2.93
PCDD/F + PCB [pgWHO-TE/m².day]	4	0.0568	2.45	0.0479	2.93

- Scenario C

For Scenario C, the mass deposition rates on an annual daily basis are the same as those shown in Scenario B because in the simulation only modified the dust concentration, as defined by the limits in Schedule 2 of S.L.549.81.

The following table shows the maximum concentration values of the pollutants calculated on the calculation domain and on the receptors when compared with the air quality limits established in DIRECTIVE 2008/50/EC ON QUALITY ENVIRONMENTAL AIR AND CLEANER AIR FOR LIVING IN EUROPE (Table n°2 and Table n°3 of EIA TORs). The results obtained from the air dispersion model show lower values than the limits set in the EIA TORs for each Scenario.

TABLE 24: COMPARISON WITH LIMITS – SCENARIO A

POLLUTANT	TYPE	RESULT - MAX CONC ON DOMAIN	RESULT - MAX CONC ON RECEPTORS	LIMIT AS PER EIA TORS
	Value	0.002990	0.002291	Cd – 0.15 ng/m³

POLLUTANT	TYPE	RESULT - MAX CONC ON DOMAIN	RESULT - MAX CONC ON RECEPTORS	LIMIT AS PER EIA TORS
Average Hourly value of Group 1 elements [ng/m^3]	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of Group 2 elements [ng/m^3]	Value	0.002978	0.002271	Hg – 1.5 ng/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of Group 3 elements [ng/m^3]	Value	0.004563	0.003560	Pb – 15 ng/m^3 As – 0.18 ng/m^3 Ni – 0.60 ng/m^3 Cr – 0.50 ng/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of PCDD/F+ PCB [ng/m^3]	Value	0.011893	0.009057	70 fg WHO-TE/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average hourly value of PM_{10} [µg/m^3]	Value	0.000555	0.000433	1.2 µg/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of $PM_{2.5}$ [µg/m^3]	Value	0.000127	0.000097	0.6 µg/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of NO_2 [µg/m^3]	Value	0.016056	0.012200	1.2 µg/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93KM	
	Value	0.0000074333	0.0000011322	10 mg/m^3

POLLUTANT	TYPE	RESULT - MAX CONC ON DOMAIN	RESULT - MAX CONC ON RECEPTORS	LIMIT AS PER EIA TORS
Average Hourly value of TVOC [mg/m³]	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of HCl [mg/m³]	Value	0.0000008920	0.0000006793	6 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of HF [mg/m³]	Value	0.0000001487	0.0000001132	1 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of SO_2 [mg/m³]	Value	0.0000044600	0.0000033965	30 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average hourly value of NOx [mg/m³]	Value	0.0000178398	0.0000135858	120 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of NH_3 [μg/m³]	Value	0.0000014867	0.0000011322	10 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of CO [μg/m³]	Value	0.0000074333	0.0000056608	50 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93KM	

Table 25: Comparison with limits – Scenario B

Pollutant	Type	Result - Max Conc on domain	Result - Max Conc on receptors	Limit as per EIA TORs
Average Hourly value of Group 1 elements [ng/m^3]	Value	0.00501	0.003840	Cd – 0.15 ng/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of Group 2 elements [ng/m^3]	Value	0.00499	0.003807	Hg – 1.5 ng/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of Group 3 elements [ng/m^3]	Value	0.0076	0.005963	Pb – 15 ng/m^3 As – 0.18 ng/m^3 Ni – 0.60 ng/m^3 Cr – 0.50 ng/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of PCDD/F+ PCB [ng/m^3]	Value	0.01994	0.015183	70 fg WHO-TE/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average hourly value of PM_{10} [μg/m^3]	Value	0.00093	0.000726	1.2 μg/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of $PM_{2.5}$ [μg/m^3]	Value	0.00021	0.000162	0.6 μg/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of NO_2 [μg/m^3]	Value	0.02691	0.020500	1.2 μg/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93KM	

POLLUTANT	TYPE	RESULT - MAX CONC ON DOMAIN	RESULT - MAX CONC ON RECEPTORS	LIMIT AS PER EIA TORS
Average Hourly value of TVOC [mg/m³]	Value	0.0000024921	0.0000018979	10 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of HCl [mg/m³]	Value	0.0000014953	0.0000011400	6 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of HF [mg/m³]	Value	0.0000002492	0.0000001898	1 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of SO_2 [mg/m³]	Value	0.0000074763	0.0000056936	30 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average hourly value of NOx [mg/m³]	Value	0.0000299053	0.0000227743	120 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of NH_3 [µg/m³]	Value	0.0000024921	0.0000014867	10 mg/m³
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
	Value	0.0000124606	0.0000094893	50 mg/m³

POLLUTANT	TYPE	RESULT - MAX CONC ON DOMAIN	RESULT - MAX CONC ON RECEPTORS	LIMIT AS PER EIA TORs
Average Hourly value of CO [µg/m^3]	Receptor/ distance from chimney	0.78km	R10 – 2.93KM	

TABLE 26: COMPARISON WITH LIMITS – SCENARIO C

POLLUTANT	TYPE	RESULT - MAX CONC ON DOMAIN	RESULT - MAX CONC ON RECEPTORS	LIMIT AS PER EIA TORs
Average hourly value of PM_{10} [µg/m^3]	Value	0.00093	0.021800	1.2 µg/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	
Average Hourly value of $PM_{2.5}$ [µg/m^3]	Value	0.00021	0.004854	0.6 µg/m^3
	Receptor/ distance from chimney	0.78km	R10 – 2.93km	

The second phase of the study a 6-week monitoring was conducted to establish the baseline values of PM_{10} (*Skypost*) and 6-week monitoring was conducted to establish the baseline values of NO_2 (*Passam*), the results obtained from the monitoring are reported in this chapter.

The PM_{10} concentrations detected by monitoring from 23 September 2024 to 9 November 2024 were influenced, on some days, by "Sahara Dust" and are therefore excluded from the scope of this work. Such events were observed on October 3rd, 9th and 10th 2024.

The analytical results obtained in the six weeks of PM_{10} monitoring were compared with the data recorded from the Maltese "Air Quality" stations and in particular the four different types of stations, Gharb (Rural environment) and Msida (Traffic), Zetjun and Attard downloaded from the ERA website,

Below lies the data collected by the stations from October 2nd to November 4th from the ERA website and the printouts of the interactive maps downloaded from the ERA website on 3rd, 9th and 10th October. The statistical parameters obtained from the aforementioned baseline readings are summarised below:

TABLE 27: STATISTICAL PARAMETERS

AVERAGE	90,4° PERCENTILE	MIN	MAX	DEV.ST	MEDIAN
42.98	69.13	18.00	88.00	16.67	38.00

Considering a baseline value equal to 42.98 μg/m³, the annualization factor 0.85 the result of the CAA calculation is equal to 36.53 μg/m³.

The analytical results obtained in the six weeks of NO_2 monitoring are shown below.

Test Report Air Pollution Measurement

passam ag

air quality monitoring

NO2 Nitrogen dioxide measurement by means of passive sampler

customer information
customer: AIS Environment Ltd.
customer ID: MW
contact person: Sacha Dunlop
project: Air Quality Study for LPCM -
reference: for Thermal Treatment Facility

passive samplers
date received: 06.11.2024
type: tube (Palmes)
pollutant: NO2
limit of detection: 0.5 ug/m3 (14 days)
sampling rate: 0.734 [ml/min]
protective filter: yes

analysis
method: SP01 photometer, Salzmann
analyte: NO2
date: 12.11.2024
place: passam ag

test report
created on: 13.11.2024
created by: K. Bodci
checked on: 13.11.2024
checked by: I. Hangartner
file name: MA012401
pages: 1

note: applies to the sample as received, results below the detection limit are indicated with "<" and the associated value, this method is accredited to ISO/IEC 17025; measurement uncertainty <25%, sampling rate related to 20 °C, further information at www.passam.ch

measuring site	passive sampler label	passive sampler lot no.	measuring period start date	start time	end date	end time	exp. time [h]	measurement blank [AUS]	sample dilution	sample value [AUS]	result m analyte/sampler [ug]	result C NO2 [ug/m3]	Comment on the analysis
35.938010, 14.449480	MAI-1	45482	23/09/2024	13:45	14/10/2024	14:08	504.4	0.002	1	0.113	0.25	11.1	
35.938010, 14.449480	MAI-10	45482	23/09/2024	13:45	14/10/2024	14:08	504.4	0.002	1	0.113	0.25	11.1	
35.938010, 14.449480	MAI-3	45482	14/10/2024	14:08	04/11/2024	13:45	503.6	0.002	1	0.132	0.29	13.0	
35.938010, 14.449480	MAI-4	45482	14/10/2024	14:08	04/11/2024	13:45	503.6	0.002	1	0.131	0.29	12.9	

The statistical parameters obtained from the aforementioned baseline readings are summarised below:

TABLE 28: STATISTICAL PARAMETERS NO_2

AVERAGE	99,8° PERCENTILE	MIN	MAX	DEV.ST	MEDIAN
12.04	13.02	11.1	13.03	1.08	12.02

Considering a baseline value equal to 12.04 μg/m³, the annualization factor 0.96 the result of the CAA calculation is equal to 11.56 μg/m³.

4.10 NOISE & VIBRATIONS

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 110.

- 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 110: BASELINE SOUND MONITORING LOCATIONS

Observations of the acoustic environment were made during the baseline sound survey periods for both monitoring locations and are included in Table 29.

TABLE 29: 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.

LOCATION	DATE	TIME STAMP	CRITICAL LISTENING OBSERVATIONS
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.

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.

The results of the sound survey are summarised in Table 30 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 30: Sound Survey Summary

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

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

4.11 Infrastructure & Utilities

Table 31 below provides an outline of the existing and/or planned infrastructure and utilities present within the AoI.

Table 31: Existing infrastructures and utilities

Feature Name	Feature Type	Owner
Street lighting	Underground cables, street lamps	Wasteserv Malta
Fencing	Boundary wall and mesh fencing	Wasteserv Malta
Power cables	Underground power cables	Enemalta
Internet cables	Aerial internet cables	GO Mobile

Figure 111 to Figure 113 provide photographic evidence of the infrastructure and utilities observed during the site survey held in July 2024.

Figure 111: Street light around the existing ECOHIVE complex buildings

FIGURE 112: BOUNDARY WALL AND FENCING AROUND THE EXISTING ECOHIVE FACILITY BUILDINGS

FIGURE 113: GO MOBILE AERIAL CABLES WITHIN THE AOI

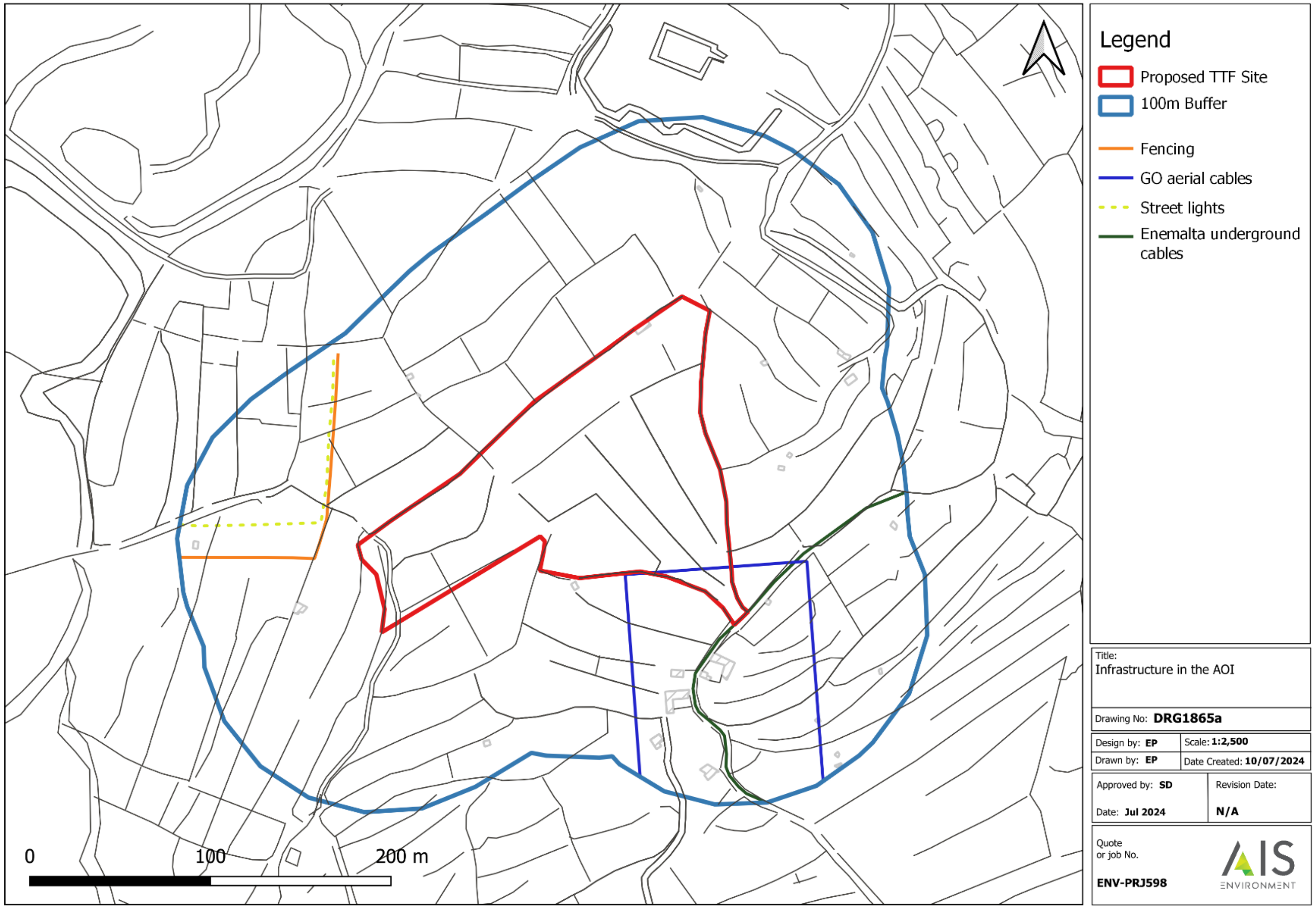


FIGURE 114: OVERVIEW OF THE EXISTING UTILITIES WITHIN THE AOI

5 ASSESSMENT OF ENVIRONMENTAL IMPACTS & RISKS

5.1 LAND/SEA COVER AND LAND/SEA USES

5.1.1 Construction Phase

Spillover effects may be caused by the temporarily storage of excavated material and access provisions for construction vehicles. Temporary facilities for construction personnel may also need to be set up close by during the construction phase. All site activities should be contained within the approved site footprint to minimise/eliminate spillover effects. The agricultural land, trees and residential buildings within the 100m buffer zone may be temporarily affected by the generation of dust which is envisaged during the construction phase. In the case of agricultural land, dust deposition on crops may decrease yield and affect the overall pH of the soil if deposited in large amounts. Mitigation measures such as site hoarding, wheel washing facilities and other dust mitigation measures are necessary to contain the adverse impacts caused by activities of the construction phase to the designated site footprint. With all appropriate mitigation measures in place, these activities are considered temporary, reversible and of minor adverse significance.

5.1.2 Operational Phase

The proposed development will give rise to a permanent change of land use to accommodate the 18,185m^2 area of the proposed TTF. The existing land use comprising of indigenous trees, rubble walls and agricultural land within the site boundary will be changed permanently. The impact is considered adverse and of major significance on the existing land use. The residual impacts are mitigated in terms of the proposed tree plantations around the new building, as the proposal includes 83m^2 of landscaping around the storage building, and an additional 32m^2 around the administration building at ground floor. Additional landscaping elements will be included at the periphery of the development to minimise visual impacts. These parcels may include a proportion of the original trees, while the remaining transplanted trees and additional specimens required as compensation will be planted in the vicinity of the site. The exact location will be determined at a later stage.

The operational phase may give rise to further impacts on the land use in the event of incidents such as fuel spills, fires, water leaks causing flooding or other extreme events which will only constitute indirect impacts from the site operations and can be substantially mitigated and/or prevented in their entirety. For this reason, the potential impacts are considered of remote probability, but potentially major significance, which will be reduced to minor residual significance if the appropriate Emergency Response Plan is in place.

5.2 LANDSCAPE CHARACTER AND VISUAL AMENITY

5.2.1 Construction Phase

Construction activities associated with the proposed Thermal Treatment Facility (TTF) will be visible from all seven viewpoints analyzed in this assessment. The use of cranes, excavation machinery, fencing, stockpiles, and other equipment will temporarily alter the visual character of the landscape from these viewpoints. However, due to the slightly smaller footprint of the TTF compared to the adjacent MRF, OPP and WtE facilities, the conspicuousness of construction activities is anticipated to be less discernible at greater distances but more pronounced in closer proximity, depending on the viewing angle.

The degree of visual impact during construction works is expected to vary based on the specific characteristics of each viewpoint and the timing of works on site. Overall, the impacts are assessed to range from moderate to major adverse, contingent on factors such as proximity, the presence of skyline intrusion, and existing screening elements.

Viewpoints closer to the site, notably VP3 and VP4, will experience the most significant visual impacts. From these vantage points, observers will have direct, short-range views of the construction activities, including detailed visual exposure to cranes and other machinery. The partial intersection of these elements with the skyline further exacerbates the visual impact, resulting in a major adverse effect on visual amenity. Similarly, VP5 and VP7, due to their elevation and orientation, are likely to capture the presence of tall construction equipment, further amplifying the visibility of activities at these locations.

At Viewpoints 1, 2, and 6, the visibility of construction operations is anticipated to be less pronounced. Factors such as the rugged terrain of the landfill in the background and partial screening by vegetation, existing structures, or walls help to moderate the visual impact from these locations. Consequently, while construction activities remain noticeable, their impact on these viewpoints is classified as moderate adverse.

The sensitivity of the landscape and viewpoints must also be considered when evaluating the construction-related impacts. Although the TTF site is not located within an Area of High Landscape Sensitivity, Viewpoints 1, 2, 6, and 7 fall within such designated areas under the CENTRAL MALTA LOCAL PLAN (CG22). The encroachment of construction activities, including potential simultaneous works at the adjacent Materials Recovery Facility (MRF), Waste-to-Energy (WtE), and Organic Processing Plant (OPP) facilities, will further diminish the landscape quality of the area. The cumulative effect of these overlapping construction activities is expected to degrade the character of the surrounding agricultural land near the landfill, leading to significantly adverse landscape impacts for these viewpoints.

Closer to the site, the landscape at Viewpoints 3 and 4 will be dominated by visible construction machinery, potential dust dispersion, and associated non-visual impacts such as noise and vibration. Viewpoint 5, a major route along Triq il-Kosta, will also be subject to noticeable construction impacts experienced by a high volume of daily commuters. The cumulative construction activities across the TTF, MRF, WtE, and OPP facilities will result in significant adverse effects on the landscape for these locations.

Given the combined visibility of the TTF, MRF, WtE, and OPP construction activities, the overall impact on both visual amenity and landscape quality is substantial, particularly for the highly sensitive viewpoints. The cumulative construction activities will detract from the landscape's character and visual experience, affecting a wide range of receptors who frequent these locations daily.

5.2.2 Operational Phase

The proposed Thermal Treatment Facility (TTF) building occupies a prominent position at the forefront of the ECOHIVE complex. While the building is substantial in size and features significant industrial components, careful consideration has been given to minimizing its visual impact. Key measures include recessing large 6-meter tanks into the ground to reduce their apparent size and integrating soft landscaping along the ring-road. Additionally, the design incorporates the shortest possible stack to meet air dispersion requirements, further reducing the structure's visual prominence. Comparatively, the TTF building is notably smaller in footprint and overall scale than the adjacent Materials Recovery Facility (MRF), Organic Processing Plant (OPP), and Waste-to-Energy (WtE) facilities.

Given its strategic location at the forefront of the complex, the TTF building has been designed with distinct visual elements to enhance its identity while blending with the surrounding landscape. The façade prominently features the name of the ECOHIVE complex, accompanied by a bold yet contextually inspired color palette. The yellow tones on the façade evoke the imagery of a hive and nearby wheat fields, the reddish-brown hues reflect the adjacent soil and bougainvillea plants, and the bluish shades used on the stack and tanks symbolize the sky and agricultural tools commonly found in the area. These unconventional color choices, while somewhat striking, have been carefully selected to resonate with the concept of designing a facility that resembles the presence of toys in a field.

To further mitigate visual impacts, the facility has been segmented into three distinct sections, creating visual interest through form and connection, as well as through the thoughtful application of color. The unconventional hues have been deliberately subdued to harmonize the facility with the surrounding landscape and the façades of neighboring facilities, ensuring the building integrates seamlessly into its context. These design, layout, and landscaping considerations collectively demonstrate a commitment to balancing functionality with sensitivity to the visual and environmental character of the area.

Despite the above efforts, the structural elements are expected to induce certain adverse landscape and visual impacts. The building commands a substantial presence especially when viewed in isolation. When the building is juxtaposed against the adjacent MRF, WtE and OPP facilities, the TTF becomes somewhat subdued in scale. Consequently, the extent of the building's visual impact varies, ranging from minor to major significant adverse effect. These impacts hinge on multiple factors, including the observer's vantage point and the presence of intervening elements that either obscure or merge the TTF into the surroundings.

From Viewpoint 1, the Thermal Treatment Facility (TTF) building would partially obscure the proposed OPP facility. However, the visibility of other WSM facilities would remain largely unaffected by the physical presence of the new building. Although the TTF's 25-meter stack may introduce a slight obstruction to the sea views, this effect is negligible and virtually imperceptible due to the significant viewing distance and the relatively short and narrow dimensions of the chimney. The visual landscape from this viewpoint is predominantly influenced by the other architectural elements of the ECOHIVE complex. As a result, the overall visual impact from Viewpoint 1 is assessed as minor adverse.

Viewpoint 2 provides a perspective similar to that of Viewpoint 1 but at a closer range, resulting in a slightly greater prominence of the TTF within the landscape. Positioned at the forefront of the ECOHIVE complex, the TTF building leads the cluster of waste management facilities. However, its visual impact is mitigated by the dominance of the larger surrounding structures. While the façades of the building are somewhat more noticeable due to their placement, the use of subdued and contextually appropriate hues allows it to harmonize with the surrounding environment and the adjacent buildings. As a result, within the broader visual context of the site, the TTF building does not draw significant attention despite encompassing a 25m chimney stack. Consequently, the visual impact from Viewpoint 2 is assessed as minor adverse.

From Viewpoint 3, observers are presented with a detailed perspective of the proposed TTF. The WSM buildings, though architecturally varied, appear visually cohesive from this vantage point, creating an impression of a unified structure without distinct spatial divisions. The TTF's relatively modest height and strategic positioning allow it to be entirely obscured by the larger facilities behind it. Set against a backdrop of existing WSM infrastructure, the TTF integrates harmoniously into the ECOHIVE complex without introducing any substantial visual disruption. While a noticeable reduction in trees and vegetation can be observed when comparing the photomontage to the baseline photograph, this change is of moderate significance within the broader context of the landfill and the industrial surroundings.

Viewpoint 4 provides another close-range perspective of the proposed TTF. Similar to the observations from Viewpoint 3, the relatively modest height of the TTF is overshadowed by the adjacent, more prominent structures within the complex. At this proximity, the distinctive façade colouration of the TTF becomes more evident, along with the complex's name prominently displayed on the top-right corner of the building. The selected hues effectively integrate with the surrounding environment, contributing to visual cohesion. The 25-meter chimney stack interrupts the skyline from this angle; however, its blue colouration serves as a mitigating factor, softening its visual impact.

This choice of color, mirroring the sky, also creates an illusion of spatial separation and reduces visual clutter, particularly in conjunction with the nearby tanks. Despite these design efforts, a clear contrast emerges when comparing the baseline photograph with the photomontage. The rural and characteristic landscape, marked by fields and trees, will be noticeably altered to accommodate the development, resulting in a stark visual transformation. Nevertheless, considering the dominance of the adjacent facilities that would shape the overall visual context in the future, the impact from this viewpoint is classified as moderately adverse.

The TTF does not break the skyline at Viewpoint 5 thanks to the adjacent Zwejra landfill in the background. The terraced rubble walled fields along with the adjacent trees provide some visual masking of the front sections of the site which include the ring road. The bluish hues of the stack are more conspicuous as the sky does not act as a backdrop from this viewing angle. The spatial segregation between all four facilities at the ECOHIVE complex is clearly delineated from this vista. The spatial extent of the building is very evident from this viewpoint. The TTF provides a physical and structural link between the OPP and WtE facilities which lies to the right side of the vista, and the MRF which lies on the left side, thus bringing together the cluster of buildings that make up the ECOHIVE complex. The impact is categorized as moderate adverse within the context of the adjacent WSM facilities which are significantly larger in size and structure.

From Viewpoint 6, the proposed TTF is partially obscured by existing rubble walls and soft landscaping. Despite this, the facility integrates harmoniously into its setting, without interrupting the skyline, as it is framed by the dominant presence of the Ghallis landfill, the OPP, the Anaerobic Digester (AD), and the WtE facility. The spatial relationship among these facilities is apparent, though a lack of similarity in their architectural design is noticeable. The visual impact from this viewpoint is assessed as minor adverse, reflecting the minimal disruption of the TTF building to the overall view along this section of the road.

Viewpoint 7 provides an extensive view of the ECOHIVE complex, showcasing all five existing and/or proposed structures from left to right: the MRF, AD, TTF, OPP, and WtE facilities. This viewpoint is popular among visitors who come to enjoy the vast coastal views, despite the ongoing landfilling and waste management activities that somewhat detract from the scenery. The TTF, positioned at the front of the complex, stands out, though it is smaller in comparison to the larger OPP and WtE facilities behind it. It occupies a significant portion of the horizontal view, blending with nearby WSM structures. However, due to the expansive landfill backdrop, the TTF does not disrupt the skyline, somewhat reducing its visual impact. The unusual bluish and reddish hues of the TTF structures and equipment are noticeable but merge fairly well with the foreground. The overall impact is rated as moderately adverse.

When evaluating landscape impacts, it is important to consider the sensitivity of the viewpoints under analysis. Although the Scheme site itself is not situated within an Area of High Landscape Sensitivity, Viewpoints 1, 2, 6, and 7 are classified as such according to the CENTRAL MALTA LOCAL PLAN, CG22. The simultaneous operation of multiple waste management facilities will significantly affect the landscape quality from these viewpoints, particularly as they encroach upon adjacent agricultural land. As a result, the operational impacts on the TTF are expected to be major adverse from these four viewpoints.

At Viewpoints 3 and 4, the TTF building will be observable from the immediate landscape, while at Viewpoint 5, it will be visible to daily commuters along Triq il-Kosta. The ongoing construction activities across all three waste management facilities will also create notable adverse effects from these viewpoints.

Concerns about light pollution during the operational phase are another consideration. Without effective mitigation measures, residual light could lead to nightscape glare, disrupting residents' sleep patterns, disorienting birds, attracting pests, and interfering with wildlife behavior. However, the impact assessment rates these concerns as minor adverse. Various measures will be taken to address these issues, such as installing lighting fixtures that minimize light pollution, ensuring the development functions smoothly within its nighttime environment.

5.3 GEOLOGY, GEOMORPHOLOGY, HYDROGEOLOGY AND SOILS

5.3.1 Construction Phase

The type of waste which will be generated includes various streams such as construction waste, excavated rock, domestic waste and wastewater. The topsoil, was removed as part of the general development plan of the ECOHIVE Complex.

Although of limited site extent, soil removal can generate major impacts related to erosion and sedimentation. When the topsoil is removed, it exposes underlying rock layers, making them more susceptible to erosion by wind and water. This can lead to a loss of fertile soil and degradation of the land. Additionally, eroded materials can be transported to nearby watercourses, causing sedimentation that may harm aquatic ecosystems by disrupting habitats and reducing water quality. Surrounding agricultural fields may also be affected due to nutrient depletion in topsoil which can lead to reduced crop yields and overall agricultural productivity.

The amount of excavation rock will vary according to the designed layout; it will range between 16,800 and 29,300m^3. The likelihood of reusing this material free of contaminants is discussed as part of this EIA in compliance with ERA requirements.

A significant amount of geological rock will be lost through the construction of the proposed TTF leading to a moderate impact. This loss is primarily due to the extensive excavation required to prepare the site for development. The excavation process will not only remove surface layers but also disrupt underlying geological formations.

The geological impact of this construction extends beyond mere rock removal. The disturbance of the site can lead to increased erosion and sedimentation in surrounding areas, affecting local ecosystems and water quality. Dust generated during excavation may disperse into the environment, potentially contaminating nearby watercourses and affecting biodiversity.

Excavation and construction activities may lead to additional indirect impacts, particularly through the generation of fine particulate matter. This particulate matter can disperse beyond the boundaries of the development site due to wind and stormwater runoff. Dust carried by the wind may settle on the ground and be transported away from the site through rainwater runoff into adjacent protected valley systems or infiltrate underground.

The bioaccumulation of particulate matter resulting from dust dispersion during construction activities poses a threat to the geological and hydrological environment. Contaminant concentrations can increase in accumulation areas, creating a burden on human health. Potential impacts include:

- Pollution of geological layers;
- Decreased quality of surrounding soils used for agriculture;
- Pollution of watercourses and the marine environment.

The environmental impact is likely to be major; however, mitigation measures need to be implemented to minimize dust dispersion into the environment.

The ground investigations have established that it is likely to have the building under development based on several foundations being supported directly on the rock. Several factors shall be taken into account during the design stage of the building foundations. These factors include:

- Failure mechanisms
    - Bearing capacity failure (or rotational failure) below strip and pad foundations;
    - Intense bearing pressures as a result of eccentric foundations close to the site perimeter.
- Excessive differential settlement of foundations on rock
    - Soil-infilled cracks can be compressed under the applied structural loads;
    - Weathered rock.

Although the bearing rock exhibits high stability parameters, the impact is likely to be moderate due to the intensity of fractures disrupting the compact rock matrix. The forecast of geotechnical instability factors incorporated in the final design of foundations will further reduce the risk of building collapse.

5.3.2 Operational Phase

The treatment of waste through a TTF results in various types of emissions and effluents during the waste treatment processes. The primary categories can be described as follows:

- **Greenhouse Gas Emissions**
  - Methane (CH_4): potentially emitted during the period before incineration in the kiln;
  - Nitrous Oxide (N_2O): potentially released during the thermal treatment;
  - Carbone Dioxide (CO_2): released during the combustion of organic materials.
- **Air Pollutants**
  - Volatile Organic Compounds (VOCs): emitted from the waste treatment process, particularly during the handling and storage of waste materials;
  - Particulate Matter (PM): generated from combustion processes.
- **Solid Residues**
  - Ash and Sludge: may contain heavy metals and other hazardous materials. This requires careful management and disposal to prevent soil and water contamination.
- **Liquids**
  - Leachate: in some cases, it can form from stored waste materials, especially if not fully contained. This leachate may contain a variety of contaminants that can pose risks to groundwater and surface water bodies.
  - Wastewater: wastewater will be produced from administration offices or related use of plant employees' restrooms. Proper management of wastewater has been planned through an appropriate water management report.

All the substances listed above, which are released during the collection, storage, and incineration of waste in a TTF, pose a major impact on soil and water environmental matrices. All of these hazards require careful monitoring and management to mitigate their environmental impact. Mitigation measures aimed at halting the emission and dispersion of the above listed hazards likely resulting from the operation of the TTF are described in the following chapter and in greater detail in technical requirements, design, and water management reports.

As part of the air dispersion model carried out in this EIA, a 6-week air quality monitoring campaign was undertaken with the objective of identifying the average daily concentrations of PM_{10} and NO_2. This study revealed that the forecasted annualization factors of 0.85 and 0.96, for PM_{10} and NO_2 respectively achieved a Corrected Annual Average (CAA) significantly lower than the Annual Limit Value (ALV). Moreover, the development of the deposition fallout model at a stack height of 25m shows that there are no significant variations in the impacts on air quality. The only receptor worth mentioning corresponds to an agricultural land (35°56′22.21″N, 14°26′45.34″E) located 0.43km away from the chimney stack. However, the forecasted impact is minor adverse.

5.4 Water Bodies

5.4.1 Construction Phase

The construction target date for the Scheme is still unknown but the overall construction phase should not take more than 19 months. The site works envisaged during the construction of the new TTF are the following:

- Excavation of rock in the proposed sites and construction of the proposed structures. This may cause release of fines to the environment by wind or runoff.
- Storage of excavated stone material and soil. On windy or rainy days this may release fines to the environment.
- Storage of contaminating substances. Contaminating substances should not be handled on site.
- Use of heavy machinery and heavy vehicles. This may lead to dust generation with negative impacts on runoff and coastal waters.
- Paving of the site will render it impermeable. This activity is accompanied by generation of runoff and loss of recharge to the Mean Sea Level Aquifer (MSLA).
- Pesticides and fertilisers may be applied for maintenance of landscaped areas. Such activities may have a negative impact on the MSLA during operation of the site.

The potential impacts arising from the construction of the proposed facility on water bodies can be listed as follows:

- Contamination of the Malta Mean Sea Level Aquifer (MSLA) via percolation of contaminants through surface vulnerability features is likely to be minor because of the brackish nature of the freshwater-lens system in this area and the lack of downstream groundwater abstraction sources.
- Spreading of contamination through Wied ta' Kieli and its tributaries originated with the Scheme (red channels in Figure 70) is likely to be moderate adverse due to the relatively high residence time of the surface water flow.
- If pollutants reach L-Għadira s-Safra and the coastal area at Qalet Marku, degradation of these coastal water bodies are likely to occur. Moderate adverse impacts are forecasted on the receptors if precautionary measures to minimize the risk of pollution are not undertaken.

5.4.2 Operational Phase

The operation of the proposed Thermal Treatment Facility (TTF) presents several potential environmental and safety concerns that require thorough examination and mitigation strategies. These impacts range from moderate to major in severity and encompass various environmental aspects.

Due to the water scarcity conditions typical of Mediterranean countries, the proposed TTF was designed with the twofold objective of reducing environmental impacts and minimizing water demand required for the operation of the plant. In particular, the implementation of alternative water resource techniques has been sought to supply the facility with water streams that supplement the public distribution system. While wastewater reuse will be encouraged, rainwater harvesting techniques will be implemented to collect rainfall during the wet season and reuse it when required.

An overview of the water balance at the proposed TTF is provided in Table 32.

TABLE 32: WATER BALANCE OVERVIEW

WATER BALANCE OVERVIEW	RAINWATER INCLUDED		WITHOUT RAINWATER
	ANNUM FLOW RATE [M^3/YEAR]	DAILY FLOW RATE [M^3/DAY]	DAILY FLOW RATE [M^3/DAY]
Total need for potable water	2,333	6	18
Total water recovery	10,086	27.6	15.8
Total reject produced	1,670	4.6	3.8

In the absence of mitigation measures aimed at reducing the risk of contamination of water bodies, potential impacts arising from the operation of the proposed TTF can be listed as follows:

- Spillage of hazardous liquids represents a moderate adverse impact. This impact arises from the handling and storage of various chemicals and substances including hazardous waste. Potential scenarios include accidental releases during transfer operations, leaks from storage tanks or pipelines, and overflow incidents due to equipment malfunction.
- Major accidents could generate major impacts on sensitive receptors in the surrounding area. These accidents might include large-scale fires or explosions, significant chemical releases, and structural failures leading to widespread contamination.
- Pesticides and fertilisers are likely used in landscaped areas for pest control, aesthetic maintenance, and vegetation management. Excessive use of pesticides and fertilisers poses a moderate adverse impact due to the potential release of such contaminants into the environment. This impact may extend beyond the landscaped area at the TTF and target watercourses, groundwater, and wildlife.

- The impermeabilization of rocky outcrops reduces the area available for natural water infiltration, potentially exacerbating existing groundwater depletion issues. In coastal areas, this can lead to saltwater intrusion into freshwater aquifers, compromising water quality and availability for both human use and ecosystem functioning. This impact is likely to be major adverse.
- The cumulative impact on additional runoff volumes generated through land impermeabilization of the ECOHIVE Complex is a critical aspect that is addressed in detail in the subsequent chapter. This impact is linked to the overall design and footprint of the facility as part as the thorough development at Maghtab, affecting hydrological patterns and potential flood risks in the surrounding area.

As part of the air dispersion model carried out in this EIA, a 6-week air quality monitoring campaign was undertaken with the objective of identifying the average daily concentrations of PM_{10} and NO_2. This study revealed that the forecasted annualization factors of 0.85 and 0.96, for PM_{10} and NO_2 respectively achieved a Corrected Annual Average (CAA) significantly lower than the Annual Limit Value (ALV). Moreover, the development of the deposition fallout model at a stack height of 25m shows that there are no significant variations in the impacts on air quality. The only receptor worth mentioning corresponds to an agricultural land (35°56′22.21″N, 14°26′45.34″E) located 0.43km away from the chimney stack. However, the forecasted impact is minor adverse.

As previously mentioned, 5% of the total area of Wied Ta' Kieli water catchment basin will be converted from agricultural to industrial area following the full development of the ECOHIVE Complex, which includes the proposed TTF. Although rainwater will be harvested and reused to the extent possible, the capacity of the storage tanks and water treatment facilities may be exceeded during intense storm events, and hence, discharged into the environment. In this chapter, the impact of flooding is assessed by considering the worst-case scenario where no rainfall is harvested.

The cumulative impact of increased runoff volumes induced by the impermeabilization of land was assessed as part of this study and compared to current flood discharge values. This land use scenario at the catchment level leads to an increase in the CN value from 78 to 82. According to Table 33, the full development of the ECOHIVE Complex is likely generate more than 2 m^3/s at the outlet of the catchment basin for rainfall events of high probability of occurrence. Increased runoff rates decrease with less likely probabilities of rainfall depths occurrence.

Therefore, the resulting impact of land impermeabilization on runoff flow rates is likely to be moderate adverse generating flash floods.

Table 33: Comparative analysis of runoff rates between current and future development scenarios

	Q(T = 5 years)	Q(T = 50 years)	Q(T = 200 years)
No development or current scenario	3.45 m^3/s	13.82 m^3/s	21.62 m^3/s
Full development of the ECOHIVE Complex	5.63 m^3/s	18.25 m^3/s	27.17 m^3/s
Percentage of increase	63%	32%	26%

5.5 Ecology - Terrestrial

5.5.1 Construction Phase

The project will directly impact approximately 85 individual trees, 50 of which are protected species comprised predominantly by Carob trees (40 - additional 5 dead individuals), followed by Lentisk trees (4) and Olive trees (1). Some individuals of the Caper bush may also be affected.

A percentage of the pre-existing mature trees may be relocated to the perimeter of the site[29], which will feature a landscaping scheme of circa 7,240 sqm. The landscaping scheme as currently proposed features 67 trees and shrubs, as described in Table 34.

The relocation or removal of trees will be determined by the soil depth, which will be confirmed at the start of the excavation phase. Should the soil depth be confirmed as too shallow to remove the full root ball without damages, the trees will be removed and not transplanted as the chance of survival is low.

Adequate compensation will be provided as advised by the ERA within the planned planting scheme or in the near vicinity of the site, with care taken to plant a cohort of species typical of the ecosystems expected within maquis habitats.

Table 34: Proposed Landscaping plan tree species

Scientific name	English name	Quantity
Olea europaea	Olive tree	25
Ceratonia siliqua	Carob tree	8

[29] Additionally, an area to the South of the TTF proposed site is earmarked for relocation of mature specimens particularly of Ceratonia siliqua (Carob trees)

SCIENTIFIC NAME	ENGLISH NAME	QUANTITY
Tamarix africana	African tamarisk	10
Laurus nobilis	Bay laurel	5
Rosmarinus officinalis prostratus	Rosemary	19
Total individual trees/shrubs		**67**
Landscaped area		**Circa 7,240 m^2**
Green roof area		**Circa 30 m^2**

The removal of these trees is not only an impact on the individuals themselves, but also to a host of fauna which may have utilised the pre-existing maquis habitat for their foraging, resting and breeding activities. Species such as birds, bats, hedgehogs and several species of reptiles and insects will lose a significant area of suitable habitat, and the overall area will continue to deteriorate due to natural habitat loss and fragmentation. However, one should note that no protected habitats will be directly impacted by the development in this regard.

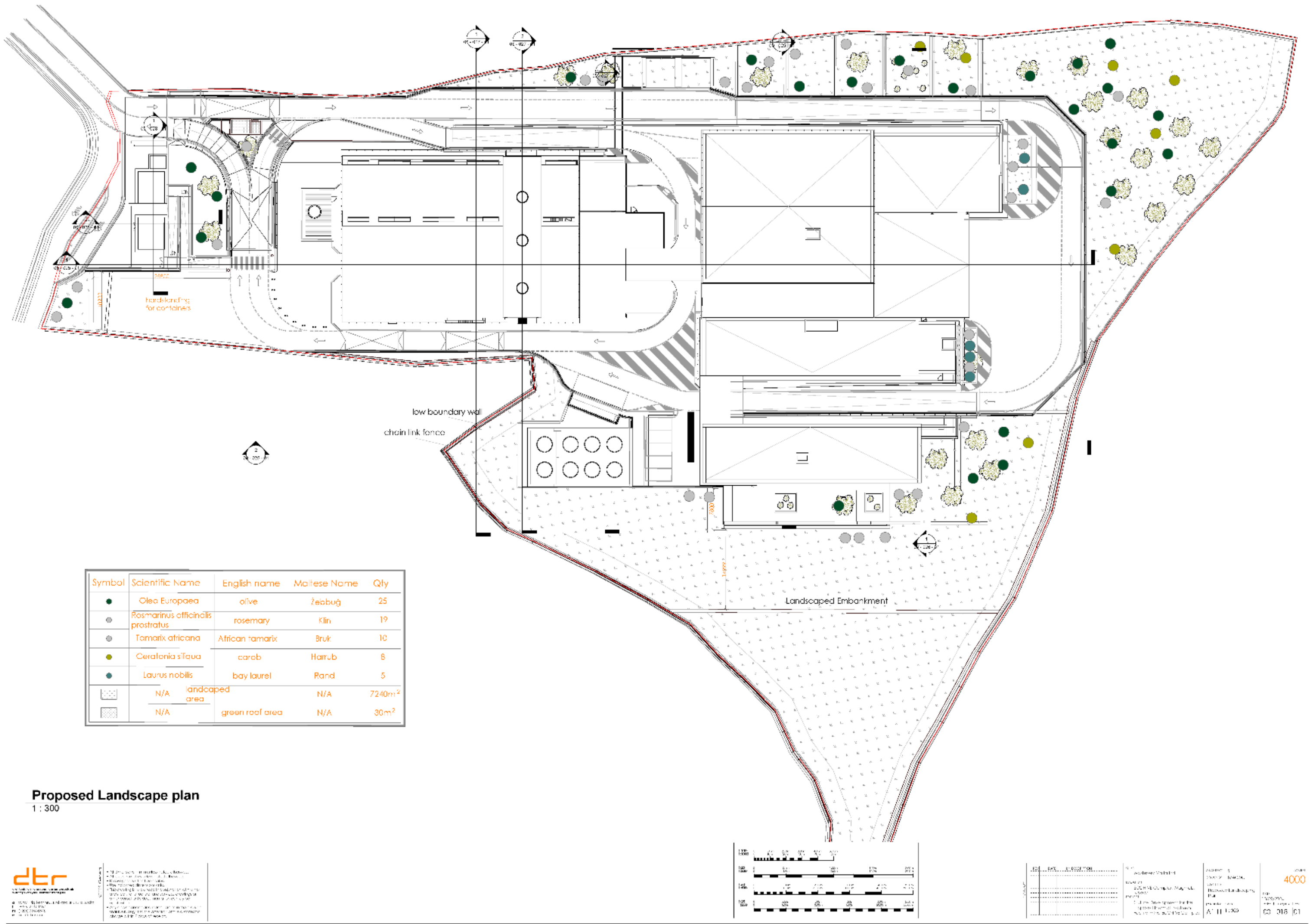


FIGURE 115: PROPOSED LANDSCAPING PLAN

There are no expected impacts on marine species as a consequence of the construction activities currently proposed.

The proposal also included the removal of all the topsoil layer of the site footprint, which comprises a considerable area (circa 18,185m²) which included numerous rubble walls, in various condition. The removal of topsoil was permitted by the Superintendence of Cultural Heritage in September 2022, subject to TORs issued by the Superintendence which required constant monitoring from an experienced archaeologist. Additional clearance was provided by the Environment and Resources Authority in October 2022. The Authority stated that an environmental permit was not required for the soil removal as long as no interventions were carried out on protected trees. Any interventions on protected tree species would require a separate nature permit.

The conversion of agricultural land, removal of soil, and dismantling of rubble walls lead to irreversible damage to all ecological characteristics linked to the habitat types found within the Area of Interest (AoI). This impact is particularly relevant to the flora and fauna which typically inhabit agricultural soil and rubble walls, particularly soil fauna and stationary species.

Excavation and construction activities may result in additional indirect impacts, particularly through the generation of fine particulate matter. This particulate matter can disperse beyond the boundaries of the development site due to wind and stormwater runoff. The dust carried by wind has the potential to adversely affect nearby trees and vegetation by obstructing and damaging their respiratory and photosynthetic surfaces. Such interference can lead to compromised physiological processes, which may result in decreased plant health and alterations in community structure, contingent upon the varying susceptibility of different species. Consequently, the dispersal of wind-borne particulates is expected to have a temporary yet significant negative impact on the vegetation within the study area.

Importantly, the nearest terrestrial Natura 2000 site, l-Għadira s-Safra, is located at a considerable distance from the construction site. Therefore, significant impacts from wind-borne dust dispersal on these protected areas are not anticipated. This assertion is further supported by prevailing Northwesterly wind patterns, which would carry airborne particulates even further away from these designated sites.

Particulate matter may also settle on the ground and be transported away from the site through rainwater runoff into adjacent protected valley systems. While predicting the extent of this impact poses challenges, it is recognised that water-borne particles can degrade substrate quality, adversely affect low-lying species, and prohibit germination of primary colonising species. Such outcomes may facilitate the proliferation of opportunistic and non-native species that are atypical of the habitat, potentially leading to competition with indigenous species if not managed appropriately.

During the use of construction vehicles, the areas surrounding the proposed site may be subject to trampling by vehicles and other machinery related to the construction.

This would increase the extent of the negative impacts on floral species and prohibit the regeneration of plant species and/or cause permanent damages to trees, particularly if the trampling occurs over longer periods throughout various seasons.

These impacts can be adequately mitigated by using site hoarding around the perimeter of the planned excavation area, employing the use of wheel-washing facilities and wetting down any exposed stockpiles. No additional land take-up should be used for the storage of materials and equipment or manoeuvring of construction vehicles.

The construction phase will inevitably increase noise levels in the area particularly during the excavation phase. Excessive noise generation can be a deterrent for faunal species, particularly if carried out during periods which are generally quiet (ex. during the night). Long-term increased noise and vibration generation may cause certain species to leave the site's surrounding area temporarily or even permanently.

The dedicated study on noise impacts on ecosystems during the construction phase resulted in a 'minor' rating, which indicates insignificant noise impacts. For both impacts, the provisions of LEGAL NOTICE 340 OF 2022 - CONSTRUCTION MANAGEMENT SITE REGULATIONS, 2022 should be followed to minimise the impacts in this regard.

5.5.2 Operational Phase

Due to the expansion of the ECOHIVE facility, the proposal is expected to induce an increase in vehicular traffic flow to and from the site. This will inevitably increase the deposition of particulate matter and gases related to combustion onto the surrounding land. However, the envisaged frequencies will be comparable to the current traffic present in the wider ECOHIVE complex and do not constitute a substantial increase.

The proposed development will introduce lighting in an area that is currently in darkness and likely frequented by nocturnal species, which may be deterred following the proposed development. Mitigation measures such as sensor-operated lights, down-turned light fixtures and other measures as indicated in the GUIDELINES FOR ECOLOGICALLY RESPONSIBLE LIGHTING[30] should be implemented to the extent possible to minimise the potential light spillover into the adjacent agricultural areas.

Risks associated with atmospheric emissions from various pollutants generated by waste incineration are anticipated. The impact on wildlife of incinerated waste is largely unclear due to the wide range of potential sources and types of receptors involved. Nonetheless, this assessment will operate under the assumption that the primary health effects observed in humans are also likely to affect animal populations.

[30] Source: https://birdlifemalta.org/wp-content/uploads/2020/07/Guidelines-for-Ecologically-Responsible-Lighting.pdf

The emission of heavy metals, dioxins, polycyclic aromatic hydrocarbons, and other volatile organic compounds can lead to harmful effects on the lungs, kidneys, skin, urinary systems, gastrointestinal tracts, and may trigger allergic reactions when ingested in high quantities over extended periods. To safeguard human health from these adverse effects, the European Commission has developed the Best Available Technology (BAT) document for Waste Incineration in accordance with the Industrial Emissions Directive 2010/75/EU.

The proposed facility will be designed to adhere to the most stringent standards outlined in these guidelines and policies.

Due to the Best Available Technology being implemented within all aspects of this proposal, it is expected that particulate matter will be released in limited quantities within a limited radius around the stack location, while bulk deposition limits will be below daily deposition thresholds. This has been confirmed in the results obtained from the stack's Air Dispersion Model, which presents results in three modelled scenarios. The models are based on baseline data collected over six weeks within the AoI. The results demonstrate a 'not significant' adverse impact caused by minimal increases of air emissions caused by the operations of the MTTF within the three scenarios.

A minor adverse impact is expected at one of the sensitive receptors identified within the study (R27, 0.43km from the site), caused by cumulative emissions arising from the operations of the MTTF and the nearby Waste to Energy plant.

Therefore, no significant impacts from air dispersion are envisaged on the biodiversity in the immediate vicinity and the surrounding biodiversity. Likewise, the expected rate of deposition of pollutants into the marine area is negligible, and not expected to reach levels which impact marine flora and fauna.

The site operations will inevitably cause an increase in noise levels of the area, due to increased vehicular traffic to the proposed site and the site operations themselves. However, the dedicated noise study for operational impacts concluded no significant impacts resulting from noise on the surrounding ecosystems.

5.6 Ecology - Avifauna

5.6.1 Construction Phase

The TTF site will be a source of noise and light pollution (emergency night-time activities and security lighting) as well as vibrations, dust and direct disturbance during the construction phase. Noise and light pollution are expected to negatively affect the terrestrial avian assemblages in the immediate vicinity of the development significantly (AoI-1)[31]. Overall, the proposed development will result in a temporary loss of potential breeding habitat for up to 5 terrestrial bird species within the AoI-1. While the proposed development, including the AoI-1, are not situated inside Natura 2000 sites, the habitats disturbed during the construction phase including the buffer area set at 0.1 km around the proposed development provide nesting territories for some land birds[32],[33]. Furthermore, the roads leading to the construction site will experience higher traffic volume of heavy machinery, creating additional disturbance, light and noise pollution, dust, vibration and direct disturbance. Material from excavation and construction will need to be stored at least temporarily on site, increasing the area of disturbance. Overall, the proposed development will lead to temporary and localised short-term disturbance for these terrestrial bird species in the AoI-1.

Several breeding territories of the Sardinian Warbler and the Zitting Cisticola will be disturbed or lost during the construction phase if works are carried out during the breeding season (March – August). Up to 2 breeding pairs of Blue Rock Thrush will be disturbed during the construction phase if works are carried out during the breeding season (March – July). The disturbance can potentially lead to the complete temporary displacement, and consecutive reduction in breeding success up to loss of nest sites leading to reproductive failure of the breeding pairs of all three species in the AoI-1 during the construction phase if it coincides with the breeding season.

Foraging areas and potential colonial nest sites of the Spanish Sparrow can be expected to be reduced temporarily during the construction phase and some broods may fail if works are carried out during the breeding season (March – August).

No significant impact is expected on the breeding population of Common Swifts in the area, since no breeding territories are expected to be destroyed, and as highly mobile aerial feeders, the birds can shift their foraging territories.

Temporary habitat loss and disturbance is expected to result in the destruction of foraging areas for other breeding, wintering, and/or staging species in the AoI-1 depending on the period of the year in which the construction works will take place.

Overall, the direct impacts during the construction phase of the TTF and ancillary facilities will act temporarily and mainly on a localised scale in the AoI-1 and, to some extent, along the access roads. The works are not expected to impact a significant proportion of the relevant bird populations on a national or wider scale.

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[31] *Dominoni, D. M. (2015). The effects of light pollution on biological rhythms of birds: an integrated, mechanistic perspective. Journal of Ornithology, 156, 409–418. https://doi.org/10.1007/s10336-015-1196-3*

[32] *Sultana et al. (2011): The Breeding Birds of Malta. BirdLife Malta, Malta.*

[33] *Epsilon Malta Ltd, Nature Conservation Consultants (2019). Malta Breeding Bird Atlas 2018. Malta: Wild Birds Regulation Unit, Ministry for the Environment, Sustainable Development and climate Change*

However, they are expected to impact few local breeders of common species significantly at least short-term.

Artificial light at night (ALAN) is well documented to negatively affect birds, including seabirds. Adults from all three procellariiform species nesting on the Maltese Islands actively avoid approaching breeding areas under high levels of illumination and may desert colonies as a result of exposure to ALAN. That seabirds are negatively affected even by temporary light pollution in front of their colonies has been recently proven for *P. yelkouan* in Malta[34]. Furthermore, ALAN causes the stranding of seabird fledglings on their first flight out of the colony. These may be injured or killed by collisions with manmade structures such as street light poles, or they might get grounded. Unless grounded individuals are found and released, they are likely to die[35]. In general, light pollution from ALAN is additive and light trespass that creates skyglow adds to light pollution in areas that are otherwise dark.

While the site of the proposed development is not situated within the immediate line of sight of any seabird nest sites, shearwater fledglings are known to strand at light polluted sites across the Maltese Islands[36]. However, a *P. yelkouan* colony holding a significant number of breeding pairs is located on St Paul's Island (MT0000022) within the 5.0 km buffer zone AoI-2, in which additional sky glow from ALAN from the construction site can have significant impacts, including on adult attendance. This is relevant if night-time construction activities are carried out during the reproductive season (February to July). The negative impact will potentially act on 45-70 breeding pairs. Including their offspring and prospecting birds, this equates to 225-350 individuals.

Additionally, ALAN is known to have negative consequences on nocturnally migrating birds in general. Bright lights are known to attract, disorient, and ground birds in active migration during the night[37] if construction work or operations are carried out at night during spring or autumn migration with no mitigation measures in place. The lit-up construction site during night-time operation is highly likely to have above-mentioned impacts on nocturnally migrating birds passing within the AoI-2 (5.0 km buffer). However, it is extremely unlikely that the additional ALAN from the

[34] *Austad, M., Oppel, S., Crymble, J., Greetham, H., Sahin, D., Lago, P. & Metzger, B. (2023). The effects of temporally distinct light pollution from ships on nocturnal colony attendance in a threatened seabird. J Ornithol 164, 527–536. https://doi.org/10.1007/s10336-023-02045-z*

[35] *Rodríguez, A., Holmes, N. D., Ryan, P. G., Wilson, K. J., Faulquier, L., Murillo, Y., Raine, A. F., Penniman, J. F., Neves, V., Rodríguez, B., Negro, J. J., Chiaradia, A., Dann, P., Anderson, T., Metzger, B., Shirai, M., Deppe, L., Wheeler, J., Hodum, P., … Corre, M. Le. (2017). Seabird mortality induced by land-based artificial lights. Conservation Biology, 31(5), 986–1001. https://doi.org/10.1111/cobi.12900*

[36] *Crymble et al. (2020): Identifying light-induced grounding hotspots for Maltese seabirds. Il-Merill 34, 23-43.*

[37] *Evans Ogden, L. J. (2002). Summary report on the bird friendly building program: Effect of light reduction on collision of migratory birds. In Fatal Light Awareness Program (Vol. 1).*

construction site will impact threshold numbers of significance of birds of any species during their nocturnal migration.

The most sensitive periods to migrating land birds are March to May and September to November. The most sensitive periods for fledging seabirds are during their respective fledging periods: June/July for Yelkouan Shearwaters and September/October for Scopoli's Shearwaters. Mediterranean Storm-petrels have an asynchronous breeding season, with fledglings expected between June and October.

5.6.2 Operational Phase

Situated mainly on ODZ land, the proposed TTF with ancillary facilities will result in the permanent reduction of breeding habitat on its footprint (and via disturbance, noise, and habitat alteration in the AoI-1 and along access roads) for up to five receptor species (see Table 1). Around 18,185 m^2 of land, predominantly consisting of non-intensive agricultural land, including rubble walls, afforested areas and disturbed zones, will be permanently lost. The direct vicinity of the planned development (AoI-1) will face permanent habitat modification from the physical structures (e.g. walls, roads) and operational activities (noise, vibration, dust and disturbance from truck traffic, thermal energy and residuals in the plume, etc.). Despite the development not being carried out in a Natura 2000 site, the current habitats in the footprint and AoI-1 provide nesting territories for protected birds[38,39]. Depending on how the non-built landscape and flat roofs of the planned development will be landscaped, the development will result in the permanent loss of several breeding pairs of *C. melanocephala*, *C. juncidis* and *M. solitarius*. Furthermore, it will lead to a reduction in foraging and roosting habitat as well as potential nesting sites for a population of breeding pairs of *P. hispaniolensis*. In the AoI-1 remaining habitat for the same species of breeding birds are expected to be reduced in size and quality. The habitat loss and reduction in habitat quality is also expected to result in the reduction of foraging areas for other breeding, wintering, and/or staging species.

Overall, the impact will be localised in scale and the numbers of birds impacted are expected to remain well below levels of significance when considering the local (national), EU or international populations of any bird species making use of the area, thus no significant impacts on avifauna are expected in the footprint including the buffer zone (AoI-1) during standard operations.

The impacts of ALAN on seabirds are laid out in 3.1.1.2. The proposed development including the AoI-1 is not situated within the immediate line of sight of any seabird nest sites. However, a *P. yelkouan* colony holding a significant number of breeding pairs is located on Saint Paul's Island (MT0000022) within the 5.0 km buffer zone AoI-2, in which additional sky glow from ALAN emitted by the TTF during operation can

[38] *Sultana et al. (2011): The Breeding Birds of Malta. BirdLife Malta, Malta.*

[39] *Epsilon Malta Ltd, Nature Conservation Consultants (2019). Malta Breeding Bird Atlas 2018. Malta: Wild Birds Regulation Unit, Ministry for the Environment, Sustainable Development and climate Change*

have significant impacts. This is relevant when operations are carried out during night-time or if the TTF including the ancillary facilities remain illuminated during the night outside working hours. The negative impact will be permanent and potentially act on 45-70 breeding pairs. Including their offspring and prospecting birds, this equates to 225-350 individuals. Additional to the up to 70 young *P. yelkouan*, fledging from Saint Paul's Island annually, seabird fledglings from other colonies might also get attracted and grounded by ALAN originating from the planned development.

As mentioned above ALAN is known to have negative consequences on nocturnally migrating birds in general. Bright lights are known to attract, disorient, and ground birds in active migration during the night[40] if the TTF carries out night-time operations (or remains lit-up in general) during the spring or autumn migration period with no mitigation measures in place. The lit-up TTF is highly likely to have above-mentioned impacts on nocturnally migrating birds passing within the AoI-2 (5.0 km buffer). However, it is extremely unlikely that the additional ALAN from the TTF will impact threshold numbers of significance of birds of any bird species passing through the wider area (AoI-2) during their nocturnal migration.

While light pollution during the operational phase has the same effects on the receptors as during the construction phase (outlined above), the impact during the operational phase is expected to act permanently (long-term).

A large variety of pollutants such as heavy metals, dioxins, furans and other pollutants are expected to end up in the TTF's stack plume when thermally treating some of the waste items listed in the PDS of the proposed project. Additionally, as the TTF is proposed to be fuelled by diesel, the plume can be expected to contain problematic diesel particulate matter (DPM), unburned partially polycyclic hydrocarbons (HC), benzene, formaldehyde, acetaldehyde, acrolein, 1,3-butadiene, carbon monoxide (CO) and nitrogen oxides (NOx). Impacts of pollutants from the stack plume are expected to extend to AoI-2, which includes Natura2000 sites designated for the breeding, foraging, and staging of protected bird species.

Apart from the implications for human health, there is substantial research into the negative effects such chemical pollutants pose on wildlife including birds, such as neurological and nervous deficiencies, impaired reproductive ability, physiological and behavioural abnormalities, mutagenic effects, and mortality[41]. Even relatively low emission concentrations may result in higher contaminant burdens in receptors

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[40] *Evans Ogden, L. J. (2002). Summary report on the bird friendly building program: Effect of light reduction on collision of migratory birds. In Fatal Light Awareness Program (Vol. 1).*

[41] *Fry, D. M. (1995). Reproductive effects in birds exposed to pesticides and industrial chemicals. Environmental Health Perspectives, 103(SUPPL. 7), 165–171. https://doi.org/10.1289/ehp.95103s7165*

Péan, S., Daouk, T., Vignet, C., Lyphout, L., Leguay, D., Loizeau, V., Bégout, M. L., & Cousin, X. (2013). Long-term dietary-exposure to non-coplanar PCBs induces behavioral disruptions in adult zebrafish and their offspring. Neurotoxicology and Teratology, 39, 45–56. https://doi.org/10.1016/j.ntt.2013.07.001 that are top-predators and long-lived species, such as seabirds, as a result of bioaccumulation[42] and biomagnification[43].

Therefore, appropriate flue gas treatment (FGT), using both dry and wet scrubber systems, must be implemented in combination with a CEMS, to make sure that chemical pollution values remain always well below legal limits.

A detailed Air Quality Study for the TTF (AIS Ref. No: PRJ-ENV598; Client Ref. No: PA/06096/23, 2nd version published on Jan 8, 2025) has modelled the impact of the stack plume on sensitive receptors in the wider area under three different simulation scenarios. With the FGT in place, the impact assessment for the three scenarios, corresponding to three different plant operations, all achieved a not significant adverse impact when evaluating the TTF in isolation.

When considering cumulative effects in combination with the proposed WtE plant in the vicinity, the results obtained show that the cumulative impact of the project and the Waste to Energy facility is assessed as not significant, except for PM_{10} regarding sensitive receptor R27 (assessed as minor). Receptor R27 refers to agricultural land at Magħtab, 0.43km from the proposed development. With the mitigation measures in place (FGT), the overall adverse cumulative impact of reduced air quality on avian receptors can be assessed as not significant.

The fly ash residues expected from the thermal treatment operation are considered hazardous waste. Additionally, the slag and bottom ash can have hazardous components as well. Fly ash residues would be temporarily stored before being exported, since there are no facilities for the treatment of such waste in Malta. Leakage or spillage of fly ash residues into the environment during storage or transport is expected to result in severe environmental impacts, including contamination, bioaccumulation and biomagnification of toxic substances with expected severe consequences for wild bird populations (see above). Slag and bottom ash need to be tested for hazardous content vigorously, to make sure their contamination content falls below threshold levels, before disposing of them on the landfill or using them for road building etc.

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[42] *Bryan, G. W., Waldichuk, M., Pentreath, R. J., & Darracott, A. (1979). Bioaccumulation of marine pollutants. Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences, 286(1015), 483–505. https://doi.org/10.2307/2418066*

[43] *Bearhop, S., Waldron, S., Thompson, D. R., & Furness, R. (2000). Bioamplification of mercury in great skua Catharacta skua chicks: The influence of trophic status as determined by stable isotope signatures of blood and feathers. Marine Pollution Bulletin, 40(2), 181–185. https://doi.org/10.1016/S0025-326X(99)00205-2*

Blanco, G., Frías, O., Jiménez, B., & Gómez, G. (2003). Factors influencing variability and potential uptake routes of heavy metals in black kites exposed to emissions from a solid-waste incinerator. Environmental Toxicology and Chemistry, 22(11), 2711–2718. https://doi.org/10.1897/02-519

Overall, the above mentioned FGT systems must be implemented and other necessary precautions and appropriate management must be taken, to avoid any hazardous residues ending up in the environment.

On the way into the boiler of the treatment facility, transport, storage and processing of dead animals including livestock that died of diseases as well as of biomedical waste from hospitals etc. pose a significant risk of leakage, accidental spills, bio-contamination (*Salmonella* sp., Botulism, etc.) and outbreaks of zoonoses (e.g. avian flu H5N1) and other diseases. Due to the close-by landfill, the wider area in which the development is proposed holds large populations (up to thousands) of gulls, mainly *L. michahellis* year-round and *C. ridibundus* during the non-breeding period. The gulls forage on the landfill, but also use the retention reservoirs and any other freshwater source in the area to drink, wash and preen. As scavengers, gulls can be expected to be highly attracted to the TTF if any organic waste, including dead livestock, is accessible to them. Gulls will be equally attracted to any open sources of freshwater, including run-off and puddles from biologically contaminated water (e.g. from cleaning the bring-in facilities, ramps, etc.), open retention reservoirs and sedimentation tanks. Even if the gulls might not be directly impacted by the zoonoses themselves, and although they might not be of conservation concern, they can get infected and then act as reservoirs and carriers of zoonoses, infecting individuals of more susceptible protected species in the Natura 2000 sites. In recent years, there is evidence that outbreaks of zoonoses are further exacerbated by climate change[44].

The transport, manipulation, and storage of flammable and potentially hazardous and toxic material in large quantities, as well as the operational activities of the TTF, impose a recognised high risk of a fire at the TTF. In such an event the plume of the blaze as well as the run-off from firefighting water will release toxins into the environment, with detrimental short- to long-term effects on living organisms including avifauna in the protected terrestrial and marine Natura 2000 sites in the AoI-2 and potentially beyond.

The TTF is one of several waste management facilities proposed as part of the ECOHIVE complex, which to date include the groundwork for the Waste to Energy facility, a proposed Material Recovery Facility, an Organic Processing Plant and an Anaerobic Digestion Plant, as well as the potential for an extended road network to service these facilities[45]. The TTF site will undergo a change in use from non-intensive agriculture to accommodate the facility. The proposed project within the entire ECOHIVE project presents another instance of open green space being sealed and

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44 R. Rupasinghe, B. B. Chomel & B Martínez-López (2002): Climate change and zoonoses: A review of the current status, knowledge gaps, and future trends, Acta Tropica, V. 226,

45 Ministry for the Environment, Climate Change and Planning (2021). Long Term Waste Management Plan for Malta 2021-2030. Environment and Resources Authority, Malta

developed in an already overdeveloped nation[46, 47]. The associated effects of habitat loss, rainwater run-off, greenhouse gas emissions, and the urban heat island effect in the place of habitat restoration, water percolation, carbon sequestration, and climate change adaptation measures will have indirect, permanent, and adverse long-term negative effects on local avian biodiversity[48].

5.7 AGRICULTURAL LAND

5.7.1 Construction Phase

Effectively, the proposed site is mainly composed of marginal agricultural land fringed with disturbed habitats merging with maquis community outcrops. Surrounding this area are also some fields of similar agricultural value. In an agricultural context, the magnitude of the project shall create an irreversible impact due to the destruction of the agricultural land.

The Strategic Plan for Environment and Development ('SPED') for Rural Policy and Design Guidance 2020 states "that whereas 'urban' places are intended for people to 'live, work, play and interact', 'rural' areas are intended to sustain the farming community while providing the general public with an escape from daily urban life to places which are 'visually pleasant and rich in biodiversity'. The countryside also supports most of the Maltese Islands' biodiversity and natural heritage, and its landscape also includes various natural geomorphological features and traditional rural structures that individually and collectively form an important aspect of the Islands' distinctive cultural legacy and history. This would infer that planning should no longer be contemplated as a piecemeal approval or rejection of a project using solely a particular parameter, without evaluating all the holistic outcomes.

The eco-environmental effects of building expansion in Maghtab contribute significantly to rural land loss. Losses of agricultural land and surrounding maquis and garigue pockets will further infringe on the remaining ecosystem. The conversion of agricultural land to buildings, other than reducing ecological space, will also create a series of ecological security issues like local temperature rise, runoff and flooding, and increased pollution other than fodder reduction. (2022, Zongfeng Chen, Yurui Li, Zhengjia Liu, Jieyong Wang and Xueqi Liu in Impacts of Different Rural Settlement Expansion Patterns on Eco-Environment and Implications in the Loess Hilly and Gully Region, China.)

Leapfrogging expansion patterns of development ultimately encroach rural areas and increase total built-up area and, in this part site, reduce animal fodder and carob

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46 Portelli, M., Conrad, E., & Galdies, C. (2020). Developing an Environmental Justice Index for Small Island States: The Case of Malta. Sustainability, 12, 9519. https://doi.org/doi:10.3390/su12229519

47 Environment and Resources Authority.State of the Environment Report (SoER) 2018; Environment andResources Authority: Marsa, Malta, 2018; Available online: https://era.org.mt/topic/soer/

48 BirdLife International. (2018). State of the world's birds: taking the pulse of the planet. BirdLife International.

pod production, dwindle the flow of rainwater to water tables, can limit full light availability, increase surface temperatures by heat reflection, diminish distinct habitats and biodiversity, lessen carbon storage potential and habitat quality. The overall continued loss of biodiversity and degradation of natural resources represents a significant threat for rural areas, as ecosystems produce ecosystem services, such as pollination, biological pest control, or the regulation of freshwater quality. The decline in biodiversity and landscape diversity may also impact both tourism activities, as rural areas become less attractive, and rural populations' mental health due to the loss of the land they and their families worked.

An evaluation of agricultural land use around this locality will indicate a general practice of dryland agriculture with a small number of poultry, rabbit, cattle, and pig farms plus horse yards, mostly between the lower part of Naxxar and on the outskirts of Magħtab village. Towards Wardija and Għargħur there are irrigated parcels. In respect of livestock production, all animals are raised intensively in buildings. Crop production appears primarily oriented towards cereal production for fodder and this would constitute the primary crop in the marginal and non-irrigated areas around the Maghtab Environmental Complex. No particular spatial spread or extended zone of influence of the impact is envisaged other than the spread of particulate matter during the construction phase.

5.7.2 Operational Phase

The deposit of particulate matter is subject to a number of factors predominant amongst which is that just about 8% of the days are calm with no wind. The mean wind speed is approximately 14.1 km/hour, and this rises more when gusts that can reach over 60 km/hour are included. The main information on potential health effects that might arise due to substances emitted by incineration facilities comes from the risk assessments of individual chemicals emitted by incinerators. Estimates of relative contributions of pollutants to total risk depend on incinerator emission characteristics, populations potentially exposed, potential routes of exposure, and, to some extent, the amount of information that has been collected.

The TTF Air Quality Study that assessed the likelihood of significant effect on ambient air quality, including exceedances of the ambient limit values in SL.549.59, as well as on the deposition levels of particular components when considering three simulation scenarios corresponding to three different plant operations, has a not significant adverse impact when evaluating the MTTF in isolation. The differences in emissions have been considered negligible in concentration and not leading to a discernible adverse impact on air quality. For the three scenarios, the 90.4th percentile of concentrations for are below the regulatory limits of 50 µg/m3 which cannot be exceed on more than 35 calendar days and are below an annual limit value of 40 µg/m3 for concentrations.

However, for the R27 receptor where the changes in the annual levels for NO2, PM10 and PM2.5 due to scheme are equal to 0,4 µg/m3 and the impact result is Minor. This essentially refers to the agricultural environs within 0.78 kilometres of the facility.

Properties of both particles and the vegetation are important in deciding their interactions and consequently the effectiveness of particle removal from atmosphere. Leaves, susceptible and highly exposed parts of a plant, may act as persistent absorbers in a polluted environment (Maiti, 1993). Small vegetation elements are more effective in removing small particles from an air stream than are large elements. They act as pollution receptors and decrease dust concentration of the air. The capability of leaves as dust receptors depends upon their surface geometry, phyllotaxy, epidermal and cuticular features, leaf pubescence and height and canopy of trees (Fowler et al., 1989; Nowak, 1994; Beckett et al., 2000; Raupach et al., 2001). This confirms relevance of crop type, size and density.

On the basis of study data, a well-designed and properly operated incineration facility emits relatively negligible amounts of pollutants, contributes little to ambient concentrations, and so is not expected to pose a substantial health risk, although, while the risks indicated at the regional level posed by environmental pollutants appear minimal, the local minor effects foreseen indicate that monitoring remains advisable. The associated environmental and socioeconomic benefits resulting from this Thermal Treatment Facility can nevertheless be considered to offset the losses incurred in this rural area and thus appropriately tailored construction work is recommended to minimize impacts outside the development area.

5.8 ARCHAEOLOGY & CULTURAL HERITAGE

5.8.1 Construction Phase

Following the completion of the desktop research study and cultural heritage assessment, the Impact Assessment was carried out to determine any effects that the project may have on the identified cultural features and the surrounding landscape. This evaluation takes in consideration local and international legislations and other relevant documents related to the protection of cultural heritage. Based on the National Protective Inventory for the Maltese Islands and the Structure Plan Policies on Cultural Heritage, Table 35 summarizes the significance of cultural features.

TABLE 35: CLASSIFICATION OF SIGNIFICANCE OF CULTURAL HERITAGE FEATURE

CULTURAL SIGNIFICANCE	CLASS	GRADE	PROTECTION
Major National Importance	A	1	To be preserved with 100m buffer zone
Local Importance	B	2	To be preserved with 50m buffer zone
Minor	C	3	It may be covered and preserved

CULTURAL SIGNIFICANCE	CLASS	GRADE	PROTECTION
Minor	D	-	It may be preserved or destroyed after proper recording
Uncertain	E	-	Further investigation required

The area of interest pertains to agricultural parcels of land which transformed over time into terraced fields, already stripped from soil, with agricultural structures such as rubble/dry-stone walls, a dilapidated farmhouse and a dry-stone hut.

The presence of megalithic remains in the vicinity of the proposed scheme, within the AoI 100m buffer zone, shows that the area would have been inhabited since prehistoric times and that the landscape would have undergone some form of change, albeit largely agricultural as far as the evidence goes. Previous studies show that the megalithic stones once belonging to the Taz-Zebbugija temples were displaced and shifted to construct other rural structures. Unfortunately, there is no written documentation pertaining to the area and little to no detailed description of land use in the area during later historical periods.

The 'Taz-Zebbugija' Megaliths (Feature 3 in Figure 98) which lies at the Southern limit of the AoI, approximately 100m away from the proposed development, are the only known structure classified as heritage feature within the AoI. In consideration of this distance, there will be no direct impact caused by the construction and operation of the proposed development. However, the grade of protection assigned to the area around it is still flagged as a potential archaeological zone.

The rural landscape, despite the use of the area located North and West to the AoI as a landfill, will be significantly impacted by the development.

With regard to the identified archaeological features exposed through archaeological evaluation, any stratified deposits above bedrock and related cultural material have already been excavated and documented (preservation by record). Therefore, no further archaeological investigations will be required within the AoI, with the exception of the S-West and Southern limits bordering with agricultural plots that still contain soil, possibly underlying cultural remains at undisturbed levels.

With regard to the identified cultural features within the AoI, the dilapidated farmhouse (Feature B in Figure 109) and the dry-stone hut (Features A in Figure 109), are very likely to suffer an adverse impact or damage. In the past, dry-stone huts were very common throughout the island of Malta providing shelter to farmers and herdsmen or their livestock. Nowadays, these features are located mainly in the northern part of the island. Many of them have collapsed over the years due to the elements or simple neglect. Since the one located within the AoI, is still well preserved, it should be considered a subject of architectural, cultural and ethnic value, also in due of the legal notice entitled "RUBBLE WALLS AND RURAL STRUCTURES REGULATIONS", last amended in 2007, which declared rubble walls and non-habitable rural structures to be protected.

According to these regulations, it is not lawful for any person to construct, make any additions to, or incorporated into, any rubble wall, whether or not bordering on any street, path or footpath, or any rural construction, structure or tenement, or any land, any drum, tank or any other object which is not constructed of rubble wall building material (S.L. 552.01 art. 6) The regulations continue to state that it is not lawful for any person to demolish or to endanger by any means whatsoever, the stability or integrity of any rubble wall or of any rural construction, structure or tenement, or to prevent free percolation of rainwater through the structure of a rubble wall, or to undermine the foundations of such rubble wall or rural construction, structure or tenement. However, the Planning Authority is declared in the law as the competent authority responsible for the administration and implementation of these regulations (S.L. 552.01 art. 6).

To conclude, the results of this study show that there will be a direct and adverse impact on the archaeological and cultural features identified in this study with minimal or no direct impact on the known cultural features present at the limit of the AoI.

5.8.2 Operational Phase

No impacts are envisaged during this phase.

5.9 AIR QUALITY

5.9.1 Construction Phase

The air dispersion model only considered the air quality impacts from operation.

5.9.2 Operational Phase

The thematic maps shown in the following figures describe the spatial distribution of the sensitive receptors with respect to the survey area and the relationships between each receptor and the calculated concentrations of PM_{10}, and NO_2. A color scale was used to emphasize the most disturbed sensitive receptors, the color scale varies from green (lower concentrations) to red (higher concentrations).

A summary table was also drawn up where the concentration value calculated by the model and integrated with the values obtained from monitoring was reported. Following the instructions of the ERA, the impact assessment has taken take into account only the sensitive aspects receptors that undergo a variation (dAA) greater than 0.3 $\mu g/m^3$ due to PM_{10} and NO_2 emissions from the proposed project.

TABLE 36: IMPACT ASSESSMENT – SCENARIO A

RECEPTOR NO.	BASELINE PM_{10} (CAA)	PREDICTED PM_{10}	CHANGE PM_{10} (DAA)	IMPACT[1]	BASELINE NO2 (CAA)	PREDICTED NO_2	CHANGE NO_2 (DAA)	IMPACT[1]
	$\mu G/M^3$	$\mu G/M^3$	$\mu G/M^3$		$\mu G/M^3$	$\mu G/M^3$	$\mu G/M^3$	
R1 to R55	36.53	36.530	0.00001 - 0.00043	N/S	11.56	11.558 - 11570	0.000259 - 0.0122	N/S

[1] Not Significant (N/S), Minor (MI), Moderate (MO), Major (MA)

TABLE 37: IMPACT ASSESSMENT – SCENARIO B

RECEPTOR NO.	BASELINE PM_{10} (CAA)	PREDICTED PM_{10}	CHANGE PM_{10} (DAA)	IMPACT[1]	BASELINE NO2 (CAA)	PREDICTED NO_2	CHANGE NO_2 (DAA)	IMPACT[1]
	$\mu G/M^3$	$\mu G/M^3$	$\mu G/M^3$		$\mu G/M^3$	$\mu G/M^3$	$\mu G/M^3$	
R1 to R55	36.53	36.530 - 36531	0.00001 - 0.00073	N/S	11.56	11.558 - 11578	0.00043 - 0.0205	N/S

[1]Not Significant (N/S), Minor (MI), Moderate (MO), Major (MA)

TABLE 38: IMPACT ASSESSMENT – SCENARIO C

RECEPTOR NO.	BASELINE PM_{10} (CAA)	PREDICTED PM_{10}	CHANGE PM_{10} (DAA)	IMPACT[1]	BASELINE NO_2 (CAA)	PREDICTED NO_2	CHANGE NO_2 (DAA)	IMPACT[1]
	$\mu G/M^3$	$\mu G/M^3$	$\mu G/M^3$		$\mu G/M^3$	$\mu G/M^3$	$\mu G/M^3$	
R1 to R55	36.53	36.530 - 36551	0.00044 - 0.0218	N/S	11.56	11.558 - 11578	0.000435 - 0.0205	N/S

[1] Not Significant (N/S), Minor (MI), Moderate (MO), Major (MA)

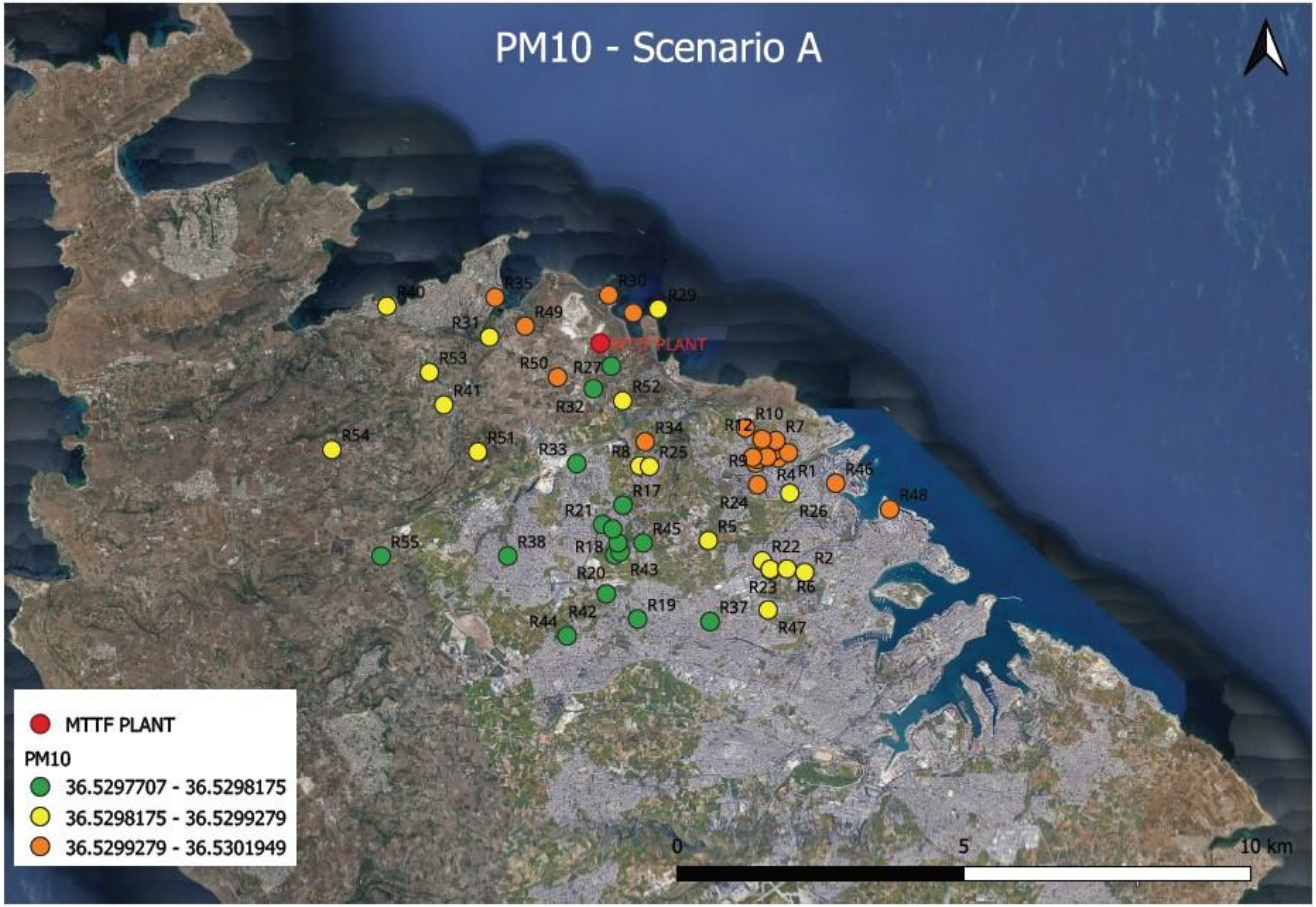

Figure 116: PM_{10} results – Scenario A

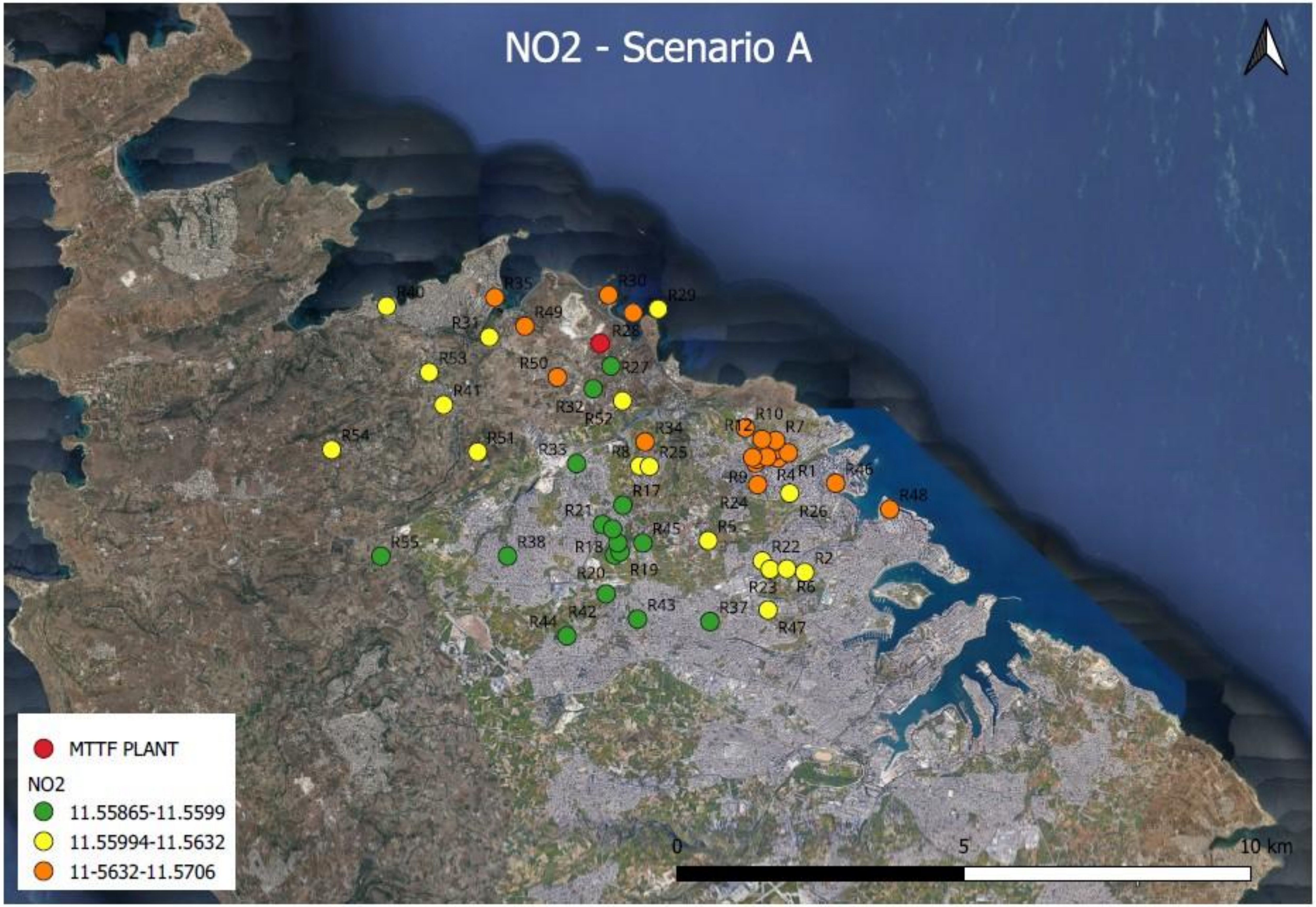

Figure 117: NO2 results – Scenario A

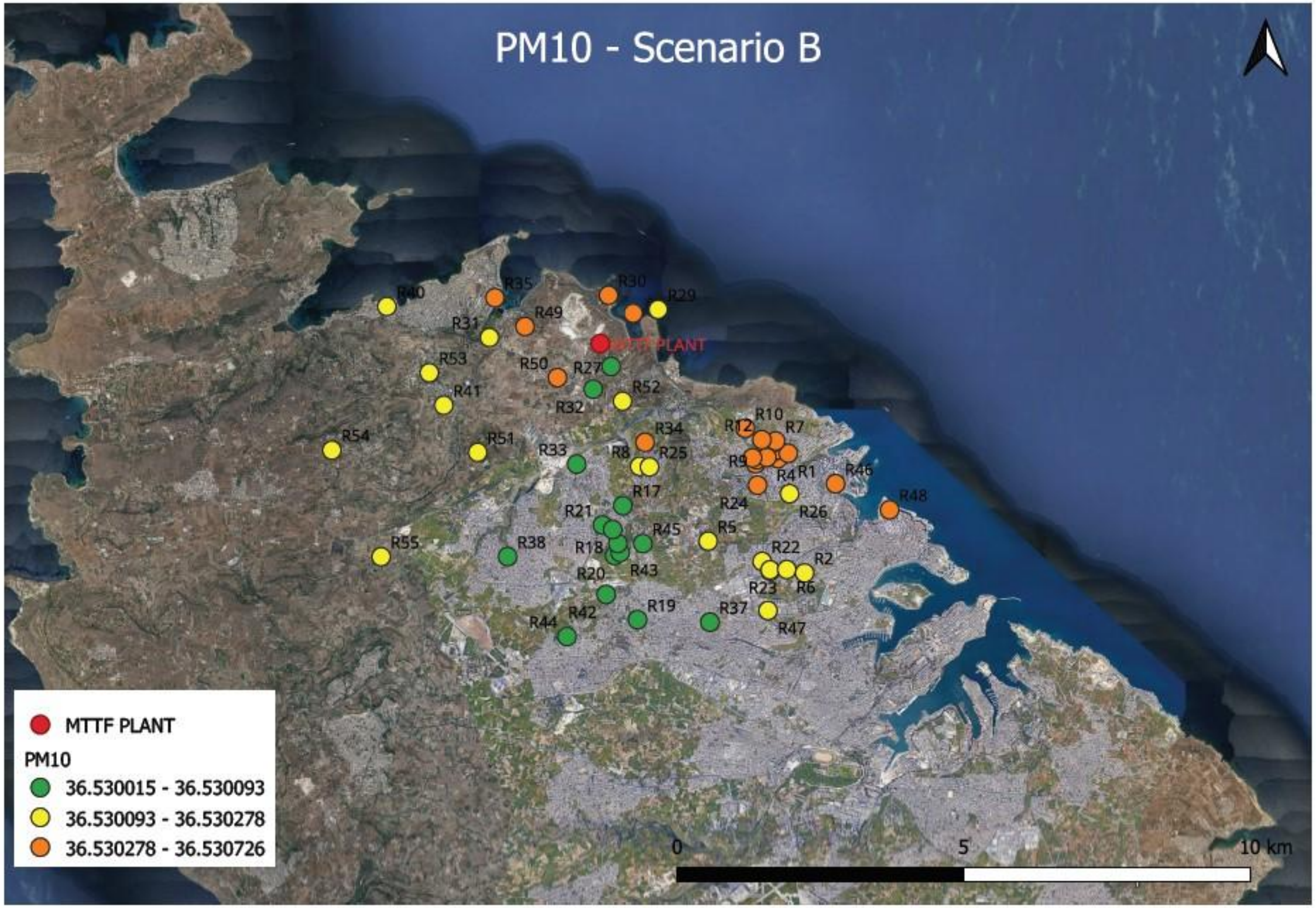

Figure 118: PM_{10} results – Scenario B

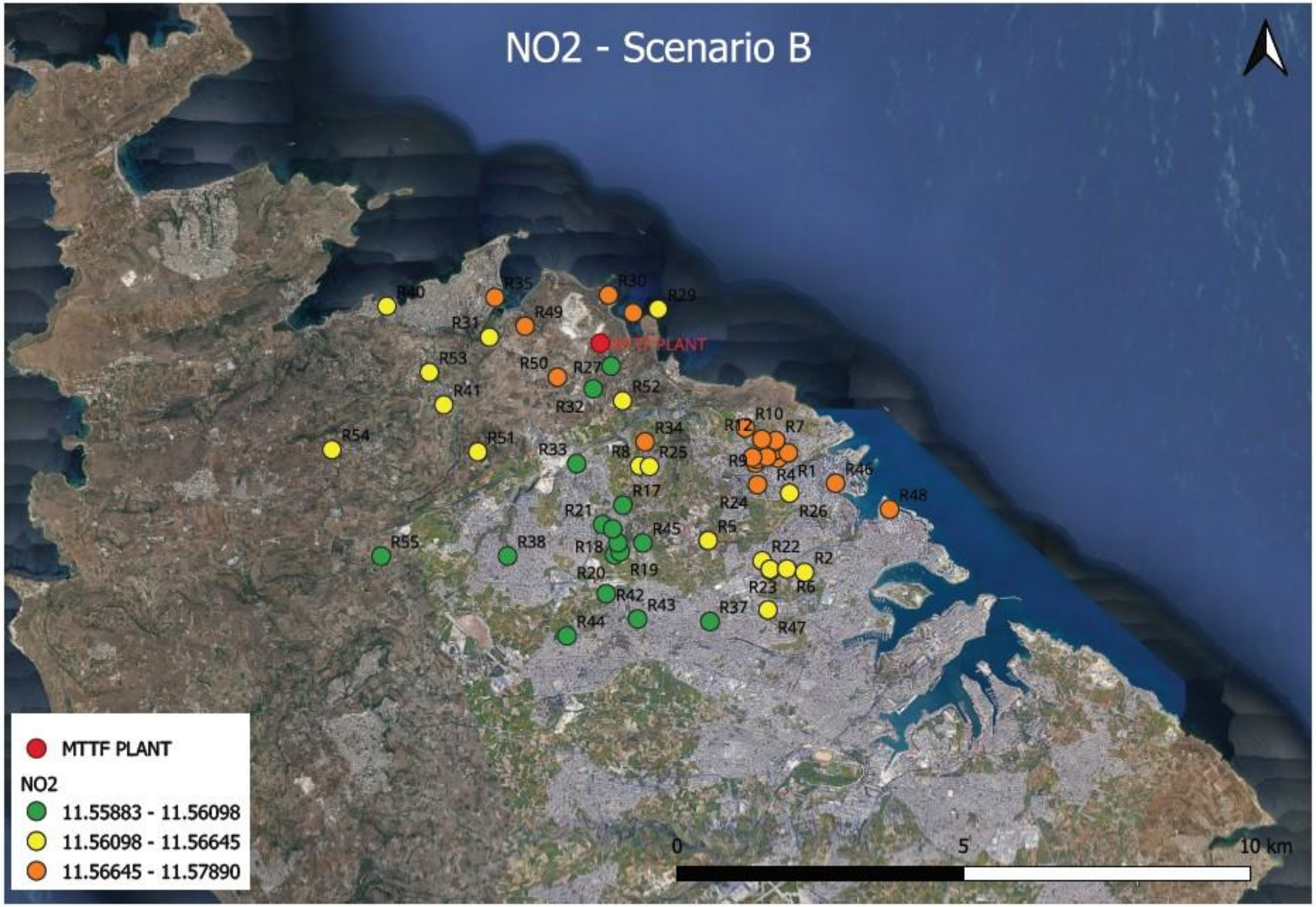

FIGURE 119: RESULTS NO2 – SCENARIO B

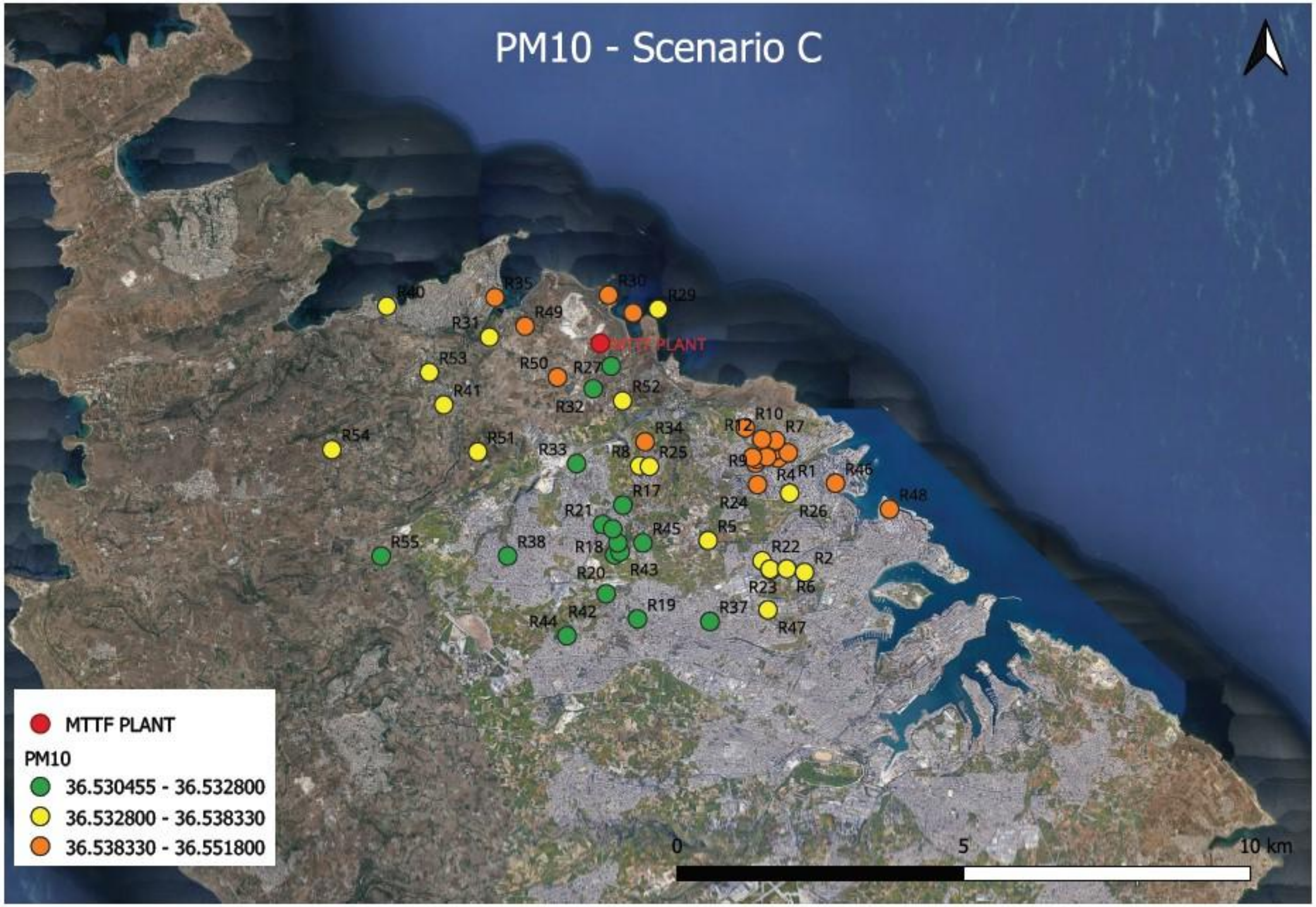

Figure 120: PM10 results – Scenario C

The annual emission loads in tons have been estimated assuming that the incinerator complies with the daily limit values in Table 3 of EIA TOR (Appendix 4B). The limit Values in the TORs are expressed as dry gas at 273.15 K, 101.3 kPa, and 11% oxygen.

TABLE 39 – DAILY LIMIT VALUE OF TABLE 3 OF EIA TORS

POLLUTANTS	LIMIT VALUE 1 [mg/Nm3]	LIMIT VALUE 2 [mg/Nm3]	LIMIT VALUE 3[mg/Nm3]
Dust	1	5	10
SO2	1	40	50
NOX	30	100	200
TOC	1	10	-
NH3	1	10	-

The annual emission loads in tons have been estimated multiplying the values in the TORs, relating to LIMIT VALUE 1, with the mass flow of:

- *Scenario A* equal to 2.29 Nm^3/s;
- *Scenario B* and *Scenario C* equal to 3.83 Nm^3/s.

TABLE 40: ANNUAL EMISSION LOADS IN TONS ESTIMATED MULTIPLYING THE LIMIT VALUE 1 WITH THE MASS FLOW OF SCENARIO A

POLLUTANTS	LIMIT VALUE 1 [TON/YEAR]
Dust	0.072112
SO_2	0.072112
NO_X	2.163370
TOC	0.072112
NH_3	0.072112

TABLE 41: ANNUAL EMISSION LOADS IN TONS ESTIMATED MULTIPLYING THE LIMIT VALUE 1 WITH THE MASS FLOW OF SCENARIO B/C

POLLUTANTS	LIMIT VALUE 1 [TON/YEAR]
Dust	0.120884
SO_2	0.120884
NO_X	3.626509
TOC	0.120884
NH_3	0.120884

The annual emission loads in tons were estimated on the basis of the daily emission contribution foreseen by the TTF for dust ($PM_{2.5}$ and PM_{10}), SO_2, NOx, TVOC and NH_3.). The maximum concentration values present in the calculation domain were considered and subsequently multiplied by the mass flow rate.

TABLE 42 – THE ANNUAL MISSION LOADS IN TONS ESTIMATED ON TTF'S DOMAIN OF SCENARIO A

POLLUTANTS	[TON/YEAR]
$PM_{2.5}$	0.0000091261
PM_{10}	0.0000400335
SO_2	0.0003216177
NO_X	0.0012864708
TOC	0.0001072059
NH_3	0.0001072059

TABLE 43 – THE ANNUAL MISSION LOADS IN TONS ESTIMATED ON TTF'S DOMAIN OF SCENARIO B

POLLUTANTS	[TON/YEAR]
$PM_{2.5}$	0.0000256450
PM_{10}	0.0001124967
SO_2	0.0009037657
NO_X	0.0036150633
TOC	0.0003012553
NH_3	0.0003012553

TABLE 44 – THE ANNUAL MISSION LOADS IN TONS ESTIMATED ON TTF'S DOMAIN OF SCENARIO C

POLLUTANTS	[TON/YEAR]
$PM_{2.5}$	0.0007693475
PM_{10}	0.0033748978
SO_2	0.0009037657
NO_X	0.0036150633
TOC	0.0003012553
NH_3	0.0003012553

5.10 NOISE & VIBRATIONS

5.10.1 Construction Phase

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).

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 45 (rounded to the nearest decibel).

TABLE 45: 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

NOISE SENSITIVE RECEPTOR	PREDICTED NOISE LEVEL, DB $L_{AEQ, 1-HOUR}$.
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

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 (and assessed in conjunction with the construction noise impact magnitude. This assessment is shown in Table 46 below.

TABLE 46: 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 46 the magnitude of the impact would be *negligible* at NSR01 and NSR02. The level of effect would, in the worst-case be *minor*. Where the level of effect is *minor*, the impact is not significant.

The predicted noise levels at NSR03 and NSR04 have been compared to the $L_{Aeq,1hr}$ noise limits contained in the AQTAG09 guidance and assessed in conjunction with the noise impact magnitude for ecological receptors. This assessment is shown in Table 47 below.

TABLE 47: 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 47 the magnitude of the impact would be *negligible* at NSR03 and NSR04. 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.

5.10.2 Operational Phase

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.

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.

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[49] with an assumed sound reduction index (RW) of 25dB. Details of these building construction materials are provided in Table 48, along with those for the roller shutter doors for the Plant and Storage buildings.

TABLE 48: SOUND REDUCTION, R_W OF BUILDING MATERIALS

CONSTRUCTION ELEMENT	RW (DB)
Walls and Roof	25
Roller Shutter Doors (closed)	21

Table 49 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 49: 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)

[49] 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

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)[50] 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).

- 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.

Based on the above assumptions and inputs the predicted specific noise levels during the operation of the Scheme are shown in Table 50 below.

TABLE 50: PREDICTED SPECIFIC NOISE LEVELS

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

NOISE SENSITIVE RECEPTOR	ASSESSMENT PERIOD	PREDICTED SPECIFIC LEVEL, DB $L_{AEQ, 1-HOUR}$.
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

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 51.

TABLE 51: BS4142:2014+A1:2019 RATING PENALTIES

SOUND SOURCE	SOUND TONAL	SOUND IMPULSIVE	SOUND INTERMITTENT	OTHER SOUND CHARACTERISTI	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 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.

SOUND SOURCE	SOUND TONAL	SOUND IMPULSIVE	SOUND INTERMITTENT	OTHER SOUND CHARACTERISTI	COMMENT
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 52, where the predicted rating levels and background sound levels have been rounded to the nearest dB.

TABLE 52: 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 52 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 53 below compares the difference between the predicted rating levels and the background sound levels in conjunction with the noise impact magnitude for residential receptors. Table 53 also determines the level of effect receptor sensitivity and noise effect significance.

TABLE 53: 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
NSR02	Daytime	-13	Negligible	Medium	Minor
	Night-time	-6	Negligible	High	Minor
NSR03	Daytime	-19	Negligible	Medium	Minor

It can be seen from Table 53 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.

Table 54 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 54: 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 55 below compares the difference between the predicted specific levels and the AQTAG09 Limit values in conjunction with the noise impact magnitude for residential receptors. Table 55 also determines the level of effect with reference to receptor sensitivity and noise effect significance.

TABLE 55: 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 55 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.

5.11 INFRASTRUCTURE & UTILITIES

5.11.1 Construction Phase

During the construction phase accidental damages may occur to the pre-existing infrastructure and utilities present within close proximity of the site development. No infrastructure or utilities exist directly within the development's footprint.

Second Interconnector

The route for the planned second interconnector does not run through the site of the scheme or the surrounding 100m buffer zone. The construction related to the second interconnector is scheduled to commence in 2026, and conclude in 2028. The site of the Scheme is separated from the route of second interconnector by a considerable distance, therefore the likelihood of potential of impacts of the Scheme construction on the second interconnector within is considered insignificant.

Construction vehicles related to the Scheme will access the site from the South gate, where works on the second interconnector are also envisaged. In this area, the precautions already planned for the protection of the second interconnector from construction vehicles and others apply. No further mitigation measures are required as a result of the planned development at this Scheme.

ECOHIVE complex – Existing Infrastructure

The Scheme's footprint encroaches agricultural land which has been cleared and is confirmed to not contain any infrastructure. However, within the buffer area, several utility features are currently present. The adjacent buildings within the ECOHIVE complex are surrounded by fencing. Street lamps are also present to illuminate the access road surrounding these buildings. These utilities are owned by Wasteserv Malta. Some items are in need of repairs and/or replacement.

Prior to the commencement of works, the chosen contractor needs to liaise with Wasteserv Malta to confirm which infrastructure is to be retained, thus eliminating the possibility of accidental damages to functioning utilities. Additionally, indirect impacts may occur through dust generated by the construction operations. Should the Contractor accidentally damage such infrastructure, they must report any damage to Wasteserv Malta and operators to coordinate a prompt repair operation at the Contractor's expense. Since the impact is known and can be prevented through a series of discussions and consultations, the envisaged impact is considered **adverse** and of **minor significance**.

ECOHIVE complex – New Infrastructure

During the construction phase, connections between the proposed development and the water and electricity amenities pre-existing within the ECOHIVE complex will need to be set up. This may cause temporary interruptions to the water and/or electricity supply within the ECOHIVE complex. Since these interruptions are expected to be localised and temporary, the impact is considered as **adverse** but of **minor significance**.

Other third-parties - Existing Infrastructure

All utility companies related to telecommunications, sewers, potable water systems, and power supply were contacted to confirm whether they own any infrastructure within the proposed site and/or a 100m buffer. With the exception of Enemalta and GO Mobile, all entities confirmed that no infrastructure is present within the site to be developed or its boundary. Enemalta confirmed a supply of underground electrical cables servicing the small group of buildings present to the South-East of the scheme site, while GO Mobile confirmed there are overhead internet cables within the same area. The latter were confirmed visually during the site visit held in July 2024 (See Figure 113).

The proposed TTF building and these infrastructure elements are present at some distance apart. Close liaison between the contractor and the cable owners will be maintained throughout the construction to establish working methods that would safeguard these existing infrastructures. Therefore, the presumed impacts from the scheme are considered to be **negligible.**

5.11.2 Operational Phase

The operation of the Scheme will expand the ECOHIVE's current capacity to process waste with the additional of thermal treatment of hazardous waste. The proposal contains an additional waste processing line intended to enable further increases in capacity to cater for projected increasing demands over time. This constitutes a **major beneficial impact** towards Malta's national waste management targets.

As a result, the complex will experience a higher flow of traffic to and from the site area. This heightened activity is not expected to exert any significant impacts on the surrounding infrastructure and utilities.

5.12 CLIMATE CHANGE AND CLIMATE CHANGE ADAPTATION

5.12.1 Impacts on Climate Change

The construction of the new TTF can have cumulative consequences on Climate Change. The direct construction impacts of such a project are temporary in nature but involve energy-intensive interventions that inevitably lead to the release of greenhouse gas (GHG) emissions. These interventions include the extraction and production of construction materials, the manufacture of raw materials and machinery, the transportation of these materials, and the operation of machinery during construction.

An increase in GHG emissions cumulatively contributes to accelerating Climate Change effects, including sea ice decline, sea level rise, extreme weather conditions, ecosystem changes, and reduced crop production:

- **Sea ice decline, sea level rise and retreat of glaciers –** global warming causes the shrinking and thinning of ice which melt and cause the sea level to rise.
- **Extreme weather conditions –** heat waves, droughts and monsoons.
- **Ecosystem changes –** earlier timing of spring events, poleward migration of arctic species, expansion of deserts, and a reduction in ocean oxygen levels and an increase in acidity affecting coral reefs, fisheries and protected species.
- **Crop production –** carrying capacity of the biosphere to produce.

The construction of the TTF can also have indirect impacts on Climate Change. The loss of rural land by cemented surfaces leads to a reduction in effective precipitation naturally recharging the underlying groundwater body, with consequent increase in run-off water volumes. By coupling this impact with increased rainfall intensity in shorter time frames (extreme weather events), the risk of flooding exacerbated by CC impacts should not be overlooked.

Despite these impacts, the construction of a new TTF can yield beneficial impacts on Climate Change. Better waste management at the TTF will reduce the need for raw materials, lower energy consumption, and decrease GHG emissions associated with the export of certain waste streams. Additionally, by diverting waste from landfills, the TTF helps reduce methane emissions and minimizes the environmental impact of waste disposal, contributing to overall Climate Change mitigation efforts.

5.12.2 Adaptability to Climate Change

The adaptability of the proposed MRF to future effects of Climate Change can be evaluated by considering its potential impact on Malta's waste management and the country's ability to increase recycling rates. The processing of hazardous waste streams at the TTF reduces the need for export, leading to a significant decrease in energy consumption and greenhouse gas emissions. This helps to mitigate the overall impact of Climate Change by lowering the carbon footprint of waste management operations.

By diverting waste from landfills, the TTF helps reduce methane emissions, a potent greenhouse gas. Methane is produced when organic waste decomposes in anaerobic conditions, such as those found in landfills. Redirecting waste to the TTF can substantially lower these methane emissions, contributing to Climate Change mitigation.

5.13 ENVIRONMENTAL RISK

Any relevant risks, including major accident scenarios like contamination, emissions, explosions, blasts, flooding and major spillages, which could originate during the excavation, construction, operational and decommissioning phases of the proposed Scheme are assessed in this chapter. The assessment includes a quantification of the risk magnitude and probability, and the relevant risk analysis vis-à-vis the aforementioned scenarios.

Potential risk scenarios can be classified as:

- One-time risks
- Recurrent risks during operational phase of the project; and
- Risks associated with extreme or exceptional events (ex: effect of earthquakes or other natural disasters on the project).

The preliminary environmental risk assessment identifies ten potential environmental threats or sources of contamination identified throughout the duration of this EIA, as listed in Table 56.

TABLE 56: IDENTIFIED ENVIRONMENTAL RISKS

ENVIRONMENTAL RISK		PROJECT PHASE		
TYPE	RISK	CONSTRUCTION (INC. EXCAVATION)	OPERATIONAL	DECOMMISSIONING
One-time Risk	Contamination of geological layers through spillage of oils or fuels	✓	✓	✓
	Contamination of the Malta Mean Sea Level Aquifer through spillage of oil or fuels	✓	✓	✓
	Contamination of the marine environment through spillage of oil, chemicals or fuels	✓	✓	✓
	Generation of dust from works which may affect surrounding sensitive receptors	✓		✓
	Rock/soil instability which could impact nearby ecological/agricultural features of land uses	✓		
	Spillage of excavated material during transportation	✓	✓	✓

ENVIRONMENTAL RISK		PROJECT PHASE		
	Dust emissions from transportation of waste rock material	✓		✓
	Loss of protected endemic vegetation species	✓		
Exceptional Risks	Instability of the facility, due to earthquakes	✓	✓	
	Damage to surrounding environment from explosion/fire	✓	✓	✓

5.13.1 Criteria used to assess environmental risks

The impacts on the environmental receptors were addressed independently to determine the Potential Source of Contamination (PSC), keeping in mind the pathway status. The effects of the various impacts identified were evaluated against the criteria listed in Table 57.

TABLE 57: CRITERIA USED TO ASSESS ENVIRONMENTAL RISKS

CRITERION	DESCRIPTION	
Impact	Adverse	Overall negative impact
	Neutral	Neither positive nor negative impact
	Beneficial	Overall positive impact
Geographical extent of impact	Local	Within the confines of the peninsula
	National	Offshore within Maltese territorial waters
	Transboundary	Offshore outside Maltese territorial waters
Duration of impact	Short-term	Impact extends over a brief period
	Medium-term	Impact extends over one phase
	Long-term	Impact extends indefinitely
Type of effect	Temporary	Impact effects cease after activities are halted
	Permanent	Impact effects are felt after activities are halted

5.13.2 Environmental Risk Evaluation

The environmental risk was determined in a qualitative manner, which involved the computation of the impact magnitude (Table 58) on the environment and the corresponding probability of occurrence (Table 59). The risk matrix is shown in Table 60 and the final risk assessment shown in Table 61.

TABLE 58: PARAMETERS USED TO ASSESS THE RISK MAGNITUDE

MAGNITUDE	EFFECT ON THE ENVIRONMENT
Insignificant	No discernible impact or measurable impairment, for example, not exceeding published guideline values for "normal" or "background" levels.
Minor	Minor effects on biological or physical environment. Minor short-, medium-term damage to a localised area or that ceases once the event is over.

MAGNITUDE	EFFECT ON THE ENVIRONMENT
Moderate	Measurable impairment on biological or physical environment but not affecting ecosystem function. Short-, medium-term impacts, where the ecosystem will recover quickly and without intervention.
Major	Serious environmental effects with some impairment of ecosystem function. Relatively widespread medium-, long-term impacts, requiring remediation, where ecosystem will recover over time once clean-up has been completed.
Severe	Very serious environmental effects with significant impairment of ecosystem function. Long term, widespread effects. Remediation required.

TABLE 59: PARAMETERS USED TO ASSESS THE RISK PROBABILITY

PROBABILITY	DESCRIPTION
Almost certain	The event is expected to occur in most circumstances /commonly repeating / occurs weekly
Likely	The event will probably occur in most circumstances / known to occur / occurs monthly
Possible	The event might occur, say yearly / has a 1 in 20 chance of occurring
Unlikely	The event could occur at some time, say once in every 10 years / say 1 in 100 chance of occurring
Rare	Event may only occur in only exceptional circumstances / less than a 1% chance of occurring

TABLE 60: RISK ASSESSMENT MATRIX

		MAGNITUDE				
		Insignificant	Minor	Moderate	Major	Severe
Probability	**Almost certain**	Med	Med	High	High	High
	Likely	Med	Med	Med	High	High
	Possible	Low	Med	Med	High	High
	Unlikely	Low	Low	Med	Med	High
	Rare	Low	Low	Med	Med	High

Table 61: Environmental risk assessment

PSC/Environmental Threat	Risk description	Pathway status	Receptor	PSC Evaluation											Evaluation of Risk												
				Impact			Extent			Term			Effect		Magnitude					Probability					Risk		
				Adverse	Neutral	Beneficial	Local	National	Transboundary	Short	Medium	Long	Temporary	Permanent	Severe	Major	Moderate	Minor	Insignificant	Almost certain	Likely	Possible	Unlikely	Rare	Low	Moderate	High
One-time environmental risks																											
Oils/fuels used on site during excavation, construction and/or potentially maintenance works during operations	Contamination of geological layers through spillage of oils or fuels	Horizontal/vertical percolation into geological layers	Aquifer system	✓			✓				✓			✓				✓					✓		✓		
	Contamination of the Malta Mean Sea Level Aquifer through spillage of oil or fuels	Horizontal/vertical percolation through geological layers and into the groundwater body	Groundwater body	✓			✓				✓			✓				✓						✓	✓		
	Contamination of the marine environment through spillage of oil, chemicals or fuels	Horizontal/vertical movement to the sea	Marine environment	✓			✓	✓			✓			✓				✓					✓		✓		
Excavation and construction works	Generation of dust from works which may affect surrounding sensitive receptors	Rock/soil excavation	Surrounding areas and uses	✓			✓			✓			✓					✓			✓					✓	
	Rock/soil instability which could impact nearby ecological/agricultural features of land uses	Excavation works potentially causing rockslides	Surrounding areas and uses	✓			✓				✓			✓		✓								✓		✓	
Vehicular transportation of waste material	Spillage of excavated material during transportation	Material dropping off the truck	Surrounding land uses	✓			✓	✓		✓			✓					✓				✓				✓	
	Dust emissions from transportation of waste rock material	Fine particles disperse in the air from the moving truck if not appropriately covered	Surrounding areas and uses	✓			✓			✓			✓					✓			✓					✓	

Exceptional environmental risks

				PSC Evaluation											Evaluation of Risk												
				Impact			Extent			Term			Effect		Magnitude					Probability					Risk		
PSC/Environmental Threat	Risk description	Pathway status	Receptor	Adverse	Neutral	Beneficial	Local	National	Transboundary	Short	Medium	Long	Temporary	Permanent	Severe	Major	Moderate	Minor	Insignificant	Almost certain	Likely	Possible	Unlikely	Rare	Low	Moderate	High
Natural earthquake	Instability of the structure, including machineries, due to earthquakes	Direct physical damage to machineries or building structure	Surrounding areas and uses; Malta waste management sector	✓			✓	✓				✓		✓		✓								✓		✓	
Explosion/jet fire	Damage to surrounding environment from explosion/fire at the facility	Flammable cloud engulfing an ignition source before it is diluted below its flammable limits	Personnel, surrounding areas, cliffs, ecology and uses; Malta waste management sector	✓			✓	✓				✓		✓		✓								✓		✓	
Flooding due to extreme weather events	Physical damage to the facility	Anthropogenic third-party interventions	Building structure and operation	✓				✓			✓		✓			✓								✓		✓	

5.14 EFFECTS ON HUMAN POPULATIONS

As outlined in the previous chapters, the TTF project may lead to various environmental impacts which in turn could affect human populations in several ways. The below table summarises these potential effects:

TABLE 62: SUMMARY OF THE EFFECTS ON HUMAN POPULATIONS

CAUSE	EFFECT	IMPACT
Effects of construction activities	Generation of dust	• Reduced air quality for nearby residents, most notably individuals who suffer from respiratory conditions.
	Noise and vibration	• A minor increase in noise is expected which may affect ECOHIVE personnel and surrounding residential receptors.
Effects during the operational phase of the project	Air quality & climate change	• The potential for the facility to increase the country's recycling rates would reduce the overall GHGs emitted on a national scale. This is likely to reduce the impacts on climate change. • The stack emissions are expected to release certain harmful pollutants into the air leading to impoverished air quality and the potential deposition of such pollutants into the soil and water bodies. The assessments carried out have quantified this impact as negligible to minor adverse.
	National waste management sector	• The construction of a new TTF will help the country to deal better with the increasing demand for the processing and management of hazardous waste.

5.15 DECOMMISSIONING PHASE

Upon completion of its life cycle, the facility may be terminated instigating decommissioning. The planning for decommission shall begin from the design stage and continue throughout the lifetime of the facility.

In order to minimize potential environmental impacts rising from the decommissioning of the TTF, the planning shall include but not be limited to the following:

- Preparation of an initial decommissioning plan;
- Collection of relevant information and data to facilitate future decommissioning;
- Selection of decommissioning strategy;
- Characterization of the facility;
- Preparation of a final decommissioning plan;
- Estimation of costs;
- Identification of the provision of financial resources for the decommissioning project;
- Submission of the plan to the regulatory body for review and approval;
- Public consultation in accordance with national requirements;
- Consideration of clean up, removal and disposal of materials.

Decommissioning options suitable for the proposed TTF shall include:

- Facility mothballing: its termination involves preserving building structures and machinery in a condition suitable for potential reuse upon reactivation. During this process, government agencies will oversee and regulate access to the industrial site to ensure compliance with relevant regulations. Additionally, contamination at the site will be addressed through rehabilitation and treatment measures.
- Partial facility decommissioning: this approach can be applied in the following scenarios: when a specific section or part of the facility is to be closed, when the facility is extensive and complex, or when the financial and environmental costs of complete decommissioning are prohibitively high. This method involves retaining certain structures and machinery in a state suitable for future reuse, while also addressing environmental contamination and monitoring access to the site in accordance with applicable regulations.
- Complete site decommissioning: it refers to the comprehensive shutdown of an industrial site, encompassing all necessary principles and regulations to safeguard human health and safety, and mitigate environmental risks. This process aims to eliminate or minimize potential

hazards associated with the facility's operations and ensure that the site is suitable for future use or redevelopment.

6 Summary of impacts

6.1 Land/sea cover and land/sea uses

Table 63: Summary of impacts table

Impact Type and Source			Impact Receptor		Effect and Scale										
Impact type	Specific intervention leading to impact	Project phase	Receptor type	Sensitivity	Direct/ indirect/ cumulative	Effect of Impact Beneficial/ Adverse	Severity	Physical/ geographic extent of impact	Short/ medium/ long term	Duration of impact Temporary/	Reversible/ irreversible	Probability of impact occurring	Overall impact significance	Proposed mitigation measures	Residual impact significance
Change of land use	Construction of the site	Operations	Existing agricultural land and ecological components	High	Direct	Adverse	High	Site	Long term	Permanent	Irreversible	Inevitable	Major	Implement the landscaping element proposed in the project design,	Major
Spillover effects	Construction of the site	Construction	Surrounding agricultural land and ecological components	High	Direct	Adverse	Medium	Surrounding area	Short term	Temporary	Reversible	Likely	Minor	Restrict operations to site as much as possible, minimise construction site size, and implement prevention measures for spillover effects. Compensate losses in nearby areas	Minor
Dust emissions	Excavation works	Construction	Access roads, adjacent fields and trees	High	Direct	Adverse	Medium	Local surrounding area	Short term	Temporary	Reversible	Likely	Minor	Follow L.N. 340 of 2022, Construction monitoring	Negligible
Increased pollution	Use of construction vehicles, Increased flow of waste carriers	Construction and Operations	Surrounding agricultural land	High	Direct	Adverse	Medium	Local surrounding area	Long term	Permanent	Irreversible	Inevitable	Moderate	Minimise vehicle idling times, appropriate traffic management	Minor
Extreme events	Oil leaks/ spills, accidents, flooding, fires, site failure etc.	Construction and Operations	Existing roads and adjacent tree plantations and agricultural land	High	Direct	Adverse	High	Local surrounding area	Medium	Temporary	Reversible	Remote	Moderate	Emergency Response Plan and prevention practices should be in place before start of operations	Minor

6.2 LANDSCAPE CHARACTER AND VISUAL AMENITY

TABLE 64: SUMMARY OF EXPECTED IMPACTS OF THE PROPOSED SCHEME

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT AND SCALE												
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARDS IMPACT	DIRECT/INDIRECT/ CUMULATIVE	BENEFICIAL/ ADVERSE	SEVERITY	PHYSICAL/ GEOGRAPHIC EXTENT OF IMPACT	SHORT/ MEDIUM/ LONG TERM	TEMPORARY/ PERMANENT	REVERSIBLE/ IRREVERSIBLE	PROBABILITY OF IMPACT OCCURRING	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE	OTHER REQUIREMENTS
Deterioration of the landscape value during construction works at VP1 to VP7	Presence of construction and excavation machinery, cranes; dust; noise; vibration and associated works	Construction & Excavation	Landscape elements	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Major	Adherence to Construction Site Regulations S.L.623.08 to reduce visual and landscape inconveniences such as dust dispersion, noise & vibration	Moderate	N/A
Reduced visual amenity during construction works at VP1, VP2 & VP6	Presence of construction and excavation machinery, cranes; dust; noise; vibration and associated works	Construction & Excavation	Residents, Farmers, Workers, Motorists, Passengers, Recreational activities: campers, joggers, cyclist, casual strollers	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Moderate		Minor	N/A
Reduced visual amenity during construction works at VP3, VP4, VP5 & VP7		Construction & Excavation		High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Temporary	Irreversible	Certain	Major		Moderate	N/A
Deterioration of the landscape value during operations at VP1, VP2, VP6 & VP7	Presence of TTF Building at ECOHIVE complex and take up of agricultural land	Operation	Landscape elements	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Permanent	Irreversible	Certain	Major	Earth-toned colours which blend with the surroundings should be used on the building façade.	Major (slight reduction)	N/A

Impact Type and Source			Impact Receptor		Effect and Scale											
Impact Type	Specific Intervention Leading to Impact	Project Phase	Receptor Type	Sensitivity & Resilience Towards Impact	Direct/Indirect/Cumulative	Beneficial/Adverse	Severity	Physical/Geographic Extent of Impact	Short/Medium/Long Term	Temporary/Permanent	Reversible/Irreversible	Probability of Impact Occurring	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Deterioration of the landscape value during operations at VP3 to VP5	Presence of TTF Building at ECOHIVE complex and take up of agricultural land	Operation	Landscape elements	High	Direct	Adverse	Medium	Site and immediate surroundings	Medium	Permanent	Irreversible	Certain	Moderate			
Reduced visual amenity during operations at VP1, VP2 & VP6	Presence of TTF Building at ECOHIVE complex and take up of agricultural land	Operation	Residents, Farmers, Workers, Motorists, Passengers, Recreational activities: campers, joggers, cyclist, casual strollers	High	Direct	Adverse	Medium	Site and immediate surroundings	Long	Permanent	Irreversible	Certain	Minor		Minor (slight reduction)	N/A
Reduced visual amenity during operations at VP3, VP4, VP5 & VP7		Operation		High	Direct	Adverse	Medium	Site and immediate surroundings	Long	Permanent	Irreversible	Certain	Moderate		Moderate (slight reduction)	N/A
Sustained light pollution at VP1 to VP7	External lighting	Operation	Residents & nearby fauna	High	Direct	Adverse	High	Site and immediate surroundings	Long	Temporary	Reversible	Unlikely	Minor	Strategic placement of external light systems; Shielded and downward lights to avoid residual light pollution.	Negligible	N/A

6.3 Geology, Geomorphology, Hydrogeology and Soils

Table 65: Summary of impacts table – Geology

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of impact occurring (inevitable/ likely/ unlikely/ remote/ uncertain)	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific interventio n leading to impact	Project phase	Receptor type	Sensitivity & resilience towards impact	Direct/ indirect/ cumulative	Beneficial/ adverse	Severity	Physical/ geographic extent of impact	Short/ medium/ long term	Temporary/ permanent	Reversible/ irreversible					
Loss of rock strata	Excavation	Construction	Mineral resources	Low	Direct and cumula tive	Adverse	High	Localised	Long term	Permanent	Irreversible	Inevitable	Moderate	Reuse or recycle excavated waste	Minor	-
Dust dispersion	Excavation and building structure	Construction	Landscape and human health	Low	Direct	Adverse	High	Widespre ad	Short term	Temporary	Reversible	Likely	Major	Site hoarding, dust suppression techniques, silt traps, etc.	Minor	There should be no stocked material that could be washed away by run-off during the rainy season
Stability of constructio n pit	Building structure	Construction and Operation	Operatives and third parties' property	High	Direct	Adverse	High	Localised	Long term	Temporary	Reversible	Uncertain	Moderate	Monitor closely during excavation and stabilize if necessary	Negligible	Monitoring structure settlements by competent geologist or geotechnical engineer
Spillages	Incident during transportatio n or storage of hazardous substances	Construction	Geological strata, soils, and watercours es	High	Direct	Adverse	High	Widespre ad	Long term	Temporary	Reversible	Likely	Major	Spill kits, hazardous substance storage areas, bunding systems, oil-water interceptors.	Minor	An emergency plan should be followed
Methane emissions	Storage of waste prior	Operation	Geological strata, soils, and	High	Direct	Adverse	Medium	Widespre ad	Long term	Temporary	Reversible	Likely	Major	Cold storage rooms for waste	Negligible	-

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT AND SCALE							PROBABILITY OF IMPACT OCCURRING (INEVITABLE/ LIKELY/ UNLIKELY/ REMOTE/ UNCERTAIN)	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE	OTHER REQUIREMENTS
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARDS IMPACT	DIRECT/ INDIRECT/ CUMULATIVE	BENEFICIAL/ ADVERSE	SEVERITY	PHYSICAL/ GEOGRAPHIC EXTENT OF IMPACT	SHORT/ MEDIUM/ LONG TERM	TEMPORARY/ PERMANENT	REVERSIBLE/ IRREVERSIBLE					
	to incineration		watercourses											containers, combustion air drawn from feeding areas under slight vacuum, shredder housed in a closed room kept under slight negative pressure.		
NO_x emissions	Incineration of waste	Operation	Geological strata, soils, and watercourses	High	Direct	Adverse	Medium	Widespread	Long term	Temporary	Reversible	Likely	Major	Installation of Selective Non-Catalytic Reduction (SNCR) process	Negligible	-
Soil Quality	Incineration of waste	Operation	Agricultural field	High	Cumulative	Adverse	High	Immediate surroundings	Long Term	Permanent	Reversible	Remote	Not significant	Monitoring of the pollutants levels around the Scheme	Not Significant	-

6.4 WATER BODIES

TABLE 66: SUMMARY OF IMPACTS – WATER BODIES

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT AND SCALE							PROBABILITY OF IMPACT OCCURRING (INEVITABLE/ LIKELY/ UNLIKELY/ REMOTE/ UNCERTAIN)	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE	OTHER REQUIREMENTS
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARDS IMPACT	DIRECT/ INDIRECT/ CUMULATIVE	BENEFICIAL/ ADVERSE	SEVERITY	PHYSICAL/ GEOGRAPHIC EXTENT OF IMPACT	SHORT/ MEDIUM/ LONG TERM	TEMPORARY/ PERMANENT	REVERSIBLE/ IRREVERSIBLE					
Contamination of Malta Mean Sea Level Aquifer (MSLA)	Percolation of contaminants through surface vulnerability features	Construction	Groundwater body	Low	Direct	Adverse	Moderate	Localised	Short	Temporary	Reversible	Likely	Minor	Installation of silt traps	Negligible	-
Runoff contamination	Storage of hazardous substances	Construction	Wied ta' Kieli watercourse	Moderate	Direct	Adverse	Moderate	Downstream catchment of the site	Medium	Temporary	Reversible	Uncertain	Moderate	Hazardous substance storage area, bunding systems.	Minor	An emergency plan in case of spillage should be followed
Contamination of coastal water bodies	Spillage of hazardous fluids	Construction	Qalet Marku and L-Għadira s-Safra	Low	Direct	Adverse	Moderate	Coastal waters	Short	Temporary	Reversible	Remote	Moderate	Monitor quantities of fluids imported onsite to prevent overflow	Negligible	-
Spillages	Handling and storage of chemicals and	Operation	Water Bodies	Moderate	Direct	Adverse	High	Localised	Short	Temporary	Reversible	Unlikely	Moderate	The facility is designed to prevent spillage from entering the ground.	Minor	Monitor the qualitative status of water bodies

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of Impact Occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain)	Overall Impact Significance	Proposed Mitigation Measures	Residual Impact Significance	Other Requirements
Impact Type	Specific Intervention Leading to Impact	Project Phase	Receptor Type	Sensitivity & Resilience towards Impact	Direct/ Indirect/ Cumulative	Beneficial/ Adverse	Severity	Physical/ Geographic Extent of Impact	Short/ Medium/ Long Term	Temporary/ Permanent	Reversible/ Irreversible					
	hazardous waste													Monitor potential leaks through pipelines and storage areas impermeability		
Major accidents	Large-scale fires or explosions, significant chemical releases, and structural failures	Operation	Water Bodies	Low	Direct	Adverse	High	Widespread	Medium	Temporary	Reversible	Remote	Major	Spill kits, hazardous substance storage areas, bunding systems, oil-water interceptors, surface waterproofing	Minor	An emergency plan should be followed
Excessive use of pesticides and fertilisers	Maintenance of landscape areas	Operation	Water Bodies	Moderate	Direct	Adverse	Moderate	Localised	Short	Temporary	Reversible	Uncertain	Moderate	Use of pesticides and fertilisers shall be controlled at required concentrations and frequency	Negligible	-

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of impact occurring (inevitable/ likely/ unlikely/ remote/ uncertain)	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific intervention leading to impact	Project phase	Receptor type	Sensitivity & resilience towards impact	Direct/ indirect/ cumulative	Beneficial/ adverse	Severity	Physical/ geographic extent of impact	Short/ medium/ long term	Temporary/ permanent	Reversible/ irreversible					
Groundwater salinization	Paving agricultural areas – depletion of groundwater recharge	Operation	Mean Sea Level Aquifer	High	Indirect and cumulative	Adverse	High	Widespread (upstream)	Long	Temporary	Reversible	Likely	Moderate	The sought mitigation measures result unfeasible.	Moderate	-
Public water network stress	Water demand for the operation of the plant	Operation	Mean Sea Level Aquifer	High	Direct and cumulative	Adverse	Moderate	Widespread (countryside)	Long	Temporary	Reversible	Likely	Moderate	Alternative water resource techniques like wastewater reuse and rainwater harvesting	Negligible	-
Flooding	Paving agricultural areas – increase of runoff flow rates	Operation	Water Catchment	Moderate	Indirect and cumulative	Adverse	Moderate	Widespread (catchment)	Short	Temporary	Reversible	Likely	Moderate	The sought mitigation measures result unfeasible.	Moderate	-

6.5 Ecology - Terrestrial

Table 67: Summary of impacts table – Ecology Terrestrial

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of impact occurring (inevitable / likely/ unlikely/ remote/ uncertain)	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific intervention leading to impact	Project phase	Receptor type	Sensitivity & resilience towards impact	Direct/ indirect/ cumulative	Beneficial/ adverse	Severity	Physical/ geographic extent of impact	Short/ medium/ long term	Temporary/ permanent	Reversible/ irreversible					
Loss of habitats and species - Circa 85 tree individuals, 50 of which are protected)	Excavation, backfilling	Construction	Vegetation & Fauna	High	Direct	Adverse	High	Localised	Long-term	Permanent	Irreversible	Inevitable	Major	Transplanting trees where possible, or compensatory planting (location TBD). Monitoring construction activities to minimise avoidable impacts	Moderate	N/A
Dust generation	Excavation, backfilling, building construction	Construction	Vegetation & Fauna	Moderate	Direct	Adverse	Moderate	Localised	Short-term	Temporary	Reversible	Likely	Minor	Dust suppression techniques, regular clearing of affected areas, construction monitoring	Negligible	N/A
Increased Light, Vibration & Noise generation	Excavation, backfilling, building	Construction	Fauna	High	Direct	Adverse	Moderate	Local and near vicinity	Short-term	Temporary	Reversible	Likely	Minor	Works will be limited to daylight hours. Use of lighting	Negligible	N/A

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of impact occurring (inevitable / likely/ unlikely/ remote/ uncertain)	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific intervention leading to impact	Project phase	Receptor type	Sensitivity & resilience towards impact	Direct/ indirect/ cumulative	Beneficial/ adverse	Severity	Physical/ geographic extent of impact	Short/ medium/ long term	Temporary/ permanent	Reversible/ irreversible					
	construction													for safety reasons should be limited to downward facing, shielded and low-frequency lights. Equipment well maintained to avoid excessive noise.		
Increased Light, Air Pollution & Noise generation	Operation of the TTF	Operations	Vegetation, Fauna, Coastal marine area	High	Direct	Adverse	Moderate	Local and near vicinity	Long-term	Permanent	Irreversible	Likely	Minor	Minimising noise spillover by using BAT and keeping apertures shut during operational hours. Ensure equipment is well-maintained and within national emission limits via regular monitoring.	Negligible	N/A

Impact Type and Source			Impact Receptor		Effect and Scale							Probability of impact occurring (inevitable / likely/ unlikely/ remote/ uncertain)	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Impact type	Specific intervention leading to impact	Project phase	Receptor type	Sensitivity & resilience towards impact	Direct/ indirect/ cumulative	Beneficial/ adverse	Severity	Physical/ geographic extent of impact	Short/ medium/ long term	Temporary/ permanent	Reversible/ irreversible					
														Limit night-time lighting to the bare minimum and use of down-facing lights.		

6.6 ECOLOGY - AVIFAUNA

TABLE 3: SUMMARY OF IMPACTS TABLE - AVIFAUNA

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT & SCALE							IMPACTS				
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARD IMPACT	DIRECT/ INDIRECT/ CUMULATIVE	BENEFICIAL/ ADVERSE	SEVERITY	PHYSICAL / GEOGRAPHIC EXTENT OF IMPACT	SHORT-/ MEDIUM-/ LONG-TERM	TEMPORARY/ PERMANENT	REVERSIBLE / IRREVERSIBLE	PROBABILITY OF IMPACT OCCURRING	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE	OTHER REQUIREMENTS
Loss of habitat for terrestrial avian species	Destruction of agricultural land in ODZ	Construction	Terrestrial avian species	High & Low	Direct	Adverse	Low	Local in footprint and AoI-1	Short-term	Temporary	Reversible	Inevitable	Moderate	Keep time short, keep footprint low, avoid (if possible) reproductive season, habitat restoration	Minor	N/A
Noise, vibration, and light pollution negatively affecting terrestrial avian assemblages in AoI-1	Construction activities, operation	Construction, decommissioning	Terrestrial avian species	Moderate & Moderate	Direct	Adverse	Low	Local, in footprint and AoI-1	Short-term	Temporary	Reversible	High	Moderate	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods	Minor	N/A
Light pollution negatively impacting nocturnally migrating birds	Lighting during construction	Construction, decommissioning	Nocturnally migrating birds	Moderate & Moderate	Direct	Adverse	Low	Broad (AoI-1 and AoI-2)	Short-term	Temporary	Reversible	High	Moderate	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods	Minor	N/A
Colony disturbance grounding of seabird fledglings, associated induced mortality caused by ALAN	Lighting during construction and operation	Construction, operation, decommissioning	Procellariiform seabirds, specifically *P. yelkouan*	High & Low	Direct	Adverse	High	Broad (AoI-2)	Short-term, potentially long-term	Temporary, potentially permanent	Reversible	High	Major	Limit night-time activities, reduce light pollution, avoid (if possible) sensitive periods.	Minor	Strictly follow guidelines for the reduction of light pollution

Exposure of (marine) avifauna to harmful substances, including biohazardous material (pathogens etc.), reducing life expectancy, physiological health state, reproductive success, disease outbreaks	Pollutants from stack plume, spills of fly ash and bottom ash, spills, of contaminated water during standard operation, transport or during accidents, bioaccumulation	Operation, potentially decommissioning	Marine avian species and others	High & Low	Direct	Adverse	High	Broad (AoI-2 and beyond)	Long-term	Permanent	Reversible	Inevitable	Major	Infrastructure (FGT) and monitoring (CEMS) of the stack. Protocols in place to minimise release and spills of any harmful substances, including biohazardous material into the environment	Not significant	N/A
Contribution to climate change, impacting biodiversity	Increase in CO2 due to use of diesel, heat-island effect from built-up footprint	Operation	Biotic and abiotic environment	Moderate & Moderate	Indirect/ Cumulative	Adverse	Moderate	Very broad	Long-term	Permanent	Reversible, with difficulty	Low to Inevitable	Not significant	Reduce footprint, Reuse of generated steam for internal purposes where possible	Not significant	N/A

6.7 Agricultural land

Table 68: Summary of impacts - Agriculture

Impact type and source			Impact receptor		Effect & Scale											
Impact type	Specific intervention leading to impact	Project phase (construction/ operation/ decommissioning)	Receptor type	Sensitivity & resilience toward impact	Direct/ Indirect/ Cumulative	Beneficial/ Adverse	Severity	Physical/ geographic extent of impact	Short-/ Medium-/ Long-term	Temporary / Permanent (indicate duration)/ Permanent	Reversible (indicate ease of reversibility)/ Irreversible	Probability of impact occurring (Inevitable/ Likely/ Unlikely/ Remote/ Uncertain	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Loss and deterioration of agricultural land, Decrease in overall ODZ area	Excavation and Construction causing land loss	Construction & Operations	Site area	High sensitivity, Low resilience	Direct & Cumulative	Adverse	Major	Development area	Long-term	Permanent	Irreversible	Inevitable	Major	Containing impacts to site area by adhering to construction regulations	Major to Moderate Adverse	NA
	Dust generation during construction	Construction	Surrounding agricultural land	Moderate sensitivity, Moderate resilience	Indirect	Adverse	Moderate	Surrounding agricultural fields	Short-term	Temporary (during construction phase)	Reversible	Likely	Moderate	Adherence to PA and ERA regulations and instructions to protect surrounding areas	Minor Adverse	NA

6.8 ARCHAEOLOGY & CULTURAL HERITAGE

TABLE 69: SUMMARY OF IMPACTS TABLE – ARCHAEOLOGY & CULTURAL HERITAGE FEATURES

IMPACT TYPE AND SOURCE			IMPACT RECEPTOR		EFFECT & SCALE							PROBABILITY OF IMPACT OCCURRING (INEVITABLE/ LIKELY/ UNLIKELY / REMOTE/ UNCERTAIN)	OVERALL IMPACT SIGNIFICANCE	PROPOSED MITIGATION MEASURES	RESIDUAL IMPACT SIGNIFICANCE	OTHER REQUIREMENTS
IMPACT TYPE	SPECIFIC INTERVENTION LEADING TO IMPACT	PROJECT PHASE (CONSTRUCTION/ OPERATION/ DECOMMISSIONING)	RECEPTOR TYPE	SENSITIVITY & RESILIENCE TOWARD 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					
Loss of features and change in the context and cultural landscape	Excavation works – Superficial demolition/ dismantling of rural structures	Construction	Identified cultural features (A,B and rubble walls)	High	Direct	Adverse	High	Limited	Long term	Permanent	Irreversible	Likely	Major	Integration or Relocation of significant features if technically possible	Moderate	N/A
Potential damage to cultural and/or archaeological features below the ground	Excavations works – Below the ground	Construction	Archaeological features	High	Direct	Adverse	High	Limited	Long term	Permanent	Irreversible	Inevitable	Major	Constant monitoring and use of sensitive construction methods.	Moderate (depending on the outcome of the proposed interventions)	N/A

6.9 Air Quality

Table 70: Summary of impacts table – Air Quality

Impact type and source			Impact receptor		Effect & Scale											
Impact type	Specific intervention leading to impact	Project phase (construction/ operation/ decommissioning)	Receptor type	Sensitivity & resilience toward 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	Probability of impact	Overall impact significance	Proposed mitigation measures	Residual impact significance	Others requirements
Emissions from stack	Hazardous waste incineration plant	Operation	Residential areas, Agricultural land and disturbed ground Natura2000 Sites of Community Importance (SCI) Natura2000 Special Protection Area (SPA) Natura2000 SPA and SCI Tree Protected Areas	High	Direct	Adverse	High	Immediate surroundings	Long-term	Temporary combustion phases	Reversible with some difficulty	Remote	Not significant	Monitoring of the pollutants levels around the Scheme to ensure that they are within limits, and periodic monitoring and maintenance of the abatement technologies	Not significant	N/A

The impact assessment for the three simulation scenarios (Scenarios A, B and C), corresponding to three different plant operations, all achieved a not significant adverse impact when evaluating the MTTF in isolation. The differences in emissions that are likely to arise across the three Scenarios are negligible in concentration and thus do not lead to a discernable adverse impact on air quality. Noise & Vibrations

6.10 Noise & Vibrations

Table 71: Summary of Impacts – Noise

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 embedde	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					
														d into the scheme		
	Operational Plant and On-site Vehicle Movements	Operation	Wildlife Habitat	Medium	Direct	Adverse	Low	Approx 100m 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

* 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

6.11 Infrastructure & Utilities

Table 72: Summary of expected impacts – Infrastructure & utilities

Impact Type and Source			Impact Receptor		Effect and Scale										
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/ permanent	Reversible/ irreversible	Probability of impact occurring	Overall impact significance	Proposed mitigation measures	Residual impact significance	Other requirements
Potential interruptions of second interconnector or cable	Dust-generating activities, traffic	Construction	National power supply	High	Direct & Indirect	Adverse	High	National	Medium	Temporary	Reversible	Remote	Negligible	N/A	Negligible	N/A
Damage to existing infrastructures/utilities	Mechanical damage	Construction	Existing infrastructure and utilities within the access route	High	Direct	Adverse	Low	Local	Short	Temporary	Reversible	Unlikely	Moderate	Liaison between WSM and contractor, Precautions taken	Minor	N/A
Damage to existing infrastructures /utilities	Dust-generating activities	Construction	Existing infrastructure and utilities within the buffer zone	Medium	Indirect	Adverse	Medium	Local	Short	Temporary	Reversible	Unlikely	Minor	Liaison between WSM and contractor, Dust-mitigation measures	Negligible	N/A
Interruptions to water and electricity supply	Connection of services to electricity grid & water network	Construction	Existing facilities within the ECOHIVE complex	Medium	Direct	Adverse	Medium	Local	Short	Temporary	Reversible	Inevitable	Minor	Liaison between WSM and contractor	Negligible	N/A
Improved capacity to treat hazardous waste	Operation of a new TTF	Operations	Existing waste management capacity	High	Direct	Beneficial	High	National	Long	Permanent	Irreversible	Inevitable	Major	N/A	Major	N/A

7 Mitigation measures, Residual Impacts & Monitoring

7.1 Land/sea cover and land/sea uses

During the construction phase, the following mitigation measures will be put in place:

- Reducing the construction footprint to the minimum possible
- Use of equipment and methods that minimise the generation of dust
- Dust mitigation measures such as site hoarding with dust curtains in place around the trench, wetting of the working area, etc.
- Spill trays in place underneath any equipment that may cause oil leaks
- Restoring surrounding natural areas that have been impacted by spillover effects to their previous condition
- Compensating for the loss of native trees
- Close communication with land-owners (such as farmers and residents in the surrounding area) throughout the construction phase
- Adhering to all construction codes of best practice
- Emergency response plans in place for the prevention, containment and mitigation of any extreme events (flooding, heatwaves, oil spills etc).

The residual impacts to the land use and cover remain of major significance due to the change of use of workable agricultural land and tree plantations into commercial uses. However, all indirect impacts related to the construction phase will be reduced to minor significance should the aforementioned mitigation measures be in place.

It is recommended that general construction site monitoring is carried out during the construction phase. Such monitoring will ensure that the Contractor is abiding by the Environmental Construction Site Regulations of 2007 (S.L.552.09) to help keep the adverse impacts of the works to a minimum.

Monitoring during the operational phase is not deemed necessary.

7.2 Landscape character and Visual Amenity

As part of the finishing works, it is imperative that the TTF building facades and structures are painted using neutral earth-toned colours that harmonize with the natural aesthetics of the surrounding buildings and terrain. These measures are essential to mitigate the visual impact of the proposed development, facilitating seamless integration into the landscape.

Additionally, the Contractor must install on-site light fixtures in a strategic manner to pre-empt any potential complaints or adverse impacts on nearby residents and fauna. The selection of outdoor lighting systems by the Applicant should prioritize shielded fixtures directed downwards onto internal road areas. This precaution is crucial in minimizing spillover lighting effects that could otherwise result in undesirable glare and disturbances to the nightscape

The Applicant should engage an environmental expert to monitor the works during the construction phase to ensure compliance with the ENVIRONMENTAL CONSTRUCTION SITE REGULATIONS OF 2007 (S.L.552.09). Attention should be given to the erection of appropriate site boundary walls, the mitigation of dust dispersion and the containment of stockpiles and machinery within the site boundaries. This will ensure that the Contractor manages the works effectively to reduce the visual impacts.

Despite the Applicant's implementation of a monitoring program and mitigation measures, it is expected that some residual impacts will persist. These are mainly due to the permanent nature of the building and the utilization of rural land in the vicinity.

7.3 Geology, Geomorphology, Hydrogeology and Soils

Some of the proposed mitigation measures related to construction best practices are highlighted below:

- **Reuse or Recycle Excavated Waste:** Implement strategies to reuse or recycle excavated materials wherever possible, reducing waste and minimizing environmental impact.
- **Site Hoarding and Dust Suppression:** Hoarding should be set up (in line with the L.N.340 of 2022 - Construction Management Site Regulations, 2022) along the construction site to minimise dispersion of particulates.
- **Silt Traps and Erosion Control:** Utilize silt traps and sediment control measures to prevent soil erosion and manage runoff effectively.
- **Oil-Water Interceptors:** Install oil-water interceptors to prevent contamination of surface water and groundwater from construction high risk activities related to the handling and storage of hazardous fluids, if used. While there is no specific information about oil-water interceptors in the context of construction a TTF, the use of such systems is consistent with best practices for environmental protection and risk management in industrial settings if the use hazardous fluids are forecasted.

To mitigate impacts on ground contamination and hydrogeology during the operation of the proposed TTF, several operational measures can be implemented. These include:

- Implementing precautionary measures to prevent methane emissions: technical specifications and basic design measures include
  - cold storage rooms for waste containers;
  - drawing primary and secondary combustion air from the feeding areas to keep these areas under slight vacuum;
  - housing the shredder in a closed room maintained under slight negative pressure through suction by the combustion air fans.
- Installing SNCR for NO_x reduction: Selective Non-Catalytic Reduction (SNCR) process involves the injection of a reagent (ammonia or urea) in the secondary combustion chamber to reduce NO_x concentrations at the outlet of the facility.
- Regular maintenance of ash discharge system: ash and sludge discharging systems should be periodically maintained to prevent soil and water contamination.
- Water management solutions: all process water streams generated shall be treated and reused to the extent possible and where it is found to be economical and environmentally feasible. Treatment of wastewater prior to reuse or discharge into the environment might be required.
- Implementing waste handling protocols: all vehicles transporting waste are properly covered to prevent spills and leaks during transit. Additionally, designated unloading areas should be equipped with containment systems to manage any accidental discharges.

- Using environmentally friendly alternatives for hazardous substances: where possible, substituting less harmful materials in operations minimizes the potential for soil and water pollution.
- Regular training for employees on best practices for waste management and spill response: this training should emphasize the importance of adhering to established protocols to prevent contamination incidents.

By integrating these measures into the facility's operations, the TTF can effectively mitigate risks related to ground contamination and protect local hydrogeological conditions. Further details on mitigation measures to be implemented during the operation of the TTF are available on the Technical Requirements report.

Residual impacts are the effects that are expected to persist after the implementation of the proposed mitigation measures. Despite the comprehensive adoption of these strategies, several unavoidable residual impacts are anticipated during both construction and operational phase of the project.

During the construction of the TTF, particularly during excavation works, there will be a permanent loss of geological layers within the footprint of the site, which could affect local ecosystems and surrounding soil health. Additionally, temporary dust accumulation is likely to occur, especially in areas adjacent to hydrological features connected to the scheme.

The risk of temporary contamination of geological formations and watercourses due to spillage incidents poses a significant concern. Specific measures included in the design report to prevent these spillages are to be followed and emergency plans implemented to minimize the diffusion of pollutants into the environment.

The stability of construction pits shall be monitored by a geologist or geotechnical engineer with the aim of preventing potential ground collapses due to unforeseen events. During the operational phase, structure settlements shall be closely monitored with the objective of ensuring that operational settlements do not exceed the limits identified during the design stage of the project.

The monitoring of pollutant levels around the Scheme is crucial to ensure that they are within limits, and to enable periodic monitoring and maintenance of the abatement technologies. Further details on this monitoring program are provided through the Air Quality Study.

7.4 WATER BODIES

Some of the proposed mitigation measures related to construction best practices are highlighted below:

- **Silt Traps:** Utilize silt traps and sediment control measures to prevent soil erosion and manage runoff effectively.
- **Hazardous substances storage area:** Store hazardous materials and liquids (paints, solvents, sealants, oils, etc.) in designated areas equipped with secondary containment measures, such as spill containment pallets.

To mitigate impacts on Water Bodies during the operation of the proposed TTF, several operational measures can be implemented. These include:

- **Leak monitoring and containment:** Monitoring of potential leaks through pipelines and set impermeable storage areas for waste.
- **Spill prevention and control:** The facility design prevents spillage from entering the ground. Storage tank leaks are contained within the tank farm, avoiding contamination of rocks or soil. Overflows are also directed to the tank farm. Additionally, spill kits facilitate immediate response to hazardous liquid spills, while hazardous substance storage areas ensure safe containment of materials, and bunding systems effectively contain leaks.
- **Controlled pesticides and fertilisers application:** Use of pesticides and fertilisers at required concentrations and frequency.
- **Rainwater harvesting:** Rainwater is collected from surfaces and stored in tanks. The harvested rainwater will be utilized for industrial purposes.
- **Wastewater reuse:** process wastewater will be collected in drain pit and leachate pit to be treated and reused.
- **Surface waterproofing:** the protection of the underground structure against water from the ground and all workmanship required for waterproofing works shall be in accordance with their relevant EN standards. Where required, further waterproofing system shall consist of a flexible adhesive water and vapor proof single-ply polymeric membrane, suitable for use for sub-structures in hot climates.
- **Hazardous substances storage area:** use of bunding systems for tanks.

The cumulative impact induced by the progressive land impermeabilization of the ECOHIVE Complex may generate moderate flooding impacts especially when current precipitation depths are compared to the impacts of Climate Change. Climate Change impacts are foreseen to generate more intense precipitation during lower rainfall events than the values currently available. In order to reduce the risk of flooding, mitigation measures have been sought but were found to be unfeasible for the study area. Stormwater retention basins are normally considered; however, the lack of soil availability to host such structures downstream of the Scheme impedes their correct functioning. On the other hand, injecting treated water from industrial drains or runoff underground, particularly near a hazardous waste treatment facility, may result in residual hazardous substances remaining. Any offset in the water treatment process, or any delayed detection of contaminants, could result in irreversible contamination of the groundwater qualitative status.

During the construction phase, the primary residual impact of concern is the potential for runoff contamination due to the storage of hazardous substances. Even with proper storage protocols and containment measures in place, the risk of accidental releases or leaks is unlikely to be entirely eliminated, potentially affecting local water quality and ecosystems.

During the operational phase, spillages resulting from the handling and storage of chemicals and hazardous waste remain a persistent risk. While stringent safety procedures and containment systems significantly reduce the likelihood of such incidents, the potential for human error or equipment failure means that small-scale spills or leaks may still occur occasionally. The risk of major accidents, though greatly minimized through safety measures, cannot be completely discounted. These could include large-scale fires or explosions, significant chemical releases, or structural failures. While the probability of such events is low, their potential consequences necessitate ongoing risk management and emergency preparedness.

The cumulative impact of flooding resulting from the land impermeabilization at the ECOHIVE Complex shall not be overlooked. Flooding events may pose a significant threat to the infrastructure located downstream to the site once the designed waste treatment facilities will be constructed.

These residual impacts underscore the importance of maintaining rigorous safety protocols, regular monitoring, and adaptive management strategies throughout the project's lifespan to ensure environmental protection and operational safety.

The following monitoring programme is designed to ensure the effective oversight of water bodies potentially impacted by the construction and operation of the new TTF.

Construction Phase:

- Fluid quantity monitoring:
  - Recording of all fluids imported to the site;
  - Reconciliation of fluid volumes against storage capacity;
  - Immediate reporting of any discrepancies or near-overflow situations.
- Storage area impermeability of hazardous materials (paints, solvents, sealants, and oils):
  - Integrity checks of spill containment pallets.

Operational phase:

- Fluid management:
  - Automated monitoring of fluid levels in all storage tanks;
  - Real-time alerts for abnormal fluid level changes;
  - Audits of fluid input-output balance.
- Pipeline and storage pits integrity:
  - Continuous monitoring via pressure sensors and flow meters;
  - Comprehensive pipeline integrity assessments;
  - Immediate shutdown and investigation protocols for detected anomalies.
- Groundwater quality:
  - Sampling and analysis of groundwater from monitoring wells around the facility in line with current practices at already established points;
- Trend analysis of groundwater data with the aim of identifying potential upwards and/or downwards trends of groundwater parameters.
- Surface runoff:
  - Inspection of drainage systems and sediment traps.

This monitoring programme should be regularly reviewed and updated based on operational experience and any changes in regulatory requirements. All monitoring activities shall be documented, and reports shall be submitted to relevant authorities as required.

7.5 ECOLOGY - TERRESTRIAL

The LEGAL NOTICE 340 OF 2022 - CONSTRUCTION MANAGEMENT SITE REGULATIONS, 2022 should be enforced to avoid the impacts from being generated in the first place and to ensure that environmental degradation is kept as low as possible. These regulations provide details on the containment and transportation measures for loose construction material on site and in transit, and other measures to prevent carrying out and/or depositing particulate matter.

Some of the proposed mitigation measures related to construction best practices are highlighted below:

- Chemical spillages from machinery should be avoided by storing wastes and chemicals in bunded areas within the construction site
- Negligence during construction activities can be mitigated through regular and effective environmental monitoring to ensure that the construction impacts are not spilling over into the adjacent habitats.
- Hoarding should be set up (in line with the L.N.340 OF 2022 - CONSTRUCTION MANAGEMENT SITE REGULATIONS, 2022) along the construction site to minimise dispersion of particulates. This should be covered with suitable mesh or material that precludes dispersion of particulate matter.
- Pre-soaking, dust suppressors and covered stockpiles are considered good practices to minimise dust emissions.
- Construction vehicles and machinery should be well-maintained and serviced such that they can be operated at the best of their environmental performance.

The proposed development is not situated within any terrestrial or marine Natura 2000 site, and it does not have any direct or indirect impacts on such sites. Therefore, no mitigation measures are being suggested within the boundaries of the neighbouring Natura 2000 sites. However, there are several ecologically significant areas within the Area of Interest (AoI) that require the implementation of best practice and mitigation measures to reduce some of the identified impacts. Additionally, mitigation measures are recommended to minimise impacts of spillover and indirect effects on protected species inhabiting the nearby protected areas which may frequent the site and its surroundings.

The following measures are related to the minimising of impacts on protected flora directly within the proposed scheme site and AoI:

- Heavy machinery should not trample on natural areas located outside of the scheme site boundary

- All construction debris and soil should not be stockpiled near the base of trees and/or natural areas, but should be hauled away for proper recovery or disposal in designated waste management areas
- Compensatory planting should **not** be carried out during the summer period
- The necessary environmental permits to carry out interventions on protected species are obtained from the ERA
- Uprooting of invasive alien species should follow the recommendations in the ERA Guidelines on Works Involving Trees (2019) on managing non-native plant invaders and restoring native plant communities in terrestrial settings in the Maltese islands
- Species to be considered for transplanting/replacement/compensatory planting include: *Olea europea, Ceratonia siliqua* and *Pistacia lentiscus*
- Should transplanting of trees be necessary, they should be pruned (not more than 25% of overall crown) to stimulate growth and reduce water loss. The trees should be watered for two consecutive days before removal, and the branches should be tied together during the transplantation phase.
- Before transplanting mature trees, the soil depth needs to be determined. For trees which are within soil less than 75cm deep, transplanting is not recommended as the majority of the root ball will be within the bedrock
- Root pruning is recommended to ensure the root ball is of equal size to the tree canopy
- For trees found within soil of adequate depth, an excavator or hand-held tools are necessary to dig a trench around the tree which is of equal depth to the tree height. Should the root ball be confirmed by the ecological monitor to be of smaller size, a shallower excavation would be acceptable as long as the root ball is not damaged. The excavator/manual tools should also dig a new pit which is around twice the original size of the root ball
- Transplanting of *Olea europea* and *Ceratonia siliqua* should take place between February and March, and the trees should be regularly monitored for growth. Follow-ups are required for at least 3 years after the specimen has been transplanted
- Transplanting should ideally be carried out in two phases: The first year (wet season) soil depth is determined and trees earmarked for transplanting are subjected to root pruning. In the second year, the same trees are relocated to the transplanting area
- Treatment and regular monitoring of emissions of gas flue from the proposed stack are required to minimise and monitor the deposition of pollutants onto the surrounding vegetation respectively

Mitigation measures related to protected fauna species present either directly within the scheme site or known to inhabit the surrounding areas are highlighted in the following text.

- Works should not be carried out during the night time due to the recorded presence of nocturnal species in the area
- Although rodent control is encouraged when setting up a construction site, care must be taken not to negatively influence any resident fauna in the immediate surroundings

- If lighting is required, downward facing luminaires should be installed within the facility to reduce light pollution during the operational phase

Residual impacts are those impacts which are bound to remain after taking into consideration the proposed mitigation measures. Despite the comprehensive adoption of the recommended mitigation measures, a number of unavoidable residual impacts are still expected to arise, namely:

- Permanent impacts on ecologically sensitive terrestrial ecosystems and assemblages falling directly within the footprint of the site.
- Temporary accumulation of dust, vibration and noise impacts within the immediate terrestrial ecosystems abutting the construction site boundary
- Increase in night-time light in previously dark agricultural areas in the surroundings, which may be frequented by protected species
- Increase in disturbance of previously undisturbed agricultural land by vehicle traffic, which may be frequented by protected species
- Increase in pollutant deposition on the surrounding vegetation through vehicular and stack emissions

A monitoring programme should be set up and implemented during the construction phases of development. The construction management plan prepared at project planning phase will be updated by the chosen contractor in order to ascertain that the best practicable environmental options available are followed through.

During the construction phase, periodic monitoring is being recommended to ensure that mitigation measures are in place and working as they should. This would ensure that no unwarranted impacts arise due to deviations from proposed working practices. Such deviations could have additional impacts over and above those originally predicted. All monitoring data should be presented to the relevant authorities at pre-agreed frequencies.

A tree specialist is recommended to oversee/enact interventions directly related to the pruning or relocation of the native tree species. All interventions related to native trees are subject to permits provided by the Environment and Resources Authority.

During the site operations, monitoring of the stack emissions will be required periodically to ensure that national emissions limits are respected and no significant adverse impacts occur in the surrounding vegetated areas.

7.6 ECOLOGY - AVIFAUNA

The recommended mitigation measures to reduce this project's impact on avifauna are largely related to foreseen light pollution impacts on breeding birds, seabirds in particular, and nocturnally migratory land birds:

- Construction work at night requiring bright lights should be avoided or kept at a minimum.
- All lighting during all phases of the proposal (construction, operation, and decommissioning) should follow the Guidelines for the Reduction of Light Pollution in the Maltese Islands (2020) published by ERA/PA, specifically:

  - Lighting should not be directed towards the sea, upwards towards the sky, or onto adjacent peripheral habitat.
  - The use of bright “cold” white lights during the night is discouraged and warm light (<3000K) should be used instead.
  - The building should not be fully lit at night during the operational phase, with the stack being lit using intermittent red light.
  - In the event that bright lights at night must be used, it is recommended to avoid the most sensitive period for seabirds, which would experience the most significant impact from such disturbance.
  - Specifically, night time security lighting should follow the above-mentioned guidelines, particularly in that the site should not be permanently illuminated but triggered by motion sensors.
- Appropriate filter technology (FGT) keeping the emission levels well below threshold levels, as proposed, should be ensured.
- Appropriate protection measures against fires and waste spillage, as well as rapid response plans, must be in place to limit and reduce the potential effects of environmentally hazardous incidents.
- Reducing the overall footprint of the proposed development by reducing the number of parking spaces for private vehicles would reduce the direct impact of habitat loss on local avifauna. By further implementing alternative modes of transport for the staff to the site (e.g. a shuttle service) would bring additional benefits by reducing the carbon footprint.

In addition to these points, it is recommended that the development does not take up a footprint larger than necessary, particularly when considering the access roads, to decrease the disturbance and destruction of terrestrial habitat used by birds. These adverse effects can be further reduced through compensatory measures such as appropriate landscaping (see section below).

Regarding the risk of pollutants from the stack plume and from leakages and accidental spillages, both during standard operations and in case of accidents such as fires, it is of utmost important that highest standards regarding infrastructure such as the implementation of BAT within the Flue Gas Treatment (FGT). Additionally, the stack should be monitored through a Continuous Emissions Monitoring System. Protocols should be implemented and adhered to, in order to keep the risk that relevant avifaunal receptors get exposed to any harmful substances, including bio-hazardous material, at a minimum.

It is highly recommended that an area of an equivalent size to that of the planned development is unsealed, where natural habitat can be restored and protected to compensate for the sealing and habitat loss caused by the planned development. This is especially important due to the cumulative effect of ongoing development in the Maltese islands with an increasing loss of natural or semi-natural open and unbuilt habitats and unsealed areas which contribute to a healthy avian assemblage.

It can also be considered to financially contribute to restoration and habitat protection projects by other entities both at land and at sea.

Since the TTF plant and facilities would likely displace breeding bird territories, we would suggest the provision of nest boxes for *A. apus*, *M. solitarius*, and *P. hispaniolensis* but also for *Falco tinnunculus*. Appropriate nest boxes and nesting structures for *A. apus, F. tinnunculus, M. solitarius*, and *P. hispaniolensis* could be made available at suitable locations at the site.

In order to sustain a healthy invertebrate community for birds foraging in the area, landscaping with endemic trees, shrubs, and plants that increase arthropod abundance and diversity and provide fruits for migratory, wintering and breeding birds, shelter and nesting habitats is suggested. Species of Mediterranean garrigue and grasslands for *Sylvia melanocephala* and *C. juncidis* could be incorporated to compensate for breeding territories lost for the species. Additionally, removing alien invasive plants from the wider area and replacing them with indigenous flora that provide food, shelter, and nesting habitat would also be advised.

7.7 Agricultural land

An inevitable loss of agricultural land has been forecasted by the Expert. Adherence to PA and ERA regulations and instructions to protect surrounding areas are to be effective to prevent further impacts arising from this development.

The unique combination of location, aspect, topography, geology, and soil characteristics in this specific site has resulted in a state of limited agricultural potential, as the area seems unable to sustain crop production without sufficient rainfall. Therefore, it can be inferred that the proposed development is expected to result in the loss of some agricultural land. However, given the small size and low quality of the agricultural land involved, the impact is considered to be relatively limited.

Given that land loss is regarded as an inevitable event during the construction of a new TTF, the consultant does not perceive the necessity of monitoring agricultural fields as part of the monitoring programme.

7.8 Archaeology & Cultural Heritage

The identified Cultural features will be directly affected by the construction of the proposed development. In light of the mentioned local legislations, it would be advisable to integrate or relocate these features within the development in order to avoid any irreversible damage or loss.

Archaeological features have already been identified and recorded within the AoI, therefore, no further archaeological investigation will be required. However, due to the possibility of underlying cultural remains at undisturbed levels within the overgrowth and the underlying deposits at the S-West and Southern end of the AoI, it is recommended that an archaeological monitor be present during any ground disturbance works in these areas, so as to ensure the preservation of any existing cultural features that might be uncovered during the course of the proposed works.

7.9 AIR QUALITY

The cumulative impacts of the project were assessed with those of other existing and/or approved projects and other waste management plants identified within the Waste Management Plan Waste (2021 -2030). This assessment takes into account existing environmental problems, areas of particular environmental importance that may be affected and the use of natural resources. Specifically, the cumulative impact was assessed between the Marsa Thermal Treatment Facility built (MTTF) plant project with the Maghtab Waste to Energy Facility (WtE).

The results obtained show that the cumulative impact of the project and the Waste to Energy facility can be considered for:

- Scenario A
  - **Not Significant** for NO_2;
  - **Not Significant** for PM_{10}, except in the R27 receptor where the change in the annual PM_{10} (dAA) levels due to scheme is equal to 0,4 $\mu g/m^3$ and the Impact result is **Minor**.

- Scenario B
  - **Not Significant** for NO_2;
  - **Not Significant** for PM_{10}, except in the R27 receptor where the change in the annual PM_{10} (dAA) levels due to scheme is equal to 0,4 $\mu g/m^3$ and the Impact result is **Minor**;

- Scenario C
  - **Not Significant** for NO_2;
  - **Not Significant** for PM_{10}, except at R27 receptor where the change in the annual PM_{10} (dAA) levels due to scheme is equal to 0,4 $\mu g/m^3$ and the Impact result is **Minor**;

The overlap of the emissions from two production plants (WtE and MTFF) does not show a substantial variation in the fallout calculated at the sensitive receptors identified in the investigated areas, compared to what was obtained only from the MTTF.

The results obtained show that the operation of the MTTF plant adjacent to the WtE plant, does not produce a significant worsening of the atmospheric impact on the identified receptors.

The results obtained show for NO_2 and PM_{10} concentrations higher than 0.3 $\mu g/m^3$ occurred up to a distance of approximately 1.35 km from the chimney in a north-east and north-west direction, specifically at the R27 - R28 - R29 - R30 - R49 - R50 - R52 receptors, but the value is significantly lower than the 40.0 $\mu g/m^3$ limit (ALV), thus contributing to a negligible adverse impact.

TABLE 73: CUMULATIVE IMPACT – SCENARIO A

RECEPTOR	BASELINE PM_{10} (CAA)	PREDICTED PM_{10}	CHANGE PM10 (DAA) MTTF+ WTE	IMPACT[1]	BASELINE NO_2 (CAA)	PREDICTED NO_2	CHANGE NO_2 (DAA) MTTF+ WTE	IMPACT[1]
	µG/M³	µG/M³	µG/M3		µG/M³	µG/M³	µG/M³	
R1 to R26	36.53	36.57 – 36.69	0.04 – 0.16	N/S	11.56	11.60 – 11.73	0.04 - 0.17	N/S
R27		37.000	0.470	Minor (MI)		12.281	0.721	N/S
R28		36.880	0.350	N/S		12.105	0.545	N/S
R29		36.850	0.320	N/S		12.065	0.505	N/S
R30		36.880	0.350	N/S		12.106	0.546	N/S
R31 to R48		36.58 – 36.78	0.05 – 0.25	N/S		11.60 - 11.81	0.04 - 0.255	N/S
R49		36.840	0.310	N/S		12.049	0.489	N/S
R50		36.890	0.360	N/S		12.126	0.566	N/S
R51		36.640	0.110	N/S		11.673	0.113	N/S
R52		36.840	0.310	N/S		12.042	0.482	N/S
R53 to R55		36.60 – 36.66	0.07 - 0.130	N/S		11.63 – 11.69	0.07 - 0.133	N/S

[1] *Not Significant (N/S), Minor (MI), Moderate (MO), Major (MA)*

TABLE 74: CUMULATIVE IMPACT – SCENARIO B

RECEPTOR	BASELINE PM_{10} (CAA)	PREDICTED PM_{10}	CHANGE PM10 (DAA) MTTF+ WTE	IMPACT[1]	BASELINE NO_2 (CAA)	PREDICTED NO_2	CHANGE NO_2 (DAA) MTTF+ WTE	IMPACT[1]
	µG/M³	µG/M³	µG/M3		µG/M³	µG/M³	µG/M³	
R1 to R26	36.53	36.57 – 36.69	0.04 – 0.16	N/S	11.56	11.60 – 11.74	0.04 - 0.18	N/S
R27		37.000	0.470	Minor (MI)		12.281	0.721	N/S
R28		36.880	0.350	N/S		12.108	0.548	N/S
R29		36.850	0.320	N/S		12.066	0.508	N/S
R30		36.880	0.350	N/S		12.110	0.550	N/S
R31 to R48		36.57 – 36.78	0.04 – 0.25	N/S		11.60 - 11.81	0.04 - 0.259	N/S
R49		36.840	0.310	N/S		12.055	0.495	N/S
R50		36.890	0.360	N/S		12.130	0.570	N/S
R51		36.640	0.110	N/S		11.674	0.114	N/S
R52		36.840	0.310	N/S		12.044	0.484	N/S
R53 to R55		36.60 – 36.66	0.07 - 0.130	N/S		11.63 – 11.69	0.07 - 0.135	N/S

[1] *Not Significant (N/S), Minor (MI), Moderate (MO), Major (MA)*

TABLE 75: CUMULATIVE IMPACT – SCENARIO C

RECEPTOR	BASELINE PM_{10} (CAA)	PREDICTED PM_{10}	CHANGE PM10 (DAA) MTTF+ WTE	IMPACT[1]	BASELINE NO_2 (CAA)	PREDICTED NO_2	CHANGE NO_2 (DAA) MTTF+ WTE	IMPACT[1]
	μG/M³	μG/M³	μG/M3		μG/M³	μG/M³	μG/M³	
R1 to R26	36.53	36.57 – 36.71	0.04 – 0.18	N/S	11.56	11.60 – 11.74	0.04 - 0.185	N/S
R27		37.000	0.471	Minor (MI)		12.281	0.721	N/S
R28		36.888	0.358	N/S		12.108	0.548	N/S
R29		36.858	0.328	N/S		12.068	0.508	N/S
R30		36.891	0.361	N/S		12.110	0.550	N/S
R31 to R48		36.57 – 36.78	0.04 – 0.25	N/S		11.60 - 11.81	0.04 - 0.259	N/S
R49		36.840	0.325	N/S		12.055	0.495	N/S
R50		36.890	0.370	N/S		12.130	0.570	N/S
R51		36.640	0.114	N/S		11.674	0.114	N/S
R52		36.840	0.314	N/S		12.044	0.484	N/S
R53 to R55		36.60 – 36.66	0.07 - 0.130	N/S		11.63 – 11.69	0.07 - 0.133	N/S

[1] Not Significant (N/S), Minor (MI), Moderate (MO), Major (MA)

7.10 NOISE & VIBRATIONS

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.

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.

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.

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.

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

From review of the submitted documents relating to noise associated with the developments, 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.

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 76 below.

Table 76: 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

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)	
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 77.

TABLE 77: 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

Noise Sensitive Receptor	Total Cumulative Level, dB $L_{Aeq, 1-hour}$.	Relevant Noise Limit, $L_{Aeq, 1-hour}$	Difference
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 77 that the calculated cumulative noise level from construction operations are below the relevant noise limits at all the NSRs considered.

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.

7.11 Infrastructure & Utilities

During the construction phase, a range of mitigation measures should be implemented to reduce the likelihood of adverse impacts upon the existing local infrastructures and utilities. Recommended mitigation measures include:

- Liaising with the operators of the existing infrastructure and utilities of the proposed work to open up communication channels.
- Taking extra precautions when working in close proximity to existing infrastructures and utilities to avoid accidental damage.
- Informing Wasteserv Malta of any accidental damage to existing infrastructure and utilities so that damages can be repaired at the expense of the Contractor.

- Site hoarding and other dust mitigation measures should be implemented as necessary to avoid indirect impacts from dust accumulation on existing infrastructure.

The operational phase is not expected to give rise to any significant impacts.

If the Contractor works with care, adopts extra precautions around the existing infrastructure and utilities and carries out any accidental repair work correctly (should the need arise) there should be no residual impacts arising from the Scheme on the existing utilities and infrastructure.

If the Contractor accidently damage the infrastructure and utilities during the construction phase, a technically competent person should oversee the repair work. This will ensure that the repair work is up to standard and restores the damaged items to their original state with the least possible inconvenience.

Monitoring of infrastructure and utilities is not required during the operational phase

8 Conclusion

The proposed Thermal Treatment Facility (TTF) aims to support Malta's Long-Term Waste Management Plan (2021-2030) by addressing key challenges, including reducing waste exports and centralizing waste management infrastructure.

Spanning approximately 18,185 m², the TTF will house the main plant along with various ancillary buildings, including a water treatment facility, administrative offices, restrooms, laundry services, a kitchen, access control points, a reception area for pet carcasses, a substation, parking, and landscaped areas to integrate with the surroundings.

However, the facility's construction poses environmental concerns. Efforts have been made to minimize its impact on terrestrial and marine ecosystems, cultural sites, and local infrastructure. Despite these efforts, certain environmental impacts remain unavoidable. One major concern is the facility's visual impact, which, along with existing waste treatment plants, could alter the area's aesthetic appeal and affect tourism.

Land use change is another critical issue, as the development will lead to habitat loss and reduce land previously used for agriculture. This could impact underground resources, such as minerals and groundwater reserves, and may increase surface runoff, potentially leading to flooding risks.

To mitigate these impacts, a monitoring plan is necessary to balance waste management needs with environmental protection. While operational disruptions will be minimal outside of maintenance or emergencies like fires, best available technologies will be used to limit emissions, ensuring compliance with environmental regulations and sustainability standards.

Ultimately, the TTF is a crucial step toward Malta's waste management goals, aligning with environmental targets and carbon neutrality commitments. Despite challenges, it holds significant potential for advancing sustainable waste management in the country.