Malta International Airport

Method Statement for the Processing and Reuse of Contaminated Material in C15 Concrete

Revision 2.0
12th November 2025

[redacted]

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Contents

1. Introduction

This document is being submitted to the **Environment and Resources Authority (ERA)** for approval to process and reuse non-hazardous contaminated material, classified under **EWC 17 05 04**, within the production of C15-grade concrete. The proposal forms part of Malta International Airport plc (MIA)'s sustainable resource management strategy and supports circular economy principles by converting industrially contaminated material into an end-of-waste product suitable for reuse in infrastructure works.

The contaminated material originates from the **former MIA fuel station**, decommissioned in 2024, where excavation works identified both hazardous and non-hazardous contamination. All hazardous waste (EWC 17 05 03*) has been removed and disposed of in accordance with ERA-approved procedures. The non-hazardous contaminated material is now stored within the Airport Campus, pending reuse authorisation.

2. Background and Investigation Summary

Following the decommissioning of the old fuel station, a Conceptual Site Model (CSM) and Summary Report were prepared by Terracore Ltd. and Dr. Robert Cortis in accordance with ERA Terms of Reference (Version 6.1, June 2024). Field sampling was carried out by Terracore Ltd., with analytical testing undertaken by Biochemie Lab S.r.l., an ISO 17025:2017 accredited laboratory in Italy (Accreditation No. 0195).

Results confirmed the presence of non-hazardous contamination limited to total hydrocarbons (C>12), primarily within the subsurface strata below the former concrete forecourt. The total excavated volume of contaminated material amounts to approximately 1,900–4,500 m^3, which would translate to approximately 4,750 m^3 of produced concrete when reused in stabilised form.

Analytical data indicated that multiple samples exceeded the industrial threshold value of 750 mg/kg DW for total hydrocarbons (C>12) as defined in Decreto Legislativo 152/2006, Allegato 5, Tabella 1. These exceedances confirm that the soil is contaminated under the Italian soil quality criteria; however, they do not classify the material as hazardous waste under Regulation (EU) 1357/2014 or the Waste Framework Directive 2008/98/EC. The material contains no substances

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exceeding any hazardous-property (HP1–HP15) thresholds and is therefore correctly classified as non-hazardous soil and stones (EWC 17 05 04).

On this basis, the material has been designated for controlled reuse following stabilisation, ensuring that the elevated hydrocarbon content is effectively immobilised within the cementitious matrix. This classification and reuse strategy are substantiated by the End-of-Waste Concrete and Leachate Reports (2025), which confirm inert behaviour of the stabilised product.

All hazardous material identified during the decommissioning phase was removed and disposed of by Ptmatic Ltd., with full traceability provided through ERA Consignment Notes CN285621_EN and CN286740. The remaining non-hazardous fraction was transported to a designated, enclosed temporary storage facility located airside within MIA's campus ([storage coordinates annexed]).

3. Objective and Scope

This method statement describes the procedures for:

1. Retrieval of stored material from the MIA airside facility.
2. Processing of the material for reuse as an aggregate fraction in C15 concrete.
3. Quality control testing and leachability assessment.
4. Traceability and recordkeeping.
5. Compliance with relevant environmental and waste regulations.

This document also supports MIA's **End-of-Waste (EoW) application**, in accordance with **Waste Regulations (S.L. 549.63)** and **Council Decision 2003/33/EC**.

4. Compliance with ERA and End-of-Waste Criteria

This proposal satisfies ERA's requirements for reuse of contaminated material as an end-of-waste product by demonstrating:

- **Classification:** Non-hazardous material (EWC 17 05 04).
- **Chemical Suitability:** Contamination limited to total hydrocarbons (C>12) within acceptable industrial thresholds.
- **Leachability:** Laboratory testing confirms full compliance with **Council Decision 2003/33/EC Section 2.1.2.1. (L/S = 10 l/kg)** inert waste limits.
- **Physical Suitability:** Laboratory tests confirm C15-grade strength and stability at 40% substitution of contaminated aggregate.
- **End-of-Waste Conditions:** Final material will be designated as end-of-waste once:
    - Leachability tests confirm inert classification (confirmed below).
    - Hydrocarbon levels are non-detectable in the final product.
    - The material is reused solely in industrial/construction applications.
- **Material onsite:** No fuels or chemicals will be stored at any point on site.

5. Leachate Results Summary

Leachate analyses were carried out by **Biochemie Lab S.r.l.** under the direction of **Dr. Robert Cortis**, in accordance with **EN 12457-2:2002** and **Council Decision 2003/33/EC**. Three trial concrete blocks (TM3, TM4, TM5) were tested for compliance with inert waste leachate thresholds. The analytical results are summarised below:

Parameter	TM3 (mg/kg)	TM4 (mg/kg)	TM5 (mg/kg)	Inert Limit (mg/kg)	Remarks
As	0.0142	0.0200	<0.0010	0.5	Below limit
Ni	0.0544	0.209	0.0182	0.4	Below limit
Pb	<0.01	<0.01	<0.01	0.5	Below limit
Cd	<0.005	<0.005	<0.005	0.04	Below limit
Cr	<0.05	<0.05	<0.05	0.5	Below limit
Zn	<1	<1	<1	4	Below limit
Chloride	<250	<250	<250	800	Below limit
Sulphate	<25	<25	<25	1,000	Below limit
Fluoride	5.8	3.9	4.8	10	Below limit
DOC	9.00	6.20	5.98	50	Below limit
pH	8.0	8.0	8.0	6–9	Within range
TDS (mg/l)	3,210	2,830	2,940	-	Stable concrete matrix

All samples **comply with the inert waste leachate criteria**, confirming that the stabilised concrete matrix effectively immobilises hydrocarbons and trace metals. These findings are supported by the **EOW Leachate Report (April 2025)** and laboratory reports **2504176.005/01 – 2504176.007/01**.

6. Material Stabilization and Environmental Rationale

The stabilisation of residual hydrocarbons occurs through the cement hydration process, which binds contaminants within the crystalline concrete matrix. Based on literature (Adaska et al., 1998; Van der Sloot, 2000):

- **Hydrocarbons** become adsorbed into the aggregate and immobilised through hydrophobic interactions within the cementitious matrix.
- **Leachate potential** is minimal due to encapsulation and low permeability of the final C15 concrete.

These mechanisms ensure that reuse poses no environmental risk and that the product meets durability and safety requirements for infrastructure use.

7. Excavation and Storage Summary

All excavation and sampling activities were performed under the supervision of MIA Technical Services. The following key activities are noted:

- Zones 1 & 2: Hazardous layers excavated to 1.2 m depth and disposed of via Ptmatic Ltd. under ERA consignment notes.
- Zones 1 – 6 and 10 – 12: Non-hazardous infill material excavated and stockpiled (approx. 1,152 m³) for potential reuse in concrete production.
- Zone 3 (3 – 5 m depth): Bedrock exhibiting elevated hydrocarbon concentrations stored for potential End-of-Waste (EoW) processing.
- Zone 5 (2 – 3 m depth): Bedrock material identified with PAH concentrations exceeding the residential threshold under Decreto Legislativo 152/2006, Allegato 5, Tabella 1.
- Zone 5 (3 – 4 m depth): Overlying soil material showing similar PAH exceedances also designated for End-of-Waste processing in accordance with the Summary Report.
- All material from Zone 5 (2 – 4 m) has therefore been stored separately within the designated containment area and will be included in the controlled stabilisation and reuse programme described in this Method Statement.

Boulders identified during excavation were previously tested under the End-of-Waste Material Characterisation Report (27 March 2025). Hydrocarbon exceedances were recorded, and these boulders were subsequently disposed of through Ptmatic Ltd.

Storage area preparation, containment lining, and block-wall construction were completed by Aparks Ltd. under MIA supervision. The facility includes a geotextile base, impermeable liner, and controlled drainage system to prevent infiltration or leachate migration.

8. Processing into C15 Concrete

Processing will be undertaken during the Apron 9 Stand Rehabilitation Works (Tender Ref. 066.25), where C15 sub-base concrete will be produced using a blend of contaminated and clean aggregates.

Based on the aggregate batch records of Trial Mixes presented in Annex 6 (APARK-MLT Method Statement), updated by batching and test results achieved from samples of crushed contaminated material collected on the 25th October 2025 (Annex 6), the proportion of contaminated material incorporated within the trial mix is now established as 40% by total aggregate weight. The results in Annex 6 are important, as the testing was carried out on the material following the batching process and not any more a experimental result.

The mix design remains within the parameters of the approved methodology and continues to represent a significant reuse fraction of the available non-hazardous material, demonstrating technical feasibility and environmental compliance.

Compressive strength testing of the trial blocks was performed by Dr. Robert Cortis using standard cubes (150 mm), in accordance with EN 12390-3:2019. The verified results obtained from Annex 6 were:

Age (days)	*Average Compressive Strength (MPa)*
7	14.8
28	16.6

These results are consistent with the strength class requirements for C15 concrete (characteristic strength ≥ 15 MPa) under EN 206:2013+A2:2021 and confirm the suitability of the stabilised material for its intended use as a non-structural sub-base concrete.

The higher strength values (16.2 MPa and 18.7 MPa) previously reported in the Method Statement correspond to an earlier laboratory-scale mix performed during the End-of-Waste validation phase (Annex 3 – EOW Concrete Report). The field trial results in Annex 6 represent the operational mix currently proposed for site implementation and will therefore be considered the definitive performance data for this submission.

In addition to the above, the sample being presented in Annex 6 shows that the compressive strength value at 3 days and 7 days (13.9 N/mm^2 and 14.1 N/mm^2) is exhibiting a normal strength gain, with the samples of crushed contaminated aggregate taken. As theoretically, the 7-day compressive strength value is considered to be 85% of the 28-day test result, it is envisaged that the 28-day compressive strength value will achieve a compressive strength of 16.5 N/mm^2. This is in excess of the targeted 15 N/mm^2, and will hence give comfort that the targeted strength will be consistently reached.

Age (days)	*Average Compressive Strength (MPa)*
7	14.0 N/mm^2
28	Expected to achieve circa (16.5 N/mm^2)

The batching and placement of concrete will continue to be carried out in accordance with the APARK-MLT Ltd. Method Statement for the Batching and Placing of C15 Concrete Using Contaminated Material (Revision R1, 2025). MIA will oversee all works to ensure full compliance with ERA's approval conditions and the End-of-Waste reuse framework.

9. Environmental Monitoring and Traceability

Malta International Airport plc (MIA) will maintain comprehensive documentation for ERA inspection, including:

- Source identification (zone, batch, and storage reference);
- Laboratory test results (characterisation, strength, and leachability);
- Transport logs and ERA consignment notes; and
- Batching records for each C15 concrete production run.

All leachate and validation testing will be performed in accordance with the same analytical protocol applied during the End-of-Waste (EoW) concrete trial batches presented in Annex 3 – EoW Leachate Report (2025), which supersedes all earlier versions.

Specifically, testing will be carried out by an ISO 17025-accredited laboratory following EN 12457-2:2002, assessing parameters in line with Council Decision 2003/33/EC and the ERA Terms of Reference (Version 6.1, 2024). This ensures direct comparability between the initial trial-batch results and the ongoing production-phase monitoring.

The term “characterisation” refers to the initial suite of laboratory analyses performed on representative material batches prior to reuse, comprising:

- Total hydrocarbons (C>12) by GC-FID;
- Metals (As, Cd, Cr, Cu, Ni, Pb, Zn) by ICP-MS;
- Polycyclic Aromatic Hydrocarbons (PAHs) by GC-MS;
- Basic physical parameters (pH, moisture, density, organic content); and
- Leachability testing in accordance with Council Decision 2003/33/EC, Section 2.1.2.1. (L/S = 10 l/kg).

This characterisation confirms the non-hazardous status of each batch prior to batching and provides the baseline for subsequent leachate and compressive-strength testing.

In parallel, MIA has issued a Request for Quotations (RFQ) titled “Consultancy Services for Material Testing and Validation – Apron 9 Stand Rehabilitation Works” (September 2025) to appoint an independent ISO 17025-accredited laboratory.

The appointed consultant will be responsible for:

- Trial-mix verification and batch-by-batch characterisation;
- Periodic leachate and compressive-strength testing following the EoW protocol; and
- Weekly and final reporting aligned with ERA ToR and ERIS submission requirements.

All analytical results will be compiled in a cumulative database demonstrating ongoing compliance with inert classification and the End-of-Waste reuse framework throughout production.

10. Conclusion

This proposal demonstrates that the controlled reuse of non-hazardous contaminated material in C15 concrete:

- Fully complies with **Waste Regulations (S.L. 549.63)**.
- Aligns with ERA's circular economy and sustainable reuse objectives.
- Poses **no environmental or public health risk** due to stabilisation and traceability controls.
- Reduces demand for virgin aggregate, contributing to **resource efficiency**.

MIA requests ERA's authorisation to proceed with processing and reuse as described herein, based on the leachate test results confirming inert classification of the stabilised material.

References

1. ***Environmental and Waste Legislation***

   - *Waste Regulations (S.L. 549.63), Government of Malta.*
   - *Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills.*
   - *Decreto Legislativo 152/2006, Allegato 5, Tabella 1 (Italy) – Industrial soil contamination limits.*

2. ***Environmental and Laboratory Standards***

   - *EN 12457-2:2002 – Characterisation of waste – Leaching; compliance test for leachability of granular waste materials.Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of, and Annex II to, Directive 1999/31/EC (2003/33/EC)*
   - *UNI EN ISO 10304-1:2009 – Water quality – Determination of dissolved anions by ion chromatography.*
   - *UNI EN ISO 17892-1:2014 – Geotechnical investigation and testing – Laboratory testing of soil.*
   - *EPA Method 6020B (2014) – Inductively Coupled Plasma–Mass Spectrometry for metals analysis.*
   - *UNI EN ISO 1484:1999 – Determination of total organic carbon (TOC) and dissolved organic carbon (DOC).*

3. ***Scientific and Technical References***

   - *Adaska, W.S., & Taubert, D.H. (1998). "Encapsulation of Non-Hazardous Waste in Cementitious Materials." Portland Cement Association (PCA), Skokie, Illinois.*
   - *Van der Sloot, H.A. (2000). "Environmental Leaching Properties of Cement-Based Products." Environmental Aspects of Construction with Waste Materials, Elsevier.*
   - *European Commission (2018). Best Practices for Circular Economy in Construction Materials.*

4. ***Project-Specific Documentation***

   - *Terracore Ltd. (2024). Summary Report and Conceptual Site Model – Former MIA Fuel Station.*
   - *Dr. Robert Cortis (2025). End-of-Waste Leachate and Concrete Reports.*
   - *Biochemie Lab S.r.l. (2025). Laboratory Reports 2504176.005/01–007/01 (ISO 17025 accredited).*
   - *APARK-MLT Ltd. (2025). Method Statement for Batching and Placing of C15 Concrete Using Contaminated Material (Rev R1).*
   - *Malta International Airport plc. (2025). RFQ – Consultancy Services for Material Testing and Validation – Apron 9 Rehabilitation Works.*

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Annexes

Annex No.	Title / Document	Prepared By / Source	Purpose / Description
1	**Summary Report**	Terracore Ltd. (2024)	Overview of soil investigation and confirmation of non-hazardous hydrocarbon contamination (EWC 17 05 04).
2	**Conceptual Site Model (CSM)**	Terracore Ltd. & Dr. Robert Cortis (2024)	Defines contaminant distribution, risk pathways, and boundaries relevant to reuse scope.
3	**EOW Concrete Report**	Dr. Robert Cortis (2025)	Trial mix design and performance validation confirming mechanical compliance with C15 concrete standards.
4	~~**EOW Leachate Report**~~	~~Dr. Robert Cortis (2025)~~	~~Confirms inert leachate classification of stabilised material (TM3–TM5).~~
5	**Laboratory Certificates (2504176.005/01–007/01)**	Biochemie Lab S.r.l. (ISO 17025)	Accredited laboratory analyses verifying compliance with inert thresholds (Council Decision 2003/33/EC).
6	**APARK-MLT Ltd. Method Statement – Batching & Placing of C15 Concrete (Rev R1)**	APARK-MLT Ltd.	Contractor's operational plan for batching, handling, and placement under controlled conditions.
7	**RFQ – Consultancy Services for Material Testing and Validation (Apron 9 Works)**	MIA	RFQ establishing the independent laboratory testing regime for ongoing validation and ERA oversight.
8	**Apron 9 Rehabilitation Plan**	MIA	Map identifying designated reuse zones for C15 concrete containing stabilised aggregate.

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Annex 1 – Summary Report

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Summary Report

Details of Client and Project Site

Client:	Malta International Airport plc
Address:	Malta International Airport
	Luqa, LQA 4000, Malta
Project Site:	Ex-Fuel Station, Malta International Airport

Introduction

The ex-fuel station situated on the grounds of the Malta International Airport (MIA) where the Skyparks 2 project is earmarked was found to be contaminated with fuel once excavations commenced. This finding set in motion a full ground investigation, where works were divided into 4 Phases.

A Conceptual Site Model (CSM) was prepared by Dr. Saviour Scerri and the undersigned Dr. Robert Cortis. Field sampling was carried out by the undersigned, with the assistance of Terracore Ltd. for coring, while the ISO 17025 Accredited Laboratory Biochemie Lab S.r.l. of Campi Bisenzio (FI), Italy, were engaged to carry out the chemical analysis of the samples collected. The results' interpretation and reporting were carried out by the undersigned.

PHASE 1

The site area was split into six equal zones, as shown in **Figure 1**. Following decommissioning and removal of the eight underground fuel storage tanks (USTs), the buried fuel lines, and the four dispensers, it transpired that the fuel lines were above a concrete platform that was buried ~0.40 m from the ground level. VOC measurements taken using a PID did not reveal presence of hydrocarbons in this surface material. Therefore, composite samples were collected from each zone to determine whether this surface infill material could be sent for backfilling in a quarry.

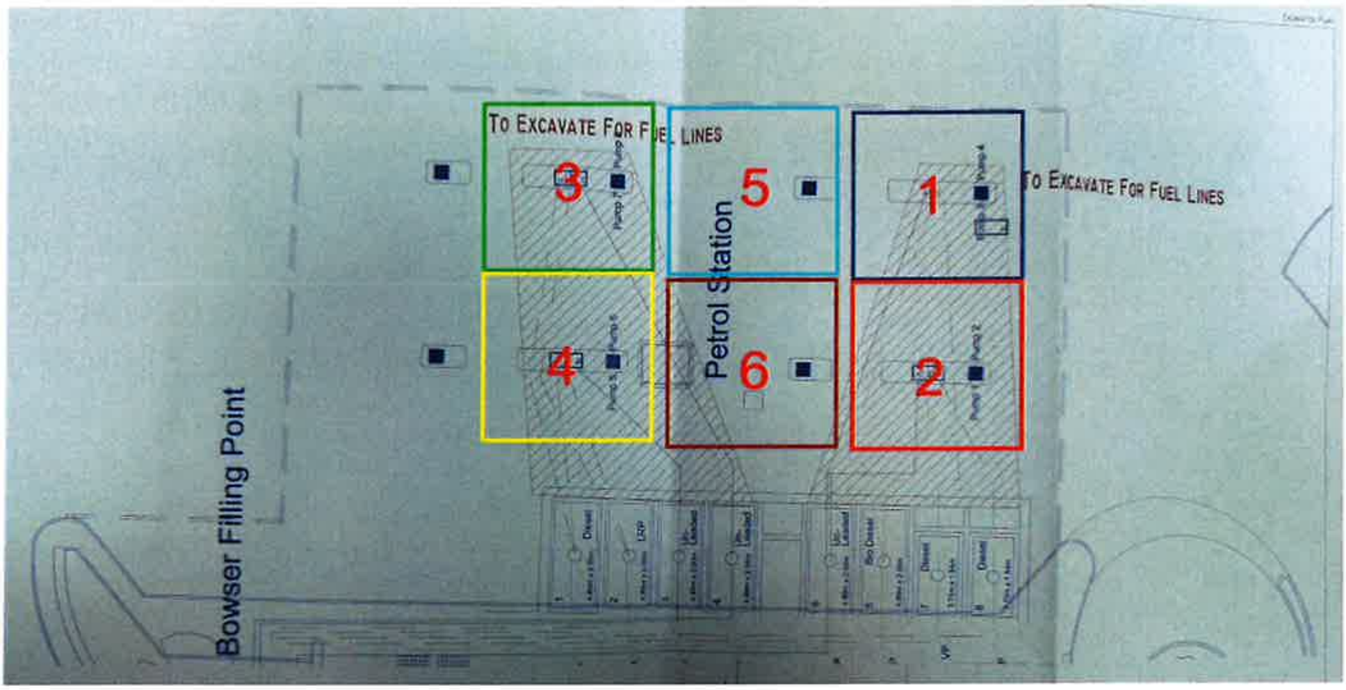


Figure 1: Site plan showing the six zones

1.1 Sampling and Analysis of the infill material above the concrete layer

Surface sampling was performed following relevant guiding standards of the ISO 18400 series, which are the revised versions of the ISO 10381 series. Samples were placed into appropriate amber glass bottles and septum-capped vials, tightly sealed, stored and maintained in the dark at 4°C – 8°C upon immediate extraction from the ground to prevent any potential losses of volatile substances until delivery to the analysing laboratory. At least 2 kg per sample were collected, whereby 1 kg was designated to be sent to the laboratory while the rest was kept cool locally to serve as a counter-sample.

The sampling details are presented in **Table 1**.

Table 1: Description of the samples collected

Sample N.	Zone n.	Sample Depth	Sampling Date
1	1	Surface	20/09/2024
2	2	Surface	20/09/2024
3	3	Surface	20/09/2024
4	4	Surface	20/09/2024
5	5	Surface	20/09/2024
6	6	Surface	20/09/2024

Results are presented as concentrations on *dry weight* basis and compared to available limit values listed in the legislation Parte IV, Allegato 5, Tabella 1 of Italian Decreto n. 152 of 2006. The methods listed in **Table 2** are in accordance with the said legislation.

Table 2: List of parameters and respective methods

Parameter	Method	LOD	
Moisture Content	DM 13/09/1999 SO n° 185 GU n° 248 21/10/1999 Met.II.2	0.1	%
Antimony	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Arsenic	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Barium	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Beryllium	EPA 3050B 1006 + EPA 6020B 2014	0.1	mg/kg
Cadmium	EPA 3050B 1006 + EPA 6020B 2014	0.1	mg/kg
Chromium	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Copper	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Lead	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Mercury	EPA 3050B 1006 + EPA 6020B 2014	0.1	mg/kg
Molybdenum	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Nickel	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Selenium	EPA 3050B 1006 + EPA 6020B 2014	0.1	mg/kg
Zinc	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Hydrocarbons C≤12 (5–12)	EPA 5021A 2014 + EPA 8015C 2007	1	mg/kg
Hydrocarbons C>12 (12–40)	ISO 16703:2004	5	mg/kg
MTBE	EPA 5021A 2014 + EPA 8015C 2007	0.1	mg/kg
PAHs [1]	EPA 3550C 2007 + EPA 8270E 2018	0.01	mg/kg
BTEXS [2]	EPA 5021A 2014 + EPA 8260D 2018	0.05	mg/kg

[1] Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j)fluoranthene, Benzo(k)fluoranthene, Benzo(e)pyrene, Benzo(g,h,i)perylene, Chrysene, Dibenzo(a,h)anthracene, Phenanthrene, Fluoranthene, Fluorene, Indeno(1,2,3-c,d)pyrene, Naphthalene, Pyrene

[2] Benzene, Toluene, Ethylbenzene, m-/p-/o-Xylene, Styrene

The only parameter which was found in levels which exceeded L1 and L2 limit values was Hydrocarbons C>12 (C12 – C40). A summary of the results of interest is listed in **Table 3**.

Table 3: Summary of results

Laboratory Report Code 2422193.xxx	**.001**	**.002**	**.003**	**.004**	**.005**	**.008**	**Soils intended for use in Public / Private / Residential mg/kg dw**	**Soils intended for use in Commercial / Industrial mg/kg dw**
Sample Number	1	2	3	4	5	6		
Sample Description	Soil	Soil	Soil	Soil	Soil	Soil		
Sampling Zone	1	2	3	4	5	6		
Hydrocarbons C≤12 (mg/kg)	2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	10	250
Hydrocarbons C>12 (C12 – C40) (mg/kg)	5700	6.7	840	420	66	110	50	750

Results marked in YELLOW indicate an exceedance of L1 limit values, whereas results marked in RED indicate an exceedance of L2 limit values. This means that only the surface material located within zone 2 could be sent for backfilling in a local quarry. The remaining material, having exceeded the L1 limit for Hydrocarbons C>12 (C12 – C40), made it ineligible for backfilling. The Client opted to send this material for End-of-Waste processing rather than disposal.

Reference: Waste Characterisation Report for the surface material only v2 dated 12/11/24

1.2 Sampling and Analysis of the infill material below the concrete layer

Dry core sampling was done using a Beretta T43 drill rig fitted with an auger, as shown in **Figure 2**. Samples were placed into appropriate amber glass bottles and septum-capped vials, tightly sealed, stored and maintained in the dark at 4°C – 8°C upon immediate extraction from the ground to prevent any potential losses of volatile substances until delivery to the analysing laboratory. At least 2 kg per sample were collected, whereby 1 kg was designated to be sent to the laboratory while the rest was kept cool locally to serve as a counter-sample.

Figure 2: Beretta T43 drill rig fitted with an auger for dry drilling

The sampling details are presented in **Table 4**, while the core depths and geocoordinates of each sampling point are given in **Table 5**.

Table 4: Sampling details

Sample	Zone	Depth	Sampling Date
A	1	0 – 1 m	09/09/2024
B		1 – 2 m	
C		2 – 2.6 m	
D	2	0 – 1 m	09/09/2024
E		1 – 2 m	
F		2 – 2.5 m	
G	3	0 – 1 m	09/09/2024
H		1 – 2 m	
I	4	0 – 1 m	09/09/2024
J		1 – 1.5 m	
5 (top)	5	0 – 1 m	09/09/2024
5 (bottom)		1 – 1.3 m	
K	6	0 – 1 m	09/09/2024
L		1 – 1.7 m	

Table 5: Core depths and geocoordinates

BH	Core Depth (m)	Coordinates
1	2.60	35°51'6.41" N, 14 °29'39.44" E
2	2.50	35°51'6.24" N, 14 °29'39.21" E
3	2.00	35°51'7.01" N, 14 °29'38.77" E
4	1.50	35°51'6.82" N, 14 °29'38.50" E
5	1.30	35°51'6.81" N, 14 °29'39.08" E
6	1.70	35°51'6.57" N, 14 °29'38.87" E

Since the original plan of the Client was to explore the route of disposal of the material situated in Zones 1 – 4 and 6 at landfill, the samples collected from BH 1 – 4 and 6 were sent to the laboratory for a three-stage waste characterisation analysis procedure. Material from Zone 5 was intended to be sent for backfilling in a quarry, hence the samples collected from BH 5 were sent to the laboratory for analysis as per **Table 2** above in accordance with legislation Parte IV, Allegato 5, Tabella 1 of Italian Decreto n. 152 of 2006. This rational stemmed from the fact that no fuel lines passed through Zone 5, presuming therefore that the level of any contamination would have been within inert levels.

The three-stage waste characterisation analysis procedure is as follows:

Stage 1 – Compositional Analysis

Chemical characterisation analysis carried out on the bulk of the sample and reported on a *tale quale* basis in accordance with S.L. 549.63 to determine the appropriate European Waste Catalogue (EWC) Code that should be assigned to it from the following:

- 17 05 03* soil and stones containing hazardous substances
- 17 05 04 soil and stones other than those mentioned in 17 05 03*

Stage 2 - Hazardous Property Assessment (HPA) and EWC code identification

The results obtained from the compositional analysis (Stage 1) shall be analysed further in a desk-based HP criteria assessment, by comparing the result obtained in the analysis to the limit value of the worst-case compound that can potentially exist in the waste, based on the site use and the compounds' chemistry.

The HPA is carried out using the latest classification labels in line with EC Regulation 1272/2008 and the Hazardous Properties in Annex III of the Waste Framework Directive (WFD) 2008/98/EC. Regulation 1272/2008 lists all the hazardous compounds that exist for each metal. Laboratory analysis determines the concentration of the metals present in the waste, but not the compounds these metals are found in. Different compounds have different toxicity, and therefore, the threshold levels for concentrations to be deemed as being present in hazardous levels varies.

The strictest existing threshold is currently of 0.1% of the worst-case compound present in the waste. Therefore, for each metal, in the assessment it is assumed that the analytically determined concentration is found in its entirety in each of the respective worst-case compounds.

It is to be pointed out that while some hazardous properties are dependent on the threshold, some hazardous properties (namely the physical properties – explosive, oxidising, and flammable), do not have any threshold and may require further testing to prove whether the particular hazardous property is present or not.

This will in turn assist with the determination of the hazardous property referred to in Annex III of the Waste Framework Directive (WFD) 2008/98/EC, leading to the classification of the waste into a particular EWC code.

Stage 3: Leachate analysis

Leachate analysis following EN 12457-2:2002 in accordance with the Council Decision 2003/33/EC on establishing the criteria and procedures for the acceptance of waste at landfills carried out to determine whether landfilling could be an option for eventual disposal of the material.

The leachate results will be used to determine whether the material fulfils all the waste acceptance criteria (WAC) for the different kinds of landfills, as set out by Annex II to the Council Directive 1999/31/EC (Landfill Directive) and as laid down in Council Decision 2003/33/EC (WAC Decision).

The IPPC Permit of the local Għallis landfill stipulates that it can only accept non-hazardous waste whose leachate content falls within the limit values stipulated for non-hazardous waste. Furthermore, acceptance of such waste at the local landfill, even if permitted to do so, is subject to an agreement with the operator – WasteServ Malta Ltd. Failure to reach an agreement, the waste shall have to be exported.

There are no landfills in Malta which can accept hazardous waste or non-hazardous waste whose leachate content falls within the limit values stipulated for hazardous waste. Therefore, disposal abroad is the only option for such waste. Should leachate levels exceed the hazardous landfill threshold, then disposal at landfill is not an option and an alternative disposal method would need to be sought.

The compositional analytical results obtained for the samples collected from BH 1 – 4 and 6 reported on a *tale quale* basis, together with the HPA, are presented in the respective laboratory reports. A summary is given in **Table 6**.

Table 6: Summary of compositional analysis and HP assessment results obtained

Sample	Lab Report N.	Result	EWC Code Assigned
A	2422193.009	Hazardous	17 05 03*
B	2422193.010	Non-Hazardous	17 05 04
C	2422193.011	Non-Hazardous	17 05 04
D	2422193.012	Hazardous	17 05 03*
E	2422193.013	Non-Hazardous	17 05 04
F	2422193.014	Non-Hazardous	17 05 04
G	2422193.015	Non-Hazardous	17 05 04
H	2422193.016	Non-Hazardous	17 05 04
I	2422193.017	Non-Hazardous	17 05 04
J	2422193.018	Non-Hazardous	17 05 04
K	2422193.019	Non-Hazardous	17 05 04
L	2422193.020	Non-Hazardous	17 05 04

The hydrocarbons present are presumably diesel. Petrol is made up of light hydrocarbons (C5 – C10, but mainly octane – C8), whereas diesel has heavier hydrocarbons (C6 – C20+, but mainly cetane – C16). The C-number is the number of carbons in the hydrocarbon. The high presence of the heavier C (above the petrol range) is clear presence of diesel. The low presence of the lighter C indicates the 'tail-end' of diesel. Had this been high too, it could potentially indicate the presence of petrol too, but being only minor in quantity, it is more likely that it is simply the lighter fraction of diesel rather than petrol. Furthermore, there are also diesel markers present such as Trimethylbenzenes and Xylene which are aromatic (*i.e.* have carbon rings), whereas petrol is typically an alkane mix, having straight chain or branched carbon, but no rings.

Thus, since the hydrocarbons present are presumably diesel, the applicable HP 7 limit in the Hazardous Property Assessment is set at 1% (10,000 mg/kg). From the HPA, the top samples from Zones 1 and 2 were found to be hazardous by HP 7 and thus assigned EWC 17 05 03*, while the remaining samples were assigned EWC 17 05 04 since they were determined to be non-hazardous.

The leachate analysis results presented in the laboratory reports are expressed in mg/l or µg/l given that this analysis is carried out on a liquid extract. However, since that the liquid:solid leachate extract procedure shall follow a ratio of 10:1 as per EN 12457-2:2002, a simple multiplication x10 converts the mg/l or µg/l result to mg/kg or µg/kg result, respectively. This converted data is presented in **Table 7**, together with the WAC limit values for disposal at a non-hazardous landfill.

The WAC limits for non-hazardous waste destined for disposal in a landfill for non-hazardous waste are stipulated in Clause 2.2.2 of Council Decision 2003/33/EC. These apply for all samples except Samples A and D, which were found to be hazardous.

The WAC limits for hazardous waste acceptable for disposal in a landfill for non-hazardous waste are stipulated in Clauses 2.3.1 and 2.3.2 of Council Decision 2003/33/EC. These apply for Samples A and D.

It should be noted that limit values stipulated in Clauses 2.2.2 and 2.3.1 are identical.

Table 7: Leachate Results

Sample	A	B	C	D	E	F	G	H	I
As (mg/kg)	**0.106**	**0.0614**	**0.0276**	**0.0435**	**0.0291**	**0.0343**	**0.0463**	**0.0341**	**0.0155**
Ba (mg/kg)	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cd (mg/kg)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cr (mg/kg)	<0.05	**0.158**	**0.0857**	**0.0509**	<0.05	**0.0789**	**0.144**	<0.05	<0.05
Cu (mg/kg)	**0.926**	**0.103**	<0.1	<0.1	<0.1	<0.1	**0.121**	**0.184**	<0.1
Hg (mg/kg)	**0.001**	**0.0015**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mo (mg/kg)	**0.176**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.109	<0.1
Ni (mg/kg)	**0.573**	**0.108**	**0.0536**	**0.0823**	**0.0423**	**0.0688**	**0.198**	**0.107**	<0.01
Pb (mg/kg)	<0.01	**0.245**	**0.0373**	**0.113**	**0.122**	**0.0905**	**0.0781**	**0.0121**	<0.01
Sb (mg/kg)	**0.03**	**0.0144**	<0.01	**0.0204**	**0.0129**	**0.011**	**0.0163**	**0.0144**	<0.01
Se (mg/kg)	**0.0104**	**0.0193**	<0.01	<0.01	**0.0107**	<0.01	<0.01	<0.01	<0.01
Zn (mg/kg)	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride (mg/kg)	**72.2**	**51.2**	**56.6**	<25	<25	**36.8**	<25	**35**	**61.6**
Fluoride (mg/kg)	**3.88**	**5.17**	**4.71**	**2.92**	**4.19**	**4.32**	**3.66**	**4.13**	**4.3**
Sulphate (mg/kg)	**253**	**187**	**112**	<25	**46.6**	**39.1**	<25	**187**	**106**
Total Dissolved Solids (TDS) (mg/kg)	**3270**	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000
Dissolved Organic Carbon (DOC) (mg/kg)	**452**	**180**	**77.7**	**390**	**511**	**212**	**491**	**435**	**296**
Phenol Index (mg/kg)	<0.1	<0.1	<0.1	**0.286**	<0.1	<0.1	**0.128**	**0.15**	<0.1
Acid Neutralisation Capacity	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Electrical Conductivity at T=25°C (µS/cm)	**503**	< 147	< 147	**151**	**163**	< 147	< 147	**203**	< 147

pH at T=25°C	**11.17**	**9.51**	**9.43**	**8.66**	**8.48**	**8.66**	**8.63**	**10.53**	**10.27**
Total Organic Carbon (TOC) (%)	**6.3**	n/a	n/a	**71**	n/a	n/a	n/a	n/a	n/a

[a] Leaching limit values for waste acceptable at Non-Hazardous Landfill Values obtained from Directive 2003/33/EC where L/S = 10 l/

[b] If this value is not achieved, a higher limit value maybe admitted by the competent authority, provided that the DOC value of 80(material's own pH or at a pH value between 7.5 and 8.0.

The leachate analysis results returned values of all parameters for all samples which were below the respective limit values stipulated for waste acceptable at a non-hazardous landfill. The TOC values for the two hazardous samples (A and D) exceeded the limit value, however, the waste may still be sent to a non-hazardous landfill on the basis of a caveat that allows exceedance of this limit if the DOC value is within limit, which, when measured at the material's own pH, was not exceeded for both samples.

However, the Client has opted to send the non-hazardous waste for End-of-Waste processing rather than disposal. The hazardous waste was taken by PTMatic Environmental Services Ltd., which is an authorised waste broker.

Notwithstanding the fact that no fuel lines passed through Zone 5, it transpired from the results obtained that the leaked fuel seeped into this zone. A summary of the results of interest from samples collected from BH 5, reported on a *dry weight* basis, and the respective limit values, are shown in **Table 8**.

Table 8: Summary of results

Laboratory Report Code	**2422193.006**	**2422193.007**	**Soils**	**Soils**
Sample Number	**5 (top)**	**5 (bottom)**	**intended for use in**	**intended for use in**
Sample Description	**Soil**	**Soil**	**Public / Private**	**Commercial**
Sampling Point	**Zone 5**	**Zone 5**	**/ Residential**	**/ Industrial**
Sample Depth	**0 – 1 m**	**1 – 1.3 m**	**mg/kg dw**	**mg/kg dw**
Hydrocarbons C≤12 (mg/kg)	< 1.0	< 1.0	10	250
Hydrocarbons C>12 (C12 – C40) (mg/kg)	79	110	50	750

Results marked in YELLOW indicate an exceedance of L1 limit values, whereas results marked in RED indicate an exceedance of L2 limit values. This means that the only parameter which was found in levels which exceeded any L1 limit values was Hydrocarbons C>12 (C12 – C40). This makes it ineligible for backfilling in a local quarry. The Client opted to send this material for End-of-Waste processing rather than disposal.

Reference: Waste Characterisation Report for the material below the concrete layer only v2 dated 12/11/24

PHASE 2

Based on the findings of the Phase 1 investigation, further testing was carried out in the infill layer of the area that is immediately adjacent and downstream (by site gradient) of the filling area, which also happened to contain the zones that returned hazardous levels of hydrocarbons. The site area was now split into twelve equal zones, as shown in **Figure 3**. A further two non-contiguous zones were also included in the investigation. Zone 13 was designated in the area that contained the bowser refilling point of the USTs, while zone 14 was designated in the area that contained the oil interceptor, since this was found cracked during its removal. The location of the number on the plan indicates the sampling point, and the legend lists the geo-coordinates.

Samples of the infill layer from zones 10, 11, 12, and 13 were collected to determine the extent of contamination of this infill material. Sampling points 10 to 12 were directly downstream of the refuelling area due to the site gradient, whereas sampling point 13 is beneath the bowser refilling point. No infill exists at BH 7, 8, 9 and 14 since these were backfilled pits that contained the fuel tanks (7 – 9) and oil interceptor (14) which were partially dug into bedrock.

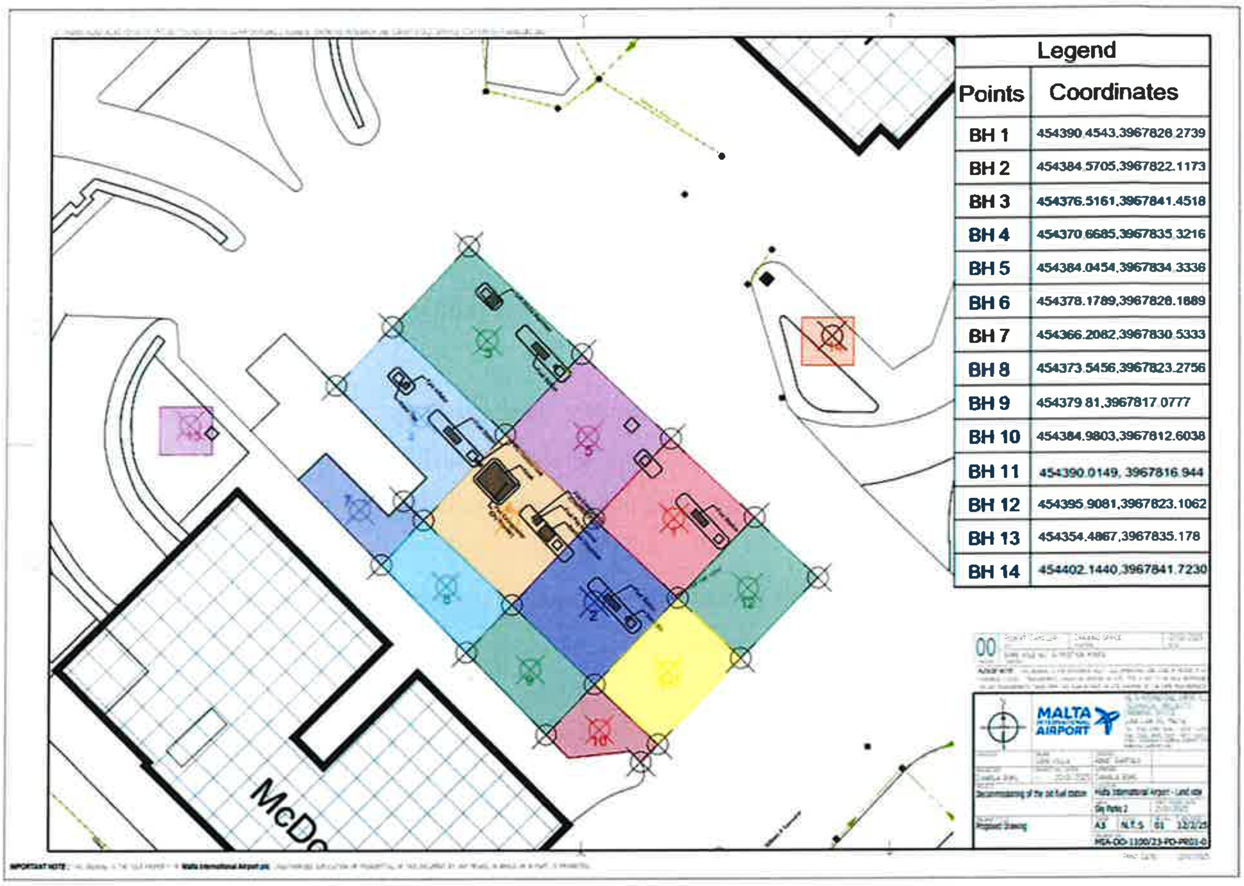


Figure 3: Site plan showing the 14 zones

2.1 Sampling and Analysis of the infill material at BH10 – BH13

Dry core sampling was done using a Beretta T43 drill rig fitted with an auger. Samples were placed into appropriate amber glass bottles and septum-capped vials, tightly sealed, stored and maintained in the dark at 4°C – 8°C upon immediate extraction from the ground to prevent any potential losses of volatile substances until delivery to the analysing laboratory. At least 2 kg per sample were collected, whereby 1 kg was designated to be sent to the laboratory while the rest was kept cool locally to serve as a counter-sample.

The sampling details are presented in **Table 9**, while the core depths of each sampling point are given in **Table 10**.

Table 9: Sampling details

Sample	Zone	Depth	Sampling Date
1	10	0 – 1 m	23/01/2025
2		1 – 2 m	
3		2 – 3.2 m	
4	11	0 – 1 m	23/01/2025
5		1 – 2 m	
6	12	0 – 1 m	23/01/2025
7		1 – 2 m	
8		2 – 2.9 m	
9	13	0.9 – 2.1 m	23/01/2025

Table 10: Core depths

BH	Core Depth (m)
10	3.20
11	2.00
12	2.90
13	2.10*

* Infill started at 0.9 m due to concrete structure housing the bowser refilling point.

The samples collected were sent to the laboratory for a two-stage waste characterisation analysis procedure, as described earlier. The compositional analytical results obtained for the infill samples collected from BH 10 – 13 reported on a *tale quale* basis, together with the HPA, are presented in the respective laboratory reports. A summary is given in **Table 11**.

Table 11: Summary of compositional analysis and HP assessment results obtained

Sample	Lab Report N.	Result	EWC Code Assigned
1	2502372.001	Non-Hazardous	17 05 04
2	2502372.002	Non-Hazardous	17 05 04
3	2502372.003	Non-Hazardous	17 05 04
4	2502372.004	Non-Hazardous	17 05 04
5	2502372.005	Non-Hazardous	17 05 04
6	2502372.006	Non-Hazardous	17 05 04
7	2502372.007	Non-Hazardous	17 05 04
8	2502372.008	Non-Hazardous	17 05 04
9	2502372.009	Non-Hazardous	17 05 04

Although all samples were found to be non-hazardous, there are three interesting finds. Firstly, Lead (Pb) was found in all samples, which implies leaded-petrol contamination, since Pb is not naturally found in soils. Petrol is made up of light hydrocarbons (C5 – C10, but mainly octane – C8), whereas diesel has heavier hydrocarbons (C6 – C20+, but mainly cetane – C16). The C-number is the number of carbons in the hydrocarbon. Unlike the light hydrocarbons which may evaporate, leaving no trace behind of their once-presence, Pb remains *in situ*.

Secondly, presence of the heavier hydrocarbon fraction (C10 – C40) only was found in BH 10, part of BH 12, and in relatively much higher levels in BH 13. Considering that the hazardous contamination determined in Zone 1 and 2 was attributed to diesel, it is presumed that hydrocarbons determined in BH 10 and 12 are from the same, even though no diesel markers such as Trimethylbenzenes and Xylene were determined, albeit this could be due to the low levels determined, with levels at BH 11 and the top metre of BH 12 being below the instrumental LOD, indicating overall minimal horizontal mobility downstream.

Thirdly, relatively high levels of the heavier hydrocarbon fraction (C10 – C40) were found at BH 13. Such levels indicate the likelihood of leakage over time, although levels found did not exceed the hazardous level threshold, which being presumably diesel, the applicable HP 7 limit in the Hazardous Property Assessment is set at 1% (10,000 mg/kg).

The Client opted to send the non-hazardous waste from BH10 – BH13 for End-of-Waste processing rather than disposal. The coring at BH13 was performed at an angle since the bowser filling point was still in place at the time of sampling.

PHASE 3

Following decommissioning and removal of the eight USTs, the buried fuel lines and the four dispensers, the oil/water separator and the bowser filling point, bedrock core samples were collected in all 14 zones shown in **Figure 3** to determine whether the bedrock has been contaminated by the operations, as well as the extent of contamination.

3.1 Sampling and Analysis of the bedrock at BH1 – BH14

Samples of the bedrock from zones 1 – 14 were collected to determine the extent of contamination of the bedrock. All cores extended down to 6m from the surface. The 6m mark was chosen as this is the maximum excavation depth. The length of the cores collected depended on the topography of the site, as the top of the bedrock varied.

Wet core sampling was done using a Beretta T19-C drill rig fitted with a hollow corer as shown in **Figure 4** and **Figure 5**. Samples were placed into appropriate amber glass bottles and septum-capped vials, tightly sealed, stored and maintained in the dark at 4°C – 8°C upon immediate extraction from the ground to prevent any potential losses of volatile substances until delivery to the analysing laboratory. At least 2 kg per sample were collected, whereby 1 kg was designated to be sent to the laboratory while the rest was kept cool locally to serve as a counter-sample.

Figure 4: Beretta T19-C drill rig fitted with a hollow corer for wet drilling

Figure 5: Beretta T19-C drill rig fitted with a hollow corer and connected water bowser for wet drilling

A depth profile, showing also the bedrock core lengths retrieved, is given in **Table 12.**

Table 12: Core depths and geocoordinates

Zone	Infill Depth (m)	Bedrock Core Depth (m)	Note
1	0-3	3-6	0-3m is the soil infill
2	0-3	3-6	0-3m is the soil infill
3	0-3	3-6	0-3m is the soil infill
4	0-2	2-6	0-2m is the soil infill
5	0-2	2-6	0-2m is the soil infill
6	0-2	2-6	0-2m is the soil infill
7	0-3	3-6	0-3m is the UST location backfilled with concrete
8	0-3	3-6	0-3m is the UST location backfilled with concrete
9	0-3	3-6	0-3m is the UST location backfilled with concrete
10	0-3	3-6	0-3m is the soil infill
11	0-2	2-6	0-2m is the soil infill
12	0-3	3-6	0-3m is the soil infill
13	1-2	2-6	0-1m is the filling point concrete structure
14	0-4	4-6	0-4m is the Oil/Water Interceptor location backfilled with soil

The sample details are presented in **Table 13**.

Table 13: Sample details

Zone	Depth	Sampling Date
1	3-4m	23/01/25
	5-6m	23/01/25
2	3-4m	23/01/25
	5-6m	23/01/25
3	3-4m	23/01/25
	5-6m	23/01/25
4	2-3m	23/01/25
	5-6m	23/01/25
5	2-3m	23/01/25
	5-6m	23/01/25
6	2-3m	23/01/25
	5-6m	23/01/25
7	3-4m	23/01/25
	5-6m	23/01/25
8	3-4m	23/01/25
	5-6m	23/01/25
9	3-4m	23/01/25
	5-6m	23/01/25
10	3-4m	24/01/25
	5-6m	24/01/25
11	2-3m	24/01/25
	5-6m	24/01/25
12	3-4m	24/01/25
	5-6m	24/01/25
13	2-3m	24/01/25
	5-6m	24/01/25
14	4-5m	12/02/25
	5-6m	12/02/25

The samples collected were sent to the laboratory for a two-stage waste characterisation analysis procedure, as described earlier. The compositional analytical results obtained for the bedrock samples collected from BH 1 – 14 reported on a *tale quale* basis, together with the HPA, are presented in the respective laboratory reports. A summary is given in **Table 14**.

Table 14: Summary of compositional analysis and HP assessment results obtained

Zone	Depth	Lab Report N.	Result	EWC Code Assigned
1	3-4m	2505166-001	Non-Hazardous	17 05 04
1	5-6m	2505166-002	Non-Hazardous	17 05 04
2	3-4m	2505384.001	Non-Hazardous	17 05 04
2	5-6m	2505384.002	Non-Hazardous	17 05 04
3	3-4m	2505166-003	Non-Hazardous	17 05 04
3	5-6m	2505166-004	Non-Hazardous	17 05 04
4	2-3m	2505384.003	Non-Hazardous	17 05 04
4	5-6m	2505384.004	Non-Hazardous	17 05 04
5	2-3m	2505166-005	Non-Hazardous	17 05 04
5	5-6m	2505166-006	Non-Hazardous	17 05 04
6	2-3m	2505384.005	Non-Hazardous	17 05 04
6	5-6m	2505384.006	Non-Hazardous	17 05 04
7	3-4m	2505384.007	Non-Hazardous	17 05 04
7	5-6m	2505384.008	Non-Hazardous	17 05 04
8	3-4m	2505384.009	Non-Hazardous	17 05 04
8	5-6m	2505384.010	Non-Hazardous	17 05 04
9	3-4m	2505384.011	Non-Hazardous	17 05 04
9	5-6m	2505384.012	Non-Hazardous	17 05 04
10	3-4m	2505384.013	Non-Hazardous	17 05 04
10	5-6m	2505384.014	Non-Hazardous	17 05 04
11	2-3m	2505384.015	Non-Hazardous	17 05 04
11	5-6m	2505384.016	Non-Hazardous	17 05 04
12	3-4m	2505166-007	Non-Hazardous	17 05 04
12	5-6m	2505166-008	Non-Hazardous	17 05 04
13	2-3m	2505384.017	Non-Hazardous	17 05 04
13	5-6m	2505384.018	Non-Hazardous	17 05 04
14	4-5m	2505384.019	Non-Hazardous	17 05 04
14	5-6m	2505384.020	Non-Hazardous	17 05 04

Levels of Hydrocarbons in all samples were below the instrumental LOD except for one sample – Zone 3, at 3-4m depth, which is the top layer of bedrock in this area. Once converted to a *dry weight* basis using the moisture content, the results could be compared to Residential limits of the Italian Decreto n. 152 of 2006. This is shown in **Table 15**.

Table 15: Summary of results at Zone 3 (3-4m) exceeding limit values given in the Italian Decreto n. 152 of 2006

Parameter	Result (mg/kg dw)	Residential Limit (mg/kg dw)	Industrial Limit (mg/kg dw)
Hydrocarbons C≤12	91.28	10	250
Hydrocarbons (C10 – C40)	1875.75	50	750

Results marked in YELLOW indicate an exceedance of L1 limit values, whereas results marked in RED indicate an exceedance of L2 limit values. This makes it ineligible for backfilling in a local quarry. The Client opted to send this material for End-of-Waste processing rather than disposal.

The Hydrocarbons C≤12 levels exceeded the Residential limit value, while the heavier Hydrocarbons exceeded the Industrial limit value too. It should be noted that waste characterisation requires the analysis of Hydrocarbons C≤12 and Hydrocarbons (C10 – C40), whereas Italian Decreto n. 152 of 2006 lists limits of Hydrocarbons C≤12 and Hydrocarbons (C12 – C40). In this instance, this incongruence in the heavier hydrocarbon range (C10 – C12) does not matter since the result obtained showed that hydrocarbons higher than C12 constituted the bulk of the result obtained.

Since the 4-5m bedrock core sample was not analysed, while the 5-6m bedrock core sample returned hydrocarbons levels which were below the limit of detection, then the 4-5m bedrock depth was assumed to be similarly contaminated without analysis and sent for End-of-Waste processing rather than disposal too.

The existing bedrock core samples from BH1 – BH14, except for BH3, were then re-analysed in accordance with legislation Parte IV, Allegato 5, Tabella 1 of Italian Decreto n. 152 of 2006 to determine whether the excavated material may be sent for backfilling in a quarry. A summary of the results obtained, reported on a *dry weight* basis, is given in Table 16.

Table 16: Summary of results obtained according to the Italian Decreto 152/06

Zone	Depth	Lab Report N.	Result
1	3-4m	2505166.009	All results were below respective Residential limits
1	5-6m	2505166.010	All results were below respective Residential limits
2	3-4m	2505384.021	All results were below respective Residential limits
2	5-6m	2505384.022	All results were below respective Residential limits
3	3-4m	*not analysed*	*Results from the waste characterisation had shown an exceedance of Residential limits on Hydrocarbons*
3	5-6m	2505166.011	All results were below respective Residential limits
4	2-3m	2505384.023	All results were below respective Residential limits
4	5-6m	2505384.024	All results were below respective Residential limits
5	2-3m	2505166.012	Three PAHs exceeded their respective Residential limits, but not their respective Industrial limits
5	5-6m	2505166.013	All results were below respective Residential limits
6	2-3m	2505384.025	All results were below respective Residential limits
6	5-6m	2505384.026	All results were below respective Residential limits
7	3-4m	2505384.027	All results were below respective Residential limits
7	5-6m	2505384.028	All results were below respective Residential limits
8	3-4m	2505384.029	All results were below respective Residential limits
8	5-6m	2505384.030	All results were below respective Residential limits
9	3-4m	2505384.031	All results were below respective Residential limits
9	5-6m	2505384.032	All results were below respective Residential limits
10	3-4m	2505384.033	All results were below respective Residential limits
10	5-6m	2505384.034	All results were below respective Residential limits
11	2-3m	2505384.035	All results were below respective Residential limits
11	5-6m	2505384.036	All results were below respective Residential limits
12	3-4m	2505166.014	All results were below respective Residential limits
12	5-6m	2505166.015	All results were below respective Residential limits
13	2-3m	2505384.039	All results were below respective Residential limits
13	5-6m	2505384.040	All results were below respective Residential limits
14	4-5m	2505384.037	All results were below respective Residential limits
14	5-6m	2505384.038	All results were below respective Residential limits

The results obtained show that all excavated bedrock, except for Zone 5 at 2-3m depth due to the slight exceedance of the residential limits of Benzo(a)pyrene, Benzo(ghi)perylene and Indeno(1,2,3-c,d)pyrene, may be sent for backfilling in a quarry.

Although no samples were analysed from the 3-4m and 4-5m depth, given the impermeable nature of the geological stratum present as indicated in the CSM, the fact that the contamination source was the infill layer above which contributed to vertical percolation, and that the exceedance was owed to trace levels, taking a precautionary approach, the bedrock from the 3-4m depth was assumed to be similarly contaminated without analysis to the 2-3m depth and sent for End-of-Waste processing rather than disposal too, while the bedrock from the 4-5m depth was assumed to be uncontaminated similar to the 5-6m depth. All inert excavated material was sent for backfilling in a licensed quarry.

Reference: Waste Characterisation Report for the bedrock v4 dated 17/06/25

CONCLUSIONS

The ground investigation carried out resulted in:

- Phase 1 – The infill material at BH1 (0-1m) and BH2 (0-1m) was found to be Hazardous upon waste characterisation analysis, assigned EWC 170503*, and carted away by PTMatic Environmental Services Ltd. for eventual export and disposal.
- Phase 2 – The infill material at BH1 (1-3m), BH2 (1-3m), and the entire column infill depth profile at BH3 (0-3m), BH4 (0-2m), BH5 (0-2m), BH6 (0-2m), BH10 (0-3m), BH11 (0-2m), BH12 (0-3m), and BH13 (1-2m), was found to be Non-Hazardous upon waste characterisation analysis, assigned EWC 170504, and taken for End-Of-Waste Processing rather than disposal.
- Phase 3 – The bedrock at BH1 – BH14 was found to be Non-Hazardous upon waste characterisation analysis and assigned EWC 170504. However, the hydrocarbon levels found at BH3 (3-4m) exceeded the Residential limits given in Parte IV, Allegato 5, Tabella 1 of Italian Decreto n. 152 of 2006 after conversion from *wet* to *dry weight*, thus making it ineligible to be sent for backfilling in a quarry. While the BH3 (5-6m) bedrock core sample returned hydrocarbons levels which were below the instrumental LOD, since the BH3 (4-5m) bedrock core sample was not analysed, this material was assumed to be similarly contaminated without analysis and treated in a similar way to that in the 3-4m depth. The 3-4m and 4-5m bedrock depths were taken for End-Of-Waste Processing rather than disposal. The existing bedrock core samples from BH1 – BH14, except for BH3, were then re-analysed in accordance with legislation Parte IV, Allegato 5, Tabella 1 of Italian Decreto n. 152 of 2006 to determine whether the excavated material may be sent for backfilling in a quarry. The results obtained show that all excavated bedrock, except for Zone 5 at 2-3m depth due to the slight exceedance of the residential limits of Benzo(a)pyrene, Benzo(ghi)perylene and Indeno(1,2,3-c,d)pyrene, may be sent for backfilling in a quarry. Since the BH5 (3-4m) and (4-5m) bedrock core samples were not analysed, taking a precautionary approach, the (3-4m) depth was assumed to be similarly contaminated without analysis and treated in a similar way to the 2-3m depth and sent for End-of-Waste processing rather than disposal. Following CSM considerations, the 4-5m bedrock depth was assumed to be uncontaminated like the 5-6m depth. All inert excavated bedrock material was sent for backfilling in a licensed quarry.

Report Revision History

A revision history is present in **Table 17**.

Table 17: Report Revision History

Version N°	Date Issued	Status
1	13 August 2025	Current

Report issued on:	13 August 2025	**Name of Air Quality Consultant:**	Dr. Robert Cortis B.Sc. (Hons.) M.Sc. Ph.D. MRSC

Signed: [redacted]

Annex 2 – CSM Report

TERRACORE

MIA Service Station, Malta International Airport, Luqa

Proposal for

Land and Groundwater Investigations

METHOD STATEMENT

Report Produced by

Terracore Ltd & Dr. Robert Cortis

DOCUMENT CONTROL

PROJECT NAME	:	MIA SKYPARKS 2- MIA Service Station, Malta International Airport. Development Planning Application (PA 05548/10) for the proposed Master Plan for the Malta International Airport Site
DOCUMENT TITLE	:	*Contamination Study – Service Station – MIA Service Station, Method statement*
DOCUMENT No.	:	*1*

DOCUMENT ISSUE

ORIGINAL	Prepared by	Reviewed by	Approved by
Date: October 2024	**Name:** Saviour Scerri	**Name:**	**Name:**
	Signature:	**Signature:**	**Signature:**

Distribution:	

REVISIONS

REVISION 0-	Name:	Name:	Name:

1. INTRODUCTION

1.1 INTRODUCTION

The Malta International Airport (MIA) had submitted a Development Planning Application (PA 05548/10) for the proposed Master Plan for the Malta International Airport Site known as Skyparks 2 (**Figure 1**).

Figure 1: Google Image showing the Skyparks 2 Site. The Purple line shows the location of the Service Station

The Scheme comprises a large-scale mixed-use development incorporating an array of diverse building typologies and open spaces, as well as a variety of activities including commercial, retail and leisure facilities and extensive parking provision. It includes also a Service Station.

Presently the application site is composed of:

- The Skyparks Building
- Public and private service car parks
- Catering facilities - the McDonalds Drive Through, restaurant and cafeteria
- A Service Station and adjoining car and coach wash (**Figure 2**, **Figure 3**, **Figure 4**)

Figure 2: Google Earth Image showing the Service Station, Car and Coach wash an Skyparks Building (07/09/2023)

Figure 3: View of the Service Station and Carwash as once seen from the Skyparks Building

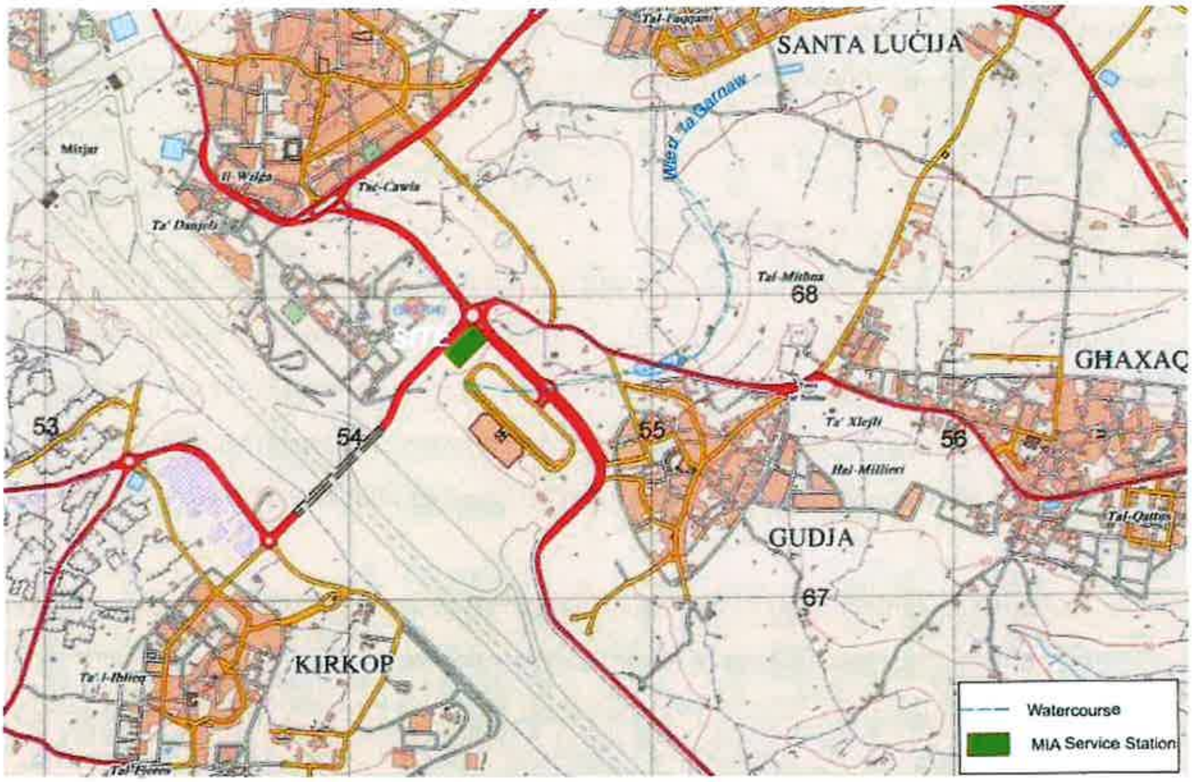


Figure 4: Location of the Service Station at the MIA (Source: MEPA Mapserver)

1.2 SCOPE

The Service Station shall be removed as part of the SKYPARKS 2 project. Therefore, all tanks, dispensers and pipework must be permanently decommissioned. The station is projected for a new setup at the same site, and thus the site will be cleared from any fuel storage, pipework and dispensing facilities, prior to commencement of any works related to the re-instatement in line with the current regulations and standards.

The Service Station has already been demolished. Despite the fact no fuel dispersal has been reported during its active service, during demolishing works it was discovered that the site is contaminated. For this reason, ERA has requested a study of the extent of contaminated land including a Conceptual Site Model (CSM) because of the Service Station activities over the past years of active service.

1.3 TERMS OF REFERENCE

The terms of reference for Site Clearance and Land Contamination Investigations issued by ERA, Version 6.1 of June 2024, were as follows:

The following terms of reference have been compiled on the basis of BS 10175:2011+A2:2017

In view of the current state of the site and activities carried out to date which could potentially have led to land and groundwater contamination, clearance of the site and preliminary investigations for contamination are required. The documents detailed in the terms of reference below are to be approved by ERA prior to the commencement of any works on site. Malta Resources Authority (MRA) and Energy and Water Agency (EWA) shall *also be notified of the activities on site so they will be able to take any action from their end that they may deem necessary. Should the site bear any legal restrictions / protections, consultation should be carried out with the relevant authorities.*

1. *Land and groundwater investigations*

   A proposal for land and groundwater investigations is to be submitted, prepared by experts in the field upon consultation with MRA and EWA (in relation to groundwater), which should include a chemist and/or a hydro geologist, with at least three years' experience in designing land and groundwater monitoring proposals and assessing land and groundwater contamination. Collection of samples should also be carried out by suitably qualified / certified persons familiar with the required methods.

   CVs of the persons involved in developing and carrying out the land contamination survey, including assessment of the results, are to be submitted for approval by ERA prior to development of the proposal detailed below.

   The proposal for land and groundwater investigations is to include the following:

   a. *An overview of the site history including details on the activities carried out (such as illegal dumping and incineration of wastes) and the type of wastes that have been deposited on site and that could have led to land contamination. If information is not available, expert judgment should be used regarding assumptions on the type of activities and wastes associated with such sites and directly associated contaminants.*

   b. *A conceptual site model (CSM) is to be developed indicating:*

      i. *Which areas have been used for the different activities (known / assumed);*
      ii. *Which areas could have been potentially contaminated by said activities (clearly indicating the sources of contamination identified through the site history, related information and/or assumptions on activities and materials handled / deposited / incinerated), and*
      iii. *The extent of areas that could have been affected through the different potential pathways of contamination identified; this needs to take into consideration sub-surface soils, groundwater and surface waters, potentially contaminated through direct exposure, leaching and run off, within and outside the site.*
      iv. *The ecology, geology, hydrogeology and topography of the site and surrounding area shall be taken into account during the development of the CSM.*
      v. *The proximity of the site to other potential sources of contamination that could have an impact on the site.*

c. *A risk assessment evaluating the environmental setting of the site and identifying any sensitive receptors that may be impacted by potential contamination present within the site.*

d. *Provide rationale / justification for the area of influence proposed for the preliminary investigation, and the number, location and depths of sampling points, making reference to the CSM. It should be noted that the number of sampling points should be statistically representative for the area under investigation, and ensure adequate coverage of the site as well as the greater area of influence (in line with requirements in Table 1 below). In view that groundwater could potentially have been contaminated; sampling of groundwater also needs to be included, preferably making use of existing boreholes [To note that drilling of any borehole requires authorization from the Competent Authority, and drilling works must comply with the provisions of S.L. 423.32; drilling rigs must also be registered with the Competent Authority as per S.L. 545.06]. Consultation with the MRA and EWA is required in this regard.*

e. *Based on the CSM developed, sampling locations shall be set to target locations being of a known or suspected source of contamination (ex. existing tanks, waste storage areas etc.) or observed environmental impact. Sampling locations may be set to target potential migration routes of mobile contaminants from such sources. The authority may instruct the person to carry out sampling from specific points in the case where reasonable suspicion persists on potential land contamination.*

Should defined sources of contamination as described above not be identified by the CSM, the sampling locations proposed are to be evenly distributed to cover the entirety of the site.

f. *The following table is an indication of the expected sampling effort. Sampling locations shall not be set at a distance greater than 50m from each other. This may require modification based upon the CSM developed.*

Table 1: Sampling requirements per area of investigation.

SITE (square m^2)	LAND	GROUNDWATER	
	DRILLING/ TRENCHES	DRILLING WELLS	SAMPLING
< 5,000	At least 2 points	At least 1 point	n. 1 samples per point
5,000 - 10,000	At least 5 points	At least 3 points	n. 1 samples per point
10,000-50,000	From 5 to 15 points	From 4 to 6 points	n. 1 samples per point
50,000-250,000	From 15 to 60 points	From 6 to 10 points (subject to a risk analysis)[2]	n. 1 samples per point

[2] If such plants are located inland, the drilling of 6 to 10 monitoring points per plant is considered to increase the pollution potential of the plants and acceptability would need to be assessed on a case by case basis.

g. *Samples from various depths are to be taken from each sampling location identified, however the Authority may amend sampling depths on a case-by-case basis. The first sample is to be within 0.5m from the surface, subsequent sampling depths are to be set at intervals of 1m. The extent of investigation for each sampling location is to be:*

i. *A minimum depth of 4m*

OR

ii. *until the target depth has been reached if this extends beyond the boundaries set in (i) above.*

OR

iii. *until proposed excavation depth is reached*

OR

iv. *a different geological stratum has been encountered.*

h. *Provide information on sampling procedure to be followed including:*

   i. The drilling/coring equipment to be used;

   ii. Any in-situ testing that may be required (ex. PID / FID)

iii. *Methods to be followed during sampling to ensure cross-contamination does not occur and that samples are handled/stored appropriately until delivery to the lab for testing;*

iv. *Proposed method for backfilling of voids left by extraction of cores including the use of appropriate impermeable compounds such as bentonite.*

It should be noted that dry-drilling is recommended to avoid flushing and dispersion of the contaminants which may be present

i. *Provide rationale / justification for contaminants selected for analysis of land and groundwater samples based on the site history and CSM developed. Consultants are to provide a list of contaminants to be investigated in this regard. Proposed omission of analytes is to be duly justified.*

The assessment should consider analysis for:

- *Heavy metals*
- *MTBE*
- *Total organic carbon (TOC)*
- *PAHs (16 PAHs: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i) perylene, Chrysene, Naphthalene, Anthracene, Phenanthrene, Fluoranthene, Dibenzo(a, h)anthracene, Indeno(1,2,3–c,d)pyrene, Pyrene, Acenaphthylene, Acenaphthene, Fluorene*
- *Hydrocarbons*
- *PCBs*
- *BTEX*
- *Chlorinated aliphatic hydrocarbons*
- *Dioxins & furans*
- *Halogenated aliphatic hydrocarbons*
- *Cyanide*
- *Asbestos*
- *Fluoride*

ERA may request testing for additional contaminants other than those proposed depending on the results obtained during the works on site as well as following consultation with MRA and EWA.

j. *EPA, ISO, EN or equivalent standards to be used to test for the different contaminants shall be provided, together with the detection limits. Certification of the laboratory/ies chosen for testing is to be provided; Laboratory is to be accredited to at least EN ISO 17025:2005/Cor 1:2006 and accredited for each and every analysis [Unless substantiated that accreditation is not technically feasible for certain analytes].*

k. *Sample containers are to be sealable and of the appropriate material so as not to cause contamination of the sample, absorb any sample components nor allow losses of volatile compounds. Routinely, wide-mouth amber glass containers are used for analyses of non-volatile organic compounds and PET containers for water-soluble analyses. Containers with a pierceable-septum screw cap can be used to allow for head space analysis for VOCs as required. Any container pretreatment is to be specified. The use of appropriate containers is to be determined in conjunction with the instructions provided by the analysing lab.*

l. *Collected samples are to be maintained at 4°C - 8°C and retained in darkness at all times up to delivery to the analysing lab. Samples collected from land are to be maintained under such conditions upon immediate retrieval from the ground and dispatched for analysis at the earliest. Samples to be kept for long-term storage pending further testing shall be maintained at -20°C.*

m. *Drilling logs and photographs are to be taken of the collected cores in their entirety and presented in the final report.*

n. *Locations of core samples are to be confirmed with the Authority on-site prior to initiation of works.*

o. *The results of the investigation and their interpretation are to be presented in a report which includes:*

   i. *Description of ground conditions encountered at the site, including groundwater regime and surface water features*
   ii. *Cross-sections showing site strata and shallow and deep groundwater levels*
   iii. *Summary tables of chemical analyses and site monitoring*
   iv. *Description of type, nature and spatial distribution of contamination, with plans where appropriate*
   v. *Statistical analysis of the data set and derivation of representative concentrations for individual contaminants to a suitable level of statistical significance*
   vi. *Evaluation of site investigation results against the outline conceptual model*

p. *Further to (o), presentation of the raw data is to be included as an Annex to the report including:*

   i. *Plans showing monitoring and sample point locations including the GPS coordinates (Geographic WGS 84 in degrees).*
   ii. *Description of site works and on-site observations*
   iii. *Exploratory borehole (where applicable), core or drilling logs including the GPS coordinates.*
   iv. *Details of response zone and other construction details of borehole monitoring installations*
   v. *Monitoring results*
   vi. *Description of samples submitted for analysis*
   vii. *Relevant Quality Assurance/Quality Control (QA/QC) data – this may include accreditations of staff, calibration certificates of equipment, laboratory accreditations (national and international standards) viii. Laboratory analytical reports, completed in accordance with the relevant QA/QC data, including relevant international analytical or test method standards*

1.4 THIS REPORT

For this purpose, Dr Robert Cortis the Industrial Chemist in charge of the contamination study has commissioned Terracore Ltd. to produce a method statement including a Conceptual Site Model for a study of the extent of the contamination arising from the operation of the Service Station.

2. SITE CONDITIONS

The site was inspected by the undersigned Geologist Dr. Saviour Scerri on the 31 October 2024 (**Figure 5**, **Figure 6**, **Figure 7**). At that time excavation works were under way in some parts of the site. The Service Station had already been decommissioned and a decommissioning report Dated October 2022 has been drawn up.

The underground fuel tanks (8 in total), dispensers and fuel lines had already been removed – no fuel contamination was determined at the time. Once excavation works commenced in the forecourt area, a concrete platform was found ~40cm below surface level, and fuel contamination was first noted beneath this platform once it was broken into.

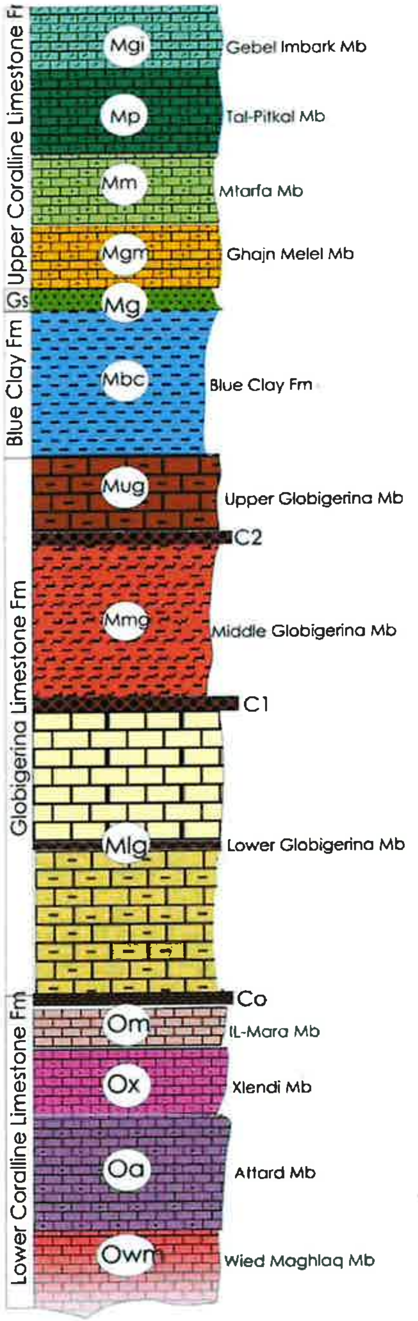
Figure 5: Photograph showing the present conditions at the Service Station

Figure 6: Photograph taken from the east showing the current general site conditions. The Carwash and Coach wash and Service Station can be seen in the background on the left

Figure 7: Photograph showing the present conditions at the carwash

3. GEOLOGY

3.1 GEOLOGICAL SETTING OF MALTA



The Maltese strata comprise hard, massive sometimes reefal, tectonically competent coralline limestones, ductile fine grained biomicrites and plastic marls and clays of a tectonically incompetent behaviour. The Litho and Chrono stratigraphical rock succession and the paleo-environment of the Maltese Islands have been studied in detail by Murray (1890), Felix (1973), Pedley (1978), Pedley *et al.* (1978), Di Geronimo *et al.* (1981). According to these authors they consist of the following formations (from youngest to oldest):

1. **Upper Coralline Limestone Formation:** up to 162m thick, represented by shallow water facies ranging from subtidal through intertidal and supratidal environments.

2. **Greensand Formation:** up to 12m glauconitic limestones.

3. **Blue clay Formation:** up to 65m slightly consolidated marls which have been deposited in an open marine environment at sea-depth between 200 and 40 m.

4. **Globigerina Limestone Formation:** a 23 - 207m thick sequence of fine-grained biomicrites with intercalated layers of phosphorite nodules. These series have been deposited at water depths between 40 and 150m in a shallow shelf area.

5. **Lower Coralline Limestone Formation:** exposed above sea level up to 140m, represented by a shallow water facies formed at sea-depth of less than 50 m.

Figure 8: Lithostratigraphy of the Maltese Islands

3.2 GEOLOGICAL CONDITIONS AT THE SKYPARKS 2 SITE

The extract from the published geological Map of the Maltese Islands (1993) shown in **Figure 9** below indicates that the site (marked in red) is located on the Lower Globigerina Limestone Formation.

This consists of a massive, yellow, pale yellow to pale grey colored medium to fine, soft, porous foraminiferal limestone with moderate to intense thalassinoidean burrow systems. Macrofossils consist mainly of whole and fragmented echinoid tests and spines and bivalve shells. This rock has a connected porosity (water absorption) of about 12% to 20% but is also permeable through fissures.

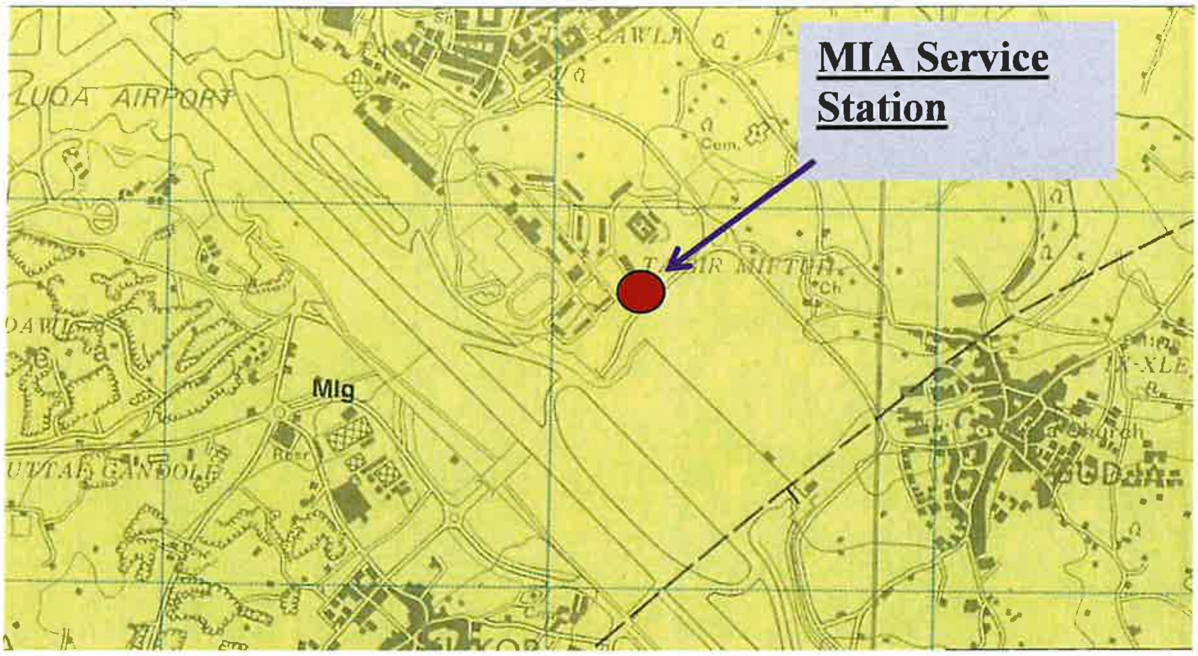


Figure 9: Geological map of the site and its environs

The Malta International Airport (MIA) Service Station is located at an altitude of ~75m above mean sea level and built on Lower Globigerina Limestone. The footprint of the Service Station is about 5000 sq m.

The whole of the Malta International Airport and its environs are located on Lower Globigerina Limestone. The Lower Coralline Limestone which makes up the mean sea level aquifer of the Maltese Islands subcrops at a depth over 30m below the site of the Service Station.

The Service Station lies on Franka stone bed that is about 20m thick, underlain by the 'soll' bed, known to be impermeable unless it is faulted. The 'soll' bed is an aquitard and does not represent an aquifer.

Ongoing excavation close to the Service Station revealed a 1.5 to 2.65m thick layer of overburden composed of brown soil and stone rubble.

3.3 STRUCTURAL GEOLOGY

The rock is bedded. Bed dip at about 2° to 4° to the northeast. No faults appear to pass across the site or close to the site. Vertical fractures, often widened by solution, can be seen on the exposed rock surface. Beds can be seen to be about 30cm thick (**Figure 10, Figure 11**).

Figure 10: Photograph showing ongoing excavation at the Skyparks 2 site, exposing bedded Lower Globigerina Limestone. Straight Vertical fissures can be seen in the middle ground.

Figure 11: Photograph showing ongoing excavation. Photograph shows bedded Lower Globigerina Limestone and vertical joint widened by solution and partly filled with brown soil

4. HYDROLOGY AND HYDROGEOLOGY

4.1 SURFACE RUNOFF

The site lies within the catchment of Wied Ta' Garnaw which skirts Santa Lucija and discharges in Wied Ta' Mazza and Wied Iz-Ziju l/o Zejtun, as shown in **Figure 12**.

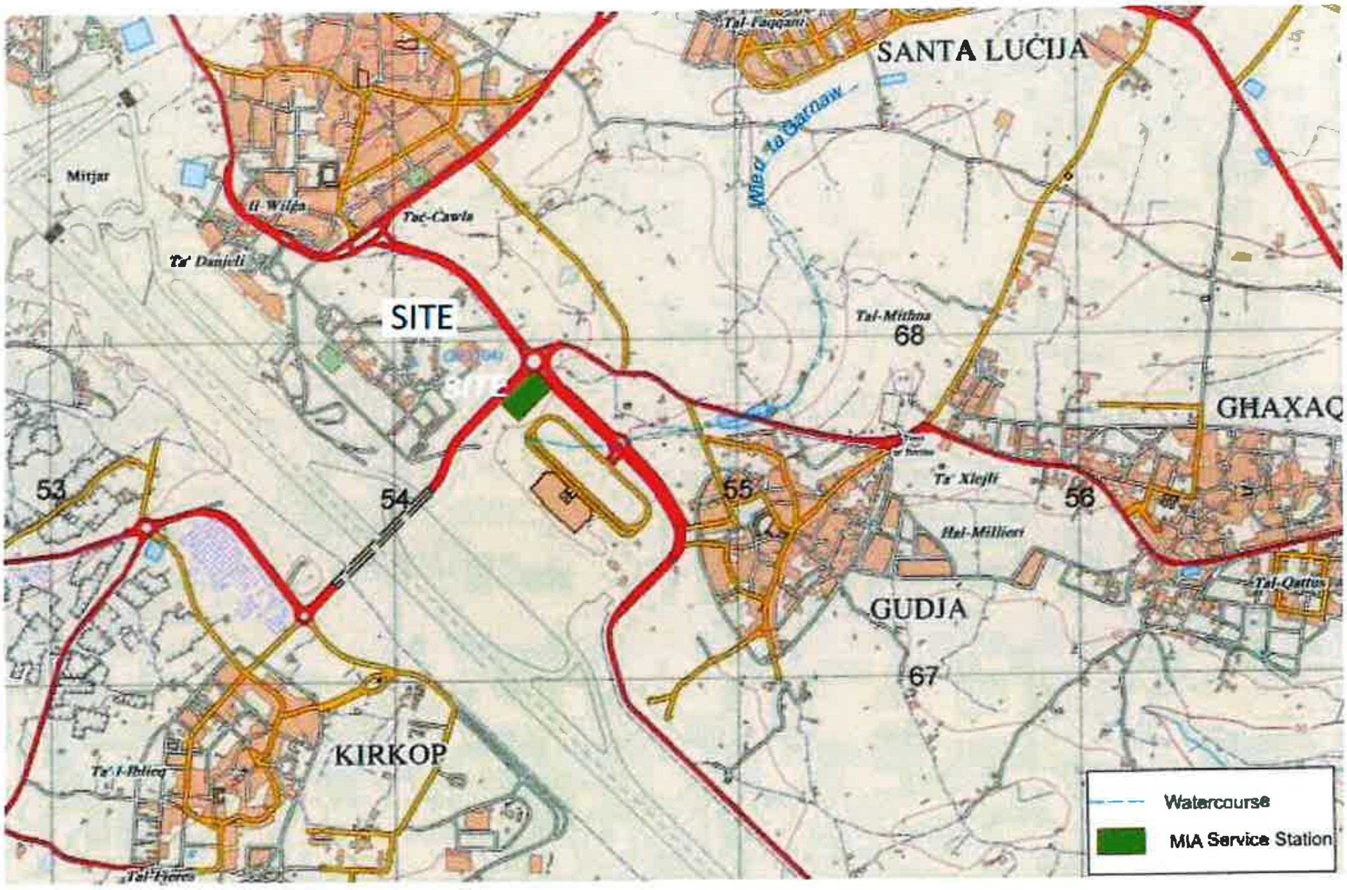


Figure 12: Map showing the site and its relations to Wied ta' Garnaw (For scale grid squares measure 1km by 1km)

4.2 THE MEAN SEA LEVEL AQUIFER

The aquifer below the site is the mean sea level aquifer represented by the Lower Coralline Limestone formation, the top of which lies at over 30m below the site. The site also lies within the 300m mean sea level aquifer protection zone as the environs of the site hosts several WSC groundwater boreholes (**Figure 13**).

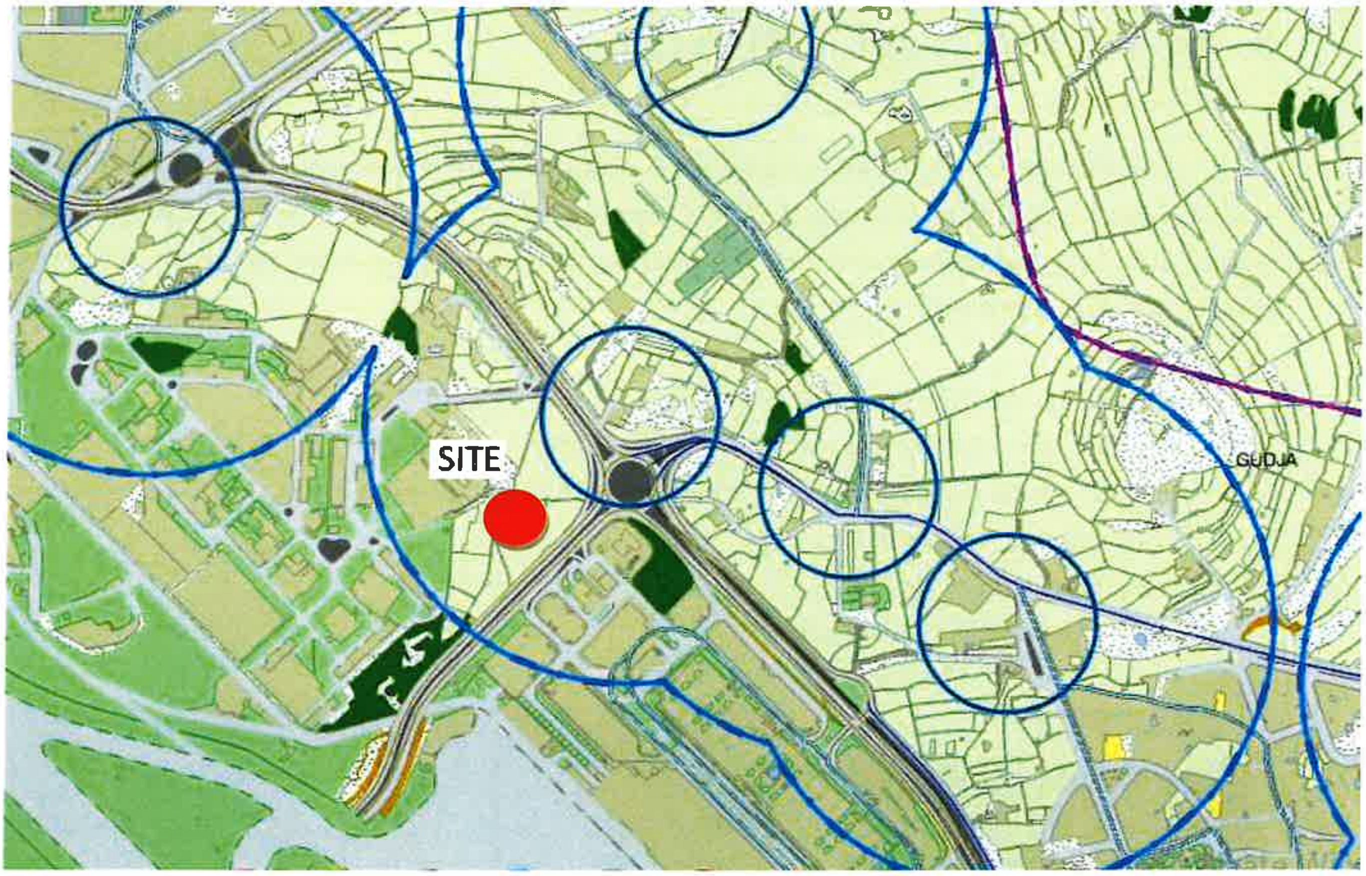


Figure 13: Map showing the 100m and the 300m protection zone of Groundwater boreholes lying in the environs of the Service Station under study (Source: MEPA Mapserver)

5. ACTIVITIES AT THE SITE

According to the owner, the Service Station was constructed in 1994-1996 (no exact date is available). It has changed very little since that time as revealed by a study of a series of aerial photographs of different vintage starting from 1998 available at the ERA (**Appendix 1**). This study also shows that the maximum extent of the Service Station has not changed since the start of fuel operations.

The activities undertaken at the Service Station are as follows (**Figure 14**):

1. Loading of petrol fuel into underground storage tanks (USTs) by fuel bowser
2. Loading of diesel fuel into underground storage tanks (USTs) by fuel bowser
3. Petrol refueling of motor vehicles
4. Diesel refueling of motor vehicles
5. Car wash services for motor vehicles

Figure 14: Google Street View (2016) showing extent of the Service Station

5.1 SCOPE OF THE STUDY

The Service Station has been in place since the 90's and its principal activity has always been handling and selling fuel to motor vehicles. During the course of these activities, no incidents of fuel that leaked to the environment have been reported, although during decommissioning facts proved otherwise.

The scope of the proposed study is to draw up a CSM to assess the extent of potential contamination of the surrounding terrain. This could have occurred primarily by soaking the underlying road surfacing and overburden and possibly percolation into the underlying Lower Globigerina Limestone and potentially further down to mean sea level some ~75m below the Service Station. Lateral migration in the rock could have occurred through fissures or permeable bedding planes.

The station lies on gently inclined terrain (Malta International Airport) and dispersal could occur by runoff during rain events and transport downstream to Wied ta' Garnaw, considered to represent a dry Watercourse (**Figure 15**).

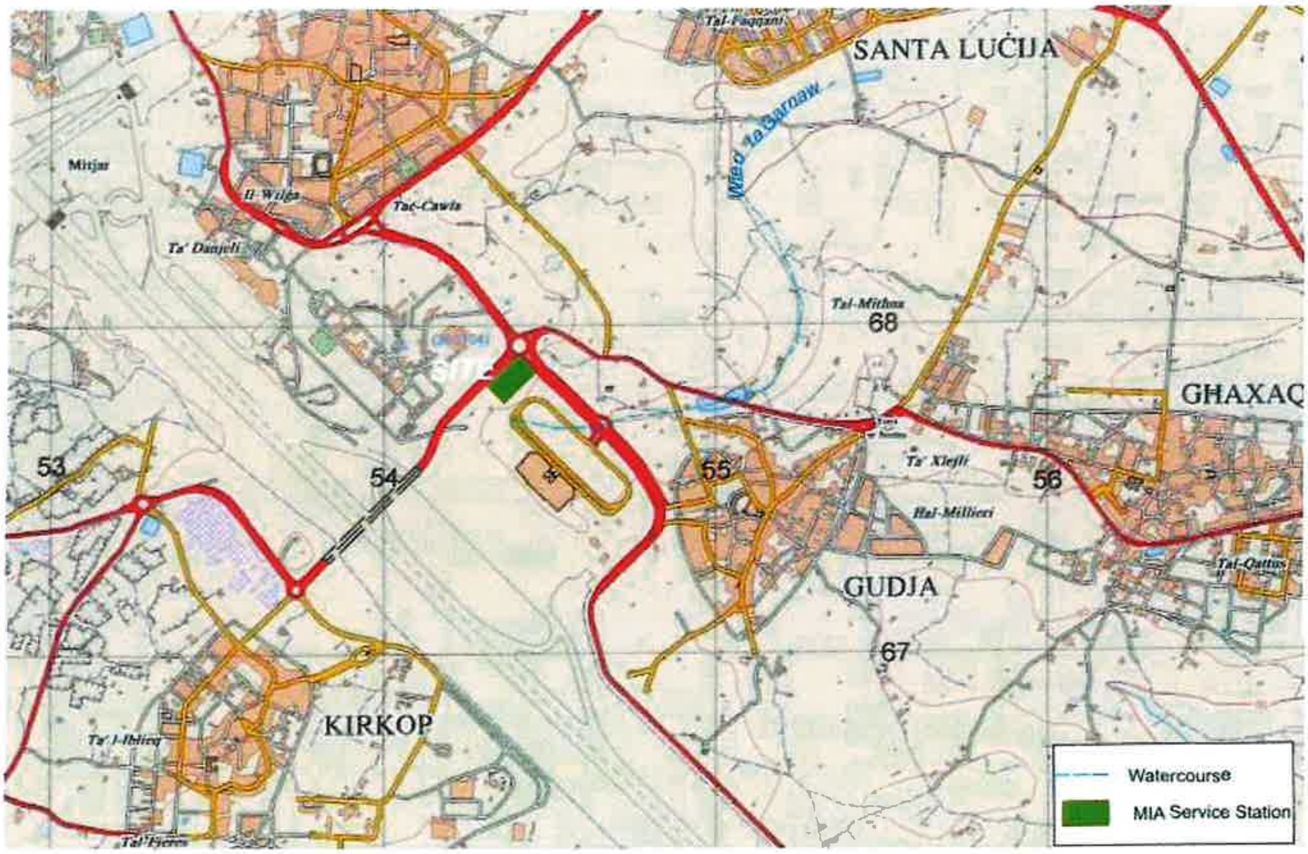


Figure 15: Map showing the relations of the site in relation to Wied ta' Garnaw, a dry watercourse that discharges into Wied ta' Mazza l/o Żejtun

The Service Station handled only Petrol and Diesel fuel. It is therefore concluded that the potential contaminating substances dispersed during such incidents are light and heavy hydrocarbons and minor quantities of fuel additives such as Lead Tetraethyl prior to the introduction of unleaded fuel. Carwash services could have caused minor contamination in the subsurface due to infiltration of foul water into the subsurface during car washing.

5.2 HISTORY OF OPERATIONS

Date of Start of Operations

Available data suggests that the Service Station started operations in 1994-1996 before MIA became a plc.

Name of operator/s

Malta International Airport plc.

Nature/type of fuel tanks as well as the fuels handled are listed in Table 1

Unleaded fuel was introduced definitely since Year 2000.

Table 1: Summary description of the underground fuel tanks of the Service Station

Tank No:	Fuel Type:	Tank Capacity (Litres):	Storage Location:	Single / Double Skin:	Tank installation year:	Dispenser No(s):
1	Diesel	14,000	Underground	Single	1996	5,6,7,8
2	Diesel	14,000	Underground	Single	1996	5,6,7,8
3	Unleaded gasoline	14,000	Underground	Single	1996	5,6
4	Unleaded gasoline	14,000	Underground	Single	1996	7,8
5	Unleaded gasoline	14,000	Underground	Single	1996	1,2,3,4
6	Biodiesel	9,700	Underground	Single	1996	1,2,3,4
7	Diesel	9,700	Underground	Single	1996	3,4
8	Diesel	9,700	Underground	Single	1996	1,2

Date of termination of operations

Operations were terminated in November 2023.

5.3 PRESENT SITE CONDITIONS

The site had already been partly decommissioned, and all the fuel tanks and some ancillary facilities has been removed, but during the initial excavation works it was discovered that the site was heavily contaminated with fuel. It was for this reason the ERA has requested a CSM.

5.4 HISTORY OF CONTAMINATION - POLLUTION INCIDENTS

Although no pollution incident of any fuel leaks into the surrounding rock/soil had ever been reported, during the initial excavation works, considerable ground contamination became evident, and this explains why ERA has requested a CSM.

5.5 RATIONALE

The environment could potentially be contaminated with hydrocarbons from the operations of a Service Station by:

- Surface flow leading to soaking of the surrounding/underlying overburden;
  - at the bowser filling point during tank refilling by fuel tankers
  - in the forecourt during vehicle filling
- Leakage and Percolation into the underlying Lower Globigerina Limestone:
  - of rusted fuel tanks
  - of fuel lines and dispensers
- Lateral dispersal along permeable bedding planes
- Further potential percolation down to sea level some ~75m below if fissures are present.

Since no fuel leaks have ever been reported, the actual volumes of fuel contamination are not known, but considering that the underlying 'Soll' bed of the Lower Globigerina Limestone is impermeable, the investigation shall be confined to the area indicated in **Figure 16.**

5.6 AQUIFER CONTAMINATION

The site lies on the Franka stone bed of the Lower Globigerina Limestone underlain by the 'Soll' bed which, unless faulted, is impermeable.

5.7 THE CONCEPTUAL SITE MODEL

Once fuel has been spilled accidentally or through leakages, it may have been dispersed beyond the boundaries of the site by numerous agents. Hence, in drawing up the Conceptual Site Model, the following points have been taken into account:

- Run-Off
- Absorption of leaked fuel by the surrounding soil
- Absorption by the surrounding rock (in small quantities - measured water absorption is usually less than 20%)
- Percolation into the overburden and underlying rock and further down to sea level if the rock is fissured
- Lateral migration at the soil/rock interface (considering that the 'soll' bed is impermeable)
- Lateral dispersal in rock, along permeable bedding planes

The model drawn up comprises the following areas (**Figure 16**):

- Site of the Fuel dispensers, bowser filling point and oil/water interceptor
- Fuel storage areas (the underground storage tanks – USTs)
- Carwash and coach wash areas

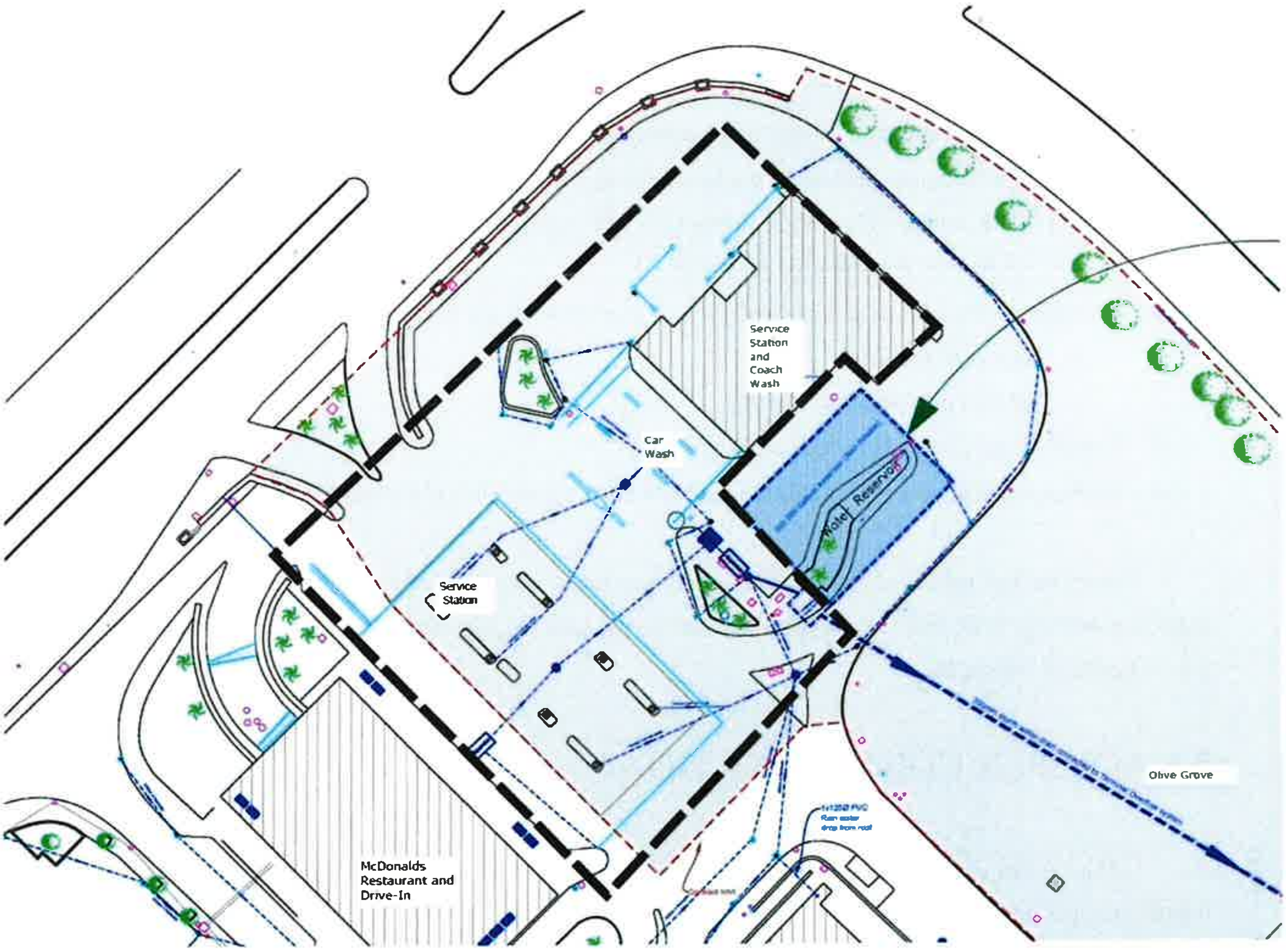


Figure 16: Site plan showing the limit of the CSM

5.8 REGULATIONS

The whole study will be guided by:

LN203/2002	Regulations for the Protection of Groundwater Against Pollution Caused by Certain Dangerous Substances, 2002	Directive 80/68/EEC
LN23/2004	Quality of Water Intended for Human Consumption Regulations, 2004	
LN116/2004	Quality of Water Intended for Human Consumption (Amendment) Regulations, 2004	
LN194/2004	Water Policy Framework Regulations, 2004	Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community Action in the field of water policy(Water Framework Directive)
S.L. 549.63	Waste Regulations	

5.8.1 STRATEGIC PLAN FOR THE ENVIRONMENT AND DEVELOPMENT (SPED)

The Strategic Plan for the Environment and Development (SPED) (2015) replaces the previous Structure Plan (which was published in 1990 and adopted in 1992). The new SPED provides a strategic spatial policy framework for environment and development up to 2020 complementing Government's economic, social and environmental objectives for the same period. The SPED covers the marine waters up to the extent of 25 nautical mile limit of the Fisheries Conservation Zone (adopted by Council Regulation EC No. 1967/2006).

The SPED provides the following guidance in the form of Specific objectives and arising issues listed in **Table 2**.

Theme	**Issues**
Biodiversity	Despite the legal protection biodiversity continues to be threatened by land development, invasive alien species, overexploitation and climate change
Land	The small size of the Islands and high population density result in competing demands for land. There is a tendency towards inefficient use of land through over provision of development
Soil	arising mainly from increased urbanisation, intensification of agricultural
Mineral resources	resources Extraction practices lead to wastage of resource
Water resources including marine waters	Pollution and development that alters the hydromorphology of these waters.
Built heritage and archaeological remains	Demolition, inappropriate design and use of new and restored buildings which undermines street character as well as pilferage of underwater heritage remain a threat especially if these are not afforded legal protection.
Cultural landscape and coastal development,	Malta's cultural landscape is threatened by the extent of built up area, industrial taller buildings on urban fringes that obstruct views of historic centres, modern agricultural practices, increased vehicular access, litter, poor standards of design and work, and lack of maintenance.
Air quality	Malta's significant air pollutants are particulates and nitrogen dioxide mainly arising from traffic, industry and energy generation and ozone mainly from transboundary sources.
Noise	Heavy traffic is the main source of ambient noise in the Maltese Islands.
Use of Chemicals	Misuse, poor collection, storage and treatment of chemicals may lead to air, water, and sediment and soil pollution. Pesticides and biocidal products are considered to be of particular concern.
Solid waste management	Malta's solid waste management practice is heavily dependent on landfills with low levels of material recovery. Construction and demolition waste makes up a significant proportion of total solid waste generated and the associated impacts are land take up, pollution and nuisance related to transport and depletion of mineral resources.
Climate change	The Maltese Islands are vulnerable to the predicted impacts of climate change. A decrease in annual precipitation that may lead to episodes of drought, more intensive storm events leading to flooding and predicted changes in global sea levels are likely to affect ecological processes

	and consequently the socioeconomic activities and infrastructure which depend on them. Energy including transport is the main source of Greenhouse Gas Emissions. Targets for non ETS sector are challenging.

Table 2: SEA Objectives and respective Issues (Strategic Plan for Environment and Development, Statement of adoption September 2015)

5.9 SAMPLING STRATEGIES RELEASE AREA(S)

Sampling strategies for investigation of RELEASE areas should incorporate information on known or suspected areas of contamination whenever this information is available. Existing information on areas of contamination is often incorporated in sampling plans through biased sampling of areas that are most likely to be impacted. Application of a statistical sampling approach such as simple random sampling alone would not be appropriate since it would not incorporate this site-specific knowledge. Known or suspected areas of contamination may not be sampled.

The information already at hand includes:

1. Fuel contamination in the infill beneath the forecourt, likely from leaking fuel lines, discovered immediately once excavation works commenced, as confirmed from VOC PID measurements
2. Fuel contamination lining in the bowser filling point, and a drainage hole at the bottom of the pit which likely led to dispersion into the underlying infill
3. Crack in the oil/water interceptor, which potentially led to dispersion of fuel into the underlying infill

Based on the above, the sampling strategy shall focus on the area of the forecourt, the area immediately besides the forecourt that is situated downstream when considering the site's gradient, the location of the USTs, the bowser filling point, and the area of the oil/water interceptor (see **Figure 17**). The terrain (infill and bedrock) in the zones marked with black boxes in **Figure 17** are shall not be sampled due to the site gradient with respect to potential leak sources. Furthermore, terrain (infill and bedrock) in these black zones shall not be excavated as the areas fall outside of the footprint of the planned buildings but rather fall squarely in the designated landscaped and service roads areas. The carwash area shall also be excluded since no fuel contamination is likely there when considering the site's gradient and the lack of potential sources.

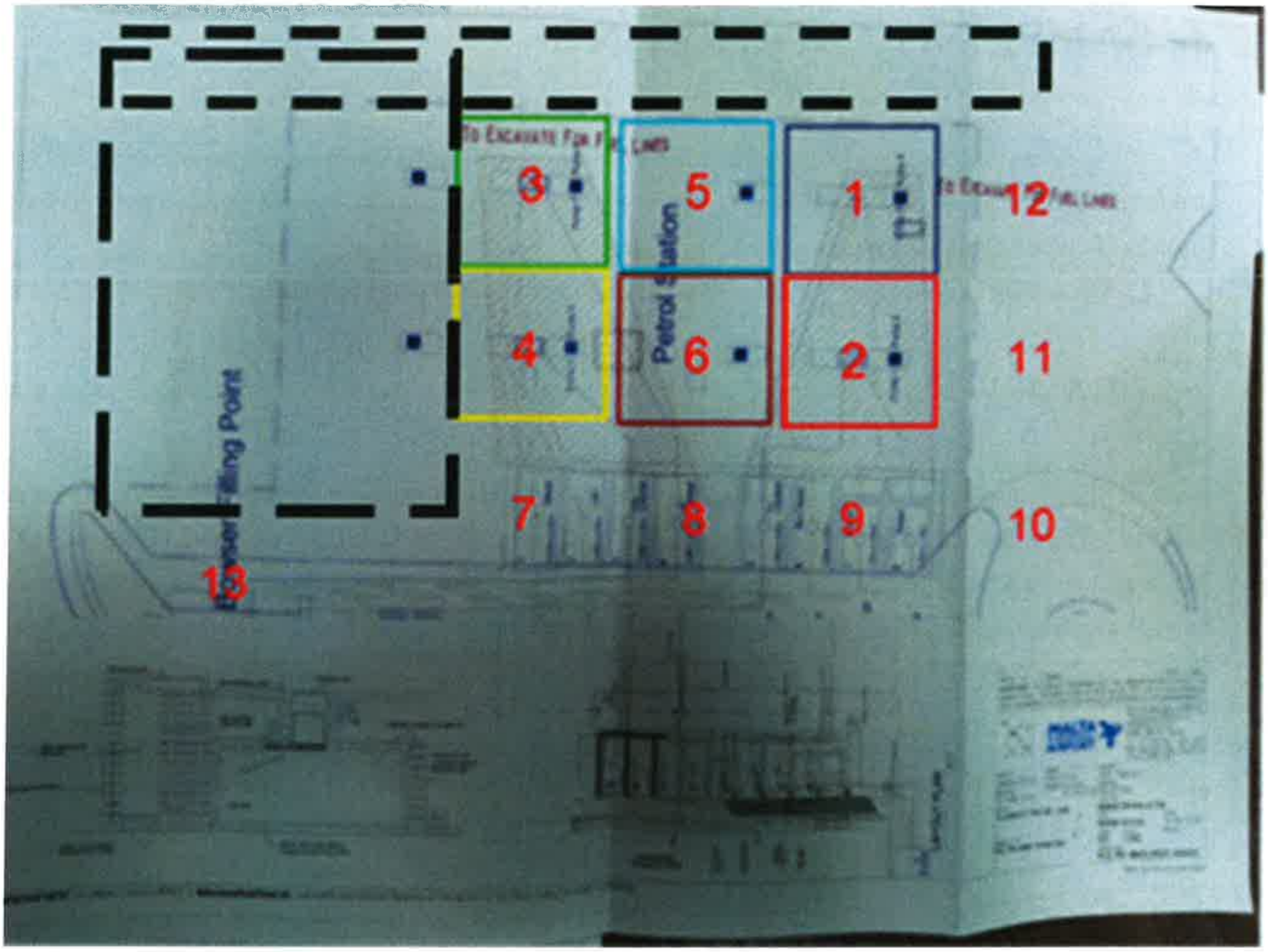


Figure 17: Site plan showing areas not being targeted for sampling (black zones) in relation to proposed sampling locations

6. SAMPLING AND TESTING

As for the sampling and testing supervision, this will comprise the undersigned Dr. Saviour Scerri and Dr Robert Cortis for the field sampling, while Biochemie Lab S.r.l. will undertake the analysis. The interpretation and reporting shall be done by Dr Robert Cortis and the undersigned.

Works shall be divided into 4 Phases. Phase 1 was carried out prior to the completion of this CSM.

6.1 PHASE 1

The site area was split into six equal zones, as shown in **Figure 18**. Following decommissioning and removal of the eight USTs, the buried fuel lines and the four dispensers, it transpired that the fuel lines were above a concrete platform that was buried ~0.40 m from the ground level. VOC measurements taken using a PID did not reveal presence of hydrocarbons in this surface material. Therefore, composite samples were collected from each zone to determine whether this surface infill material could be sent for backfilling in a quarry.

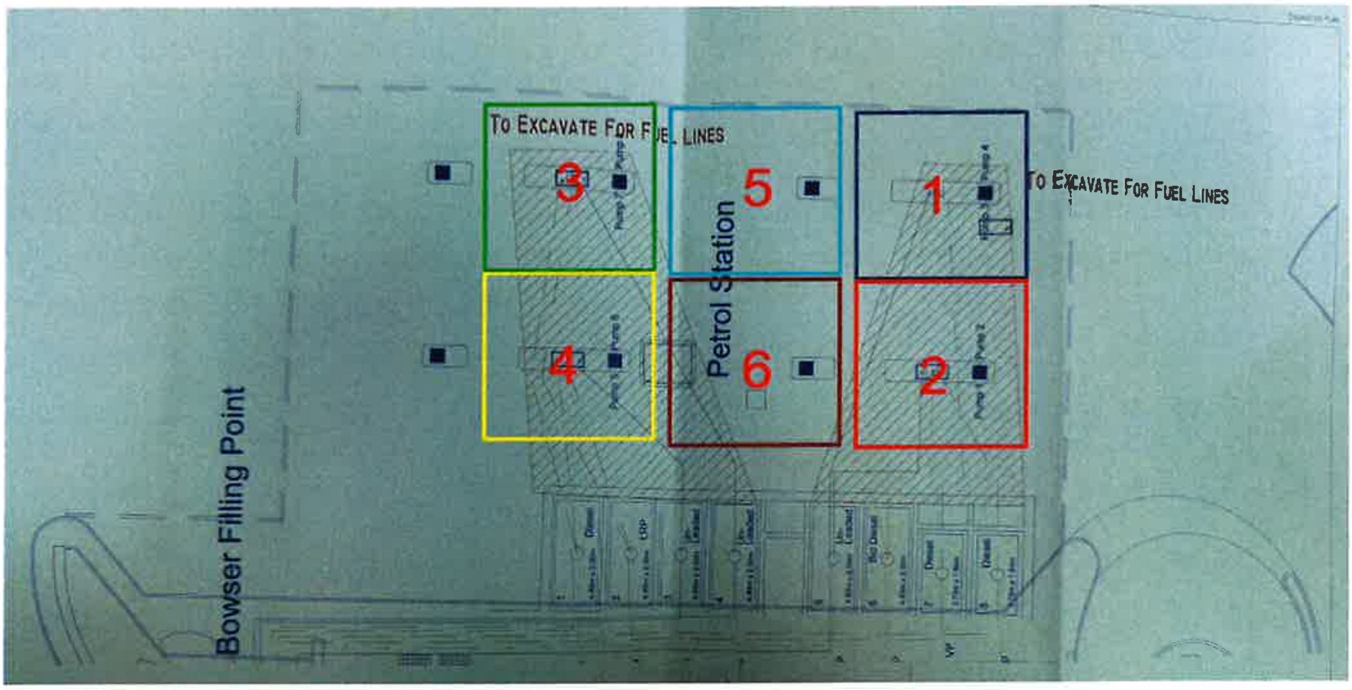


Figure 18: Site plan showing the six zones

6.1.1 Sampling and Analysis of the surface material above the concrete layer

Surface sampling was performed following relevant guiding standards of the ISO 18400 series, which are the revised versions of the ISO 10381 series. Samples were placed into appropriate amber glass bottles and septum-capped vials, tightly sealed, stored and maintained in the dark at 4°C – 8°C upon immediate extraction from the ground to prevent any potential losses of volatile substances until delivery to the analysing laboratory. At least 2 kg per sample were collected, whereby 1 kg was designated to be sent to the laboratory while the rest was kept cool locally to serve as a counter-sample.

The sampling details are presented in **Table 3**.

Table 3: Description of the samples collected

Sample N.	Zone n.	Sample Depth	Sampling Date
1	1	Surface	20/09/2024
2	2	Surface	20/09/2024
3	3	Surface	20/09/2024
4	4	Surface	20/09/2024
5	5	Surface	20/09/2024
6	6	Surface	20/09/2024

Results are presented as concentrations on *dry weight* basis and compared to available limit values listed in the legislation Parte IV, Allegato 5, Tabella 1 of Italian Decreto n. 152 of 2006. The methods listed in **Table 4** are in accordance with the said legislation.

Table 4: List of parameters and respective methods

Parameter	Method	LOD	
Moisture Content	DM 13/09/1999 SO n° 185 GU n° 248 21/10/1999 Met.II.2	0.1	%
Antimony	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Arsenic	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Barium	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Beryllium	EPA 3050B 1006 + EPA 6020B 2014	0.1	mg/kg
Cadmium	EPA 3050B 1006 + EPA 6020B 2014	0.1	mg/kg
Chromium	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Copper	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Lead	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Mercury	EPA 3050B 1006 + EPA 6020B 2014	0.1	mg/kg
Molybdenum	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Nickel	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Selenium	EPA 3050B 1006 + EPA 6020B 2014	0.1	mg/kg
Zinc	EPA 3050B 1006 + EPA 6020B 2014	1	mg/kg
Hydrocarbons C<12 (5–12)	EPA 5021A 2014 + EPA 8015C 2007	1	mg/kg
Hydrocarbons C>12 (12–40)	ISO 16703:2004	5	mg/kg
MTBE	EPA 5021A 2014 + EPA 8015C 2007	0.1	mg/kg
PAHs [1]	EPA 3550C 2007 + EPA 8270E 2018	0.01	mg/kg
BTEXS [2]	EPA 5021A 2014 + EPA 8260D 2018	0.05	mg/kg

[1] Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j)fluoranthene, Benzo(k)fluoranthene, Benzo(e)pyrene, Benzo(g,h,i)perylene, Chrysene, Dibenzo(a,h)anthracene, Phenanthrene, Fluoranthene, Fluorene, Indeno(1,2,3-c,d)pyrene, Naphthalene, Pyrene

[2] Benzene, Toluene, Ethylbenzene, m-/p-/o-Xylene, Styrene

The only parameter which was found in levels which exceeded L1 and L2 limit values was Hydrocarbons C>12 (C12-C40). A summary of the results of interest is listed in **Table 5**.

Table 5: Summary of results

Laboratory Report Code 2422193.xxx	**.001**	**.002**	**.003**	**.004**	**.005**	**.008**	Soils	Soils
Sample Number	**1**	**2**	**3**	**4**	**5**	**6**	**intended for use in**	**intended for use in**
Sample Description	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Soil**	**Public / Private**	**Commercial**
Sampling Point	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Zone 5**	**Zone 6**	**/ Residential**	**/ Industrial**
Sample Depth	**Surfa ce**	**Surfa ce**	**Surfa ce**	**Surfa ce**	**Surfa ce**	**Surfa ce**	**mg/kg dw**	**mg/kg dw**
Hydrocarbons C<=12 (mg/kg)	2.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	10	250
Hydrocarbons C>12 (C12-C40) (mg/kg)	5700	6.7	840	420	66	110	50	750

Results marked in YELLOW indicate an exceedance of L1 limit values, whereas results marked in RED indicate an exceedance of L2 limit values. This means that only the surface material located within zone 2 may be sent for backfilling in a local quarry. The remaining material, having exceeded the L1 limit for Hydrocarbons C>12 (C12-C40), makes it ineligible for backfilling. The material shall be sent for End-of-Waste processing.

Reference: Waste Characterisation Report for the surface material only v2 dated 12/11/24

6.1.2 Sampling and Analysis of the infill material below the concrete layer

Dry core sampling was done using a Beretta T43 drill rig fitted with an auger, as shown in **Figure 19**. Samples were placed into appropriate amber glass bottles and septum-capped vials, tightly sealed, stored and maintained in the dark at 4°C – 8°C upon immediate extraction from the ground to prevent any potential losses of volatile substances until delivery to the analysing laboratory. At least 2 kg per sample were collected, whereby 1 kg was designated to be sent to the laboratory while the rest was kept cool locally to serve as a counter-sample.

Figure 19: Beretta T43 drill rig fitted with an auger for dry drilling

The sampling details are presented in **Table 6**, while the core depths and geocoordinates of each sampling point are given in **Table 7**. It is pertinent to note that the 0 m mark refers to the concrete layer and excludes the ~0.40m surface material above the concrete layer.

Table 6: Sampling details

Sample	Zone	Depth	Sampling Date
A	1	0 – 1 m	09/09/2024
B		1 – 2 m	
C		2 – 2.6 m	
D	2	0 – 1 m	09/09/2024
E		1 – 2 m	
F		2 – 2.5 m	
G	3	0 – 1 m	09/09/2024
H		1 – 2 m	
I	4	0 – 1 m	09/09/2024
J		1 – 1.5 m	
5 (top)	5	0 – 1 m	09/09/2024
5 (bottom)		1 – 1.3 m	
K	6	0 – 1 m	09/09/2024
L		1 – 1.7 m	

Table 7: Core depths and geocoordinates

BH	Core Depth (m)	Coordinates
1	2.60	35°51'6.41" N, 14 °29'39.44" E
2	2.50	35°51'6.24" N, 14 °29'39.21" E
3	2.00	35°51'7.01" N, 14 °29'38.77" E
4	1.50	35°51'6.82" N, 14 °29'38.50" E
5	1.30	35°51'6.81" N, 14 °29'39.08" E
6	1.70	35°51'6.57" N, 14 °29'38.87" E

Since the original plan of the Client was to explore the route of disposal of the material situated in Zones 1 – 4 and 6 at landfill, the samples collected from BH 1 – 4 and 6 were sent to the laboratory for a three-stage waste characterisation analysis procedure. Material from Zone 5 was intended to be sent for backfilling in a quarry, hence the samples collected from BH 5 were sent to the laboratory for analysis as per Table 4 above in accordance with legislation Parte IV, Allegato 5, Tabella 1 of Italian Decreto n. 152 of 2006. The three-stage waste characterisation analysis procedure is as follows:

Stage 1 – Compositional Analysis

Chemical characterisation analysis carried out on the bulk of the sample and reported on a *tale quale* basis in accordance with S.L. 549.63 to determine the appropriate European Waste Catalogue (EWC) Code that should be assigned to it from the following:

- 17 05 03* soil and stones containing hazardous substances
- 17 05 04 soil and stones other than those mentioned in 17 05 03*

Stage 2 - Hazardous Property Assessment (HPA) and EWC code identification

The results obtained from the compositional analysis (Stage 1) shall be analysed further in a desk-based HP criteria assessment, by comparing the result obtained in the analysis to the limit value of the worst-case compound that can potentially exist in the waste, based on the site use and the compounds' chemistry.

The HPA is carried out using the latest classification labels in line with EC Regulation 1272/2008 and the Hazardous Properties in Annex III of the Waste Framework Directive (WFD) 2008/98/EC. Regulation 1272/2008 lists all the hazardous compounds that exist for each metal. Laboratory analysis determines the concentration of the metals present in the waste, but not the compounds these metals are found in. Different compounds have different toxicity, and therefore, the threshold levels for concentrations to be deemed as being present in hazardous levels varies.

The strictest existing threshold is currently of 0.1% of the worst-case compound present in the waste. Therefore, for each metal, in the assessment it is assumed that the analytically determined concentration is found in its entirety in each of the respective worst-case compounds.

It is to be pointed out that while some hazardous properties are dependent on the threshold, some hazardous properties (namely the physical properties – explosive, oxidising, and flammable), do not have any threshold and may require further testing to prove whether the particular hazardous property is present or not.

This will in turn assist with the determination of the hazardous property referred to in Annex III of the Waste Framework Directive (WFD) 2008/98/EC, leading to the classification of the waste into a particular EWC code.

Stage 3: Leachate analysis

Leachate analysis following EN 12457-2:2002 in accordance with the Council Decision 2003/33/EC on establishing the criteria and procedures for the acceptance of waste at landfills carried out to determine whether landfilling could be an option for eventual disposal of the material.

The leachate results will be used to determine whether the material fulfils all the waste acceptance criteria (WAC) for the different kinds of landfills, as set out by Annex II to the Council Directive 1999/31/EC (Landfill Directive) and as laid down in Council Decision 2003/33/EC (WAC Decision).

The IPPC Permit of the local Għallis landfill stipulates that it can only accept non-hazardous waste whose leachate content falls within the limit values stipulated for non-hazardous waste. Furthermore, acceptance of such waste at the local landfill, even if permitted to do so, is subject to an agreement with the operator – WasteServ Malta Ltd. Failure to reach an agreement, the waste shall have to be exported.

There are no landfills in Malta which can accept hazardous waste or non-hazardous waste whose leachate content falls within the limit values stipulated for hazardous waste. Therefore, disposal abroad is the only option for such waste. Should leachate levels exceed the hazardous landfill threshold, then disposal at landfill is not an option and an alternative disposal method would need to be sought.

The compositional analytical results obtained for the samples collected from BH 1 – 4 and 6 reported on a *tale quale* basis, together with the HPA, are presented in the respective laboratory reports. A summary is given in **Table 8**.

Table 8: Summary of compositional analysis and HP assessment results obtained

Sample	Lab Report N.	Result	EWC Code Assigned
A	2422193.009	Hazardous	17 05 03*
B	2422193.010	Non-Hazardous	17 05 04
C	2422193.011	Non-Hazardous	17 05 04
D	2422193.012	Hazardous	17 05 03*
E	2422193.013	Non-Hazardous	17 05 04
F	2422193.014	Non-Hazardous	17 05 04
G	2422193.015	Non-Hazardous	17 05 04
H	2422193.016	Non-Hazardous	17 05 04
I	2422193.017	Non-Hazardous	17 05 04
J	2422193.018	Non-Hazardous	17 05 04
K	2422193.019	Non-Hazardous	17 05 04
L	2422193.020	Non-Hazardous	17 05 04

The hydrocarbons present are presumably diesel. Petrol is made up of light hydrocarbons (C5 – C10, but mainly octane – C8), whereas diesel has heavier hydrocarbons (C6 – C20+, but mainly cetane – C16). The C-number is the number of carbons in the hydrocarbon. The high presence of the heavier C (above the petrol range) is clear presence of diesel. The low presence of the lighter C indicates the 'tail-end' of diesel. Had this been high too, it could potentially indicate the presence of petrol too, but being only minor quantity, it is more likely that it is simply the lighter fraction of diesel rather than petrol. Furthermore, there are also diesel markers present such as Trimethylbenzenes and Xylene which are aromatic (*i.e.* have carbon rings), whereas petrol is typically an alkane mix, having straight chain or branched carbon, but no rings.

Thus, since the hydrocarbons present are presumably diesel, the applicable HP 7 limit in the Hazardous Property Assessment is set at 1% (10,000 mg/kg). From the HPA, the top sample from Zones 1 and 2 were found to be hazardous by HP 7 and thus assigned EWC 17 05 03*, while the remaining samples were assigned EWC 17 05 04 since they were determined to be non-hazardous.

The leachate analysis results presented in the laboratory reports are expressed in mg/l or µg/l given that this analysis is carried out on a liquid extract. However, since that the liquid:solid leachate extract procedure shall follow a ratio of 10:1 as per EN 12457-2:2002, a simple multiplication x10 converts the mg/l or µg/l result to mg/kg or µg/kg result, respectively. This converted data is presented in **Table 9**, together with the WAC limit values for disposal at a non-hazardous landfill.

The WAC limits for non-hazardous waste destined for disposal in a landfill for non-hazardous waste are stipulated in Clause 2.2.2 of Council Decision 2003/33/EC. These apply for all samples except Samples A and D, which were found to be hazardous.

The WAC limits for hazardous waste acceptable for disposal in a landfill for non-hazardous waste are stipulated in Clauses 2.3.1 and 2.3.2 of Council Decision 2003/33/EC. These apply for Samples A and D.

It should be noted that limit values stipulated in Clauses 2.2.2 and 2.3.1 are identical.

Table 9: Leachate Results

Sample	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
As (mg/kg)	**0.106**	**0.0614**	**0.0276**	**0.0435**	**0.0291**	**0.0343**	**0.0463**	**0.0341**	**0.0155**
Ba (mg/kg)	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cd (mg/kg)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cr (mg/kg)	<0.05	**0.158**	**0.0857**	**0.0509**	<0.05	**0.0789**	**0.144**	<0.05	<0.05
Cu (mg/kg)	**0.926**	**0.103**	<0.1	<0.1	<0.1	<0.1	**0.121**	**0.184**	<0.1
Hg (mg/kg)	**0.001**	**0.0015**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mo (mg/kg)	**0.176**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.109	<0.1
Ni (mg/kg)	**0.573**	**0.108**	**0.0536**	**0.0823**	**0.0423**	**0.0688**	**0.198**	**0.107**	<0.01
Pb (mg/kg)	<0.01	**0.245**	**0.0373**	**0.113**	**0.122**	**0.0905**	**0.0781**	**0.0121**	<0.01
Sb (mg/kg)	**0.03**	**0.0144**	<0.01	**0.0204**	**0.0129**	**0.011**	**0.0163**	**0.0144**	<0.01
Se (mg/kg)	**0.0104**	**0.0193**	<0.01	<0.01	**0.0107**	<0.01	<0.01	<0.01	<0.01
Zn (mg/kg)	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloride (mg/kg)	**72.2**	**51.2**	**56.6**	<25	<25	**36.8**	<25	**35**	**61.6**
Fluoride (mg/kg)	**3.88**	**5.17**	**4.71**	**2.92**	**4.19**	**4.32**	**3.66**	**4.13**	**4.3**
Sulphate (mg/kg)	**253**	**187**	**112**	<25	**46.6**	**39.1**	<25	**187**	**106**
Total Dissolved Solids (TDS) (mg/kg)	**3270**	<2000	<2000	<2000	<2000	<2000	<2000	<2000	<2000
Dissolved Organic Carbon (DOC) (mg/kg)	**452**	**180**	**77.7**	**390**	**511**	**212**	**491**	**435**	**296**
Phenol Index (mg/kg)	<0.1	<0.1	<0.1	**0.286**	<0.1	<0.1	**0.128**	**0.15**	<0.1
Acid Neutralisation Capacity	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Electrical Conductivity at T=25°C (µS/cm)	**503**	< 147	< 147	**151**	**163**	< 147	< 147	**203**	< 147

pH at T=25°C	**11.17**	**9.51**	**9.43**	**8.66**	**8.48**	**8.66**	**8.63**	**10.53**	**10.27**
Total Organic Carbon (TOC) (%)	**6.3**	n/a	n/a	**71**	n/a	n/a	n/a	n/a	n/a

[a] Leaching limit values for waste acceptable at Non-Hazardous Landfill Values obtained from Directive 2003/33/EC where L/S = 10 l/

[b] If this value is not achieved, a higher limit value maybe admitted by the competent authority, provided that the DOC value of 80 material's own pH or at a pH value between 7.5 and 8.0.