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SITE-SPECIFIC

CONSTRUCTION
WASTE MANAGEMENT PLAN

FOR

GLL PRS HOLDCO LIMITED

RELATING TO A PROPOSED

STRATEGIC HOUSING DEVELOPMENT, 'KENELM'

AT

DEER PARK
HOWTH
CO. DUBLIN

21st May 2021

Ian Byrne MSc, MIOA, Dip Environmental & Planning Law

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1.0 INTRODUCTION

This document presents a site-specific Construction Waste Management Plan (CWMP) for the control, management and monitoring of waste associated with the construction of a proposed residential development at Deer Park, Howth, Co. Dublin.

The proposed application area is greenfield and is enclosed along its northern and eastern boundaries by a demesne wall. To the south is Deer Park golfclub and to the west residential dwellings.

A review of historical aerial photography identifies that other than partial use as a racetrack, which use ceased in 1842, the site has been in its present condition i.e. greenfield.

The CWMP has been prepared to demonstrate how the Construction Phase will comply with the following relevant legislation and relevant Best Practice Guidelines:

Waste Management Acts 1996

Waste Management (Collection Permit) Regulations 2007 (SI No. 820 of 2007)

Waste Management (Collection Permit) Amendment Regulations 2008 (SI No. 87 of 2008)

EPA "Guidance on Soil and Stone By-Products in the context of Article 27 of the European Communities (Waste Directive) Regulations – Version 3 June 2019

Department of the Environment, Heritage and Local Government – Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects – July 2006.

Fingal County Council Development Plan 2017 – 2023 – Construction & Demolition Waste Management Objectives

Objective WM18

Ensure that construction and demolition Waste Management Plans meet the relevant recycling / recovery targets for such waste in accordance with the national legislation and regional waste management policy.

The **Objective of this CWMP** is to minimise the quantity of waste generated by construction activities, to maximise the use of materials in an efficient manner and to maximise the segregation of construction waste materials on-site to produce uncontaminated waste streams for off-site recycling.

The CWMP shall be implemented throughout the construction phase of the development to ensure the following:

- That all site activities are effectively managed to minimise the generation of waste and to maximise the opportunities for on-site reuse and recycling of waste materials.
- To ensure that all waste materials are segregated into different waste fractions and stored on-site in a managed and dedicated waste storage area.
- To ensure that all waste materials generated by site activities are removed from site by appropriately permitted waste haulage contractors and that all wastes are disposed of at approved waste licensed / permitted facilities in compliance with the *Waste Management Act 1996* and all associated Waste Management Regulations.

2.0 DEVELOPMENT DESCRIPTION

The proposed development comprises construction of a residential scheme of 162 no. residential units comprised of 1, 2 and 3 bed apartments across 3 no. apartment blocks (A-C).

FIGURE 1 SITE LOCATION

3.0 DESCRIPTION OF SITE ACTIVITIES & WASTE ARISINGS

Demolition

To facilitate access to the development, it is proposed to provide a vehicular and pedestrian access to the northwest of the site and a separate pedestrian access to the north east. This will necessitate partial demolition of the northern demesne boundary wall. This is the only demolition required to facilitate the development.

The project conservation architect describes the wall as comprising coursed random rubble construction mainly Calp limestone, the upper section which has been rebuilt and repointed. The masonry construction is generally limestone laid and originally pointed with a non-hydraulic lime mortar mix. The evidence of later rebuilding can be seen by the variation in stone and workmanship.

The method statement for the works proposed to the wall is included as an Appendix to the Construction Environmental Management Plan prepared by Barrett Mahony Consulting Engineers included under separate cover.

There are no other structures present on site and accordingly this report deals with waste arising from the construction phase of the proposed development.

Construction Phase

The range of works required for the Construction Phases are summarised in Table 1. The expected construction and demolition waste that will be generated throughout the course of the development are described in Tables 2 - 4 below.

Table 1 Sequence of Construction Works

Activity Sequence	General Description
Enabling Works	Set up hoarding compound, site stripping
Utility trenches	Gas, Electricity, drainage
Basement Excavation	Removal of soils off site
Construction of Buildings	Piling, superstructure formwork
Mechanical & Electrical installation	Drainage, Utility ducts, power
Cladding & Building Fit Out	Windows, internal works
Services installation and connections	ESB, gas, telecoms
Landscaping, Roads and Footpaths	Planting and hard surfaces

Table 2 Typical Construction & Demolition Waste Composition

Description of Waste	%
Soils & Stones	76.7
Mixed C&D	7.0
Metals	3.0
Concrete Bricks Tiles, Gypsum	12.0
Wood, Glass, Plastic	0.3
Bitumen Waste	1.0
Totals	100

Source EPA Sept 2020

Table 3 Predicted Construction Waste Generation

Waste Type	Predicted tonnage to be produced	Re-Use		Recyclable		Disposal	
		Tonnage	%	Tonnage	%	Tonnage	%
Mixed C&D	1202	-	-	601	50	601	50
Metals	515	-	-	515	100	-	-
Concrete, Blocks, Gypsum	2060	1030	80	-	-	1030	20
Wood Glass Plastic	52	-	-	5.2	10	46.8	90
Bitumen	172			172	100	-	-
Total	4000	1030		1293.2		1676.8	
Soils	45,000	45,000	100				

Table 4 Typical Construction Waste Types

Description of Waste	Corresponding LoW Code
Concrete, Bricks, Tiles and Ceramics	17 01
Concrete	17 01 01
Bricks	17 01 02
Tiles and Ceramics	17 01 03
Mixture of concrete, bricks tiles & ceramics	17 01 07
Wood, Glass and Plastic	17 02
Wood	17 02 01
Glass	17 02 02
Plastic	17 02 03
Bituminous mixtures, coal tar and products	17 03
Bituminous mixtures containing other than those mentioned ir 17 03 01	17 03 02
Bituminous Mixtures including Coal Tar and Tarred products	17.03 02
Metals (including their alloys)	17 04
Copper, Bronze, Brass	17 04 01
Aluminium	17 04 02
Lead	17 04 03
Zinc	17 04 04
Iron and Steel	17 04 05
Tin	17 04 06
Mixed Metals	17 04 07
Insulation and Construction Materials	17 06 04
Gypsum based construction material	17 08 02
Mixed Construction and Demolition Waste other than those mentioned in 17 09 01, 17 09 02, 17 09 03	17 09 04
Sewage Screenings	19 08 01
Paper and Cardboard	20 01 01
Wood other than that mentioned in 20 01 37	20.01 38
Soil and Stones	17 05 04
Mixed Municipal Waste	20 03 01
Hydraulic oils	13 01 01*
Fuel oils and diesel	13 07 01*

4.0 PRINCIPALS OF THE CONSTRUCTION WASTE MANAGEMENT PLAN

Waste materials generated by construction activities will be managed according to the Department of the Environment, Heritage and Local Government's 2006 Publication - *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* and with regard to *Fingal County Council Development Plan 2017 – 2023 – Construction & Demolition Waste Management Objectives.*

The CDWMP specifically addresses the following points:

- Analysis of waste arisings / material surpluses
- Waste Management Responsibilities and Training
- Specific Waste Management
- Objectives for the Project including the potential to re-use existing on-site materials for further use in the construction phase.
- Methods proposed for Prevention, Reuse and Recycling
- Waste Handling Procedures
- Hazardous Waste Handling Procedures
- Waste Storage Procedures
- Waste Disposal Procedures
- Waste Auditing
- Record Keeping
- Waste Collection and Facility Permit Management

5.0 WASTE MANAGEMENT & RESPONSIBILITIES

Project Manager - Roles and Responsibilities

The Project Manager will be responsible for the overall implementation of the CDWMP. The Project Manager will ensure that the reporting and recording requirements are met and all necessary resources are in place to support the implementation of the plan.

A technically competent and appropriately trained C&D Waste Officer will be appointed by the Project Manager. The nominated person will be responsible for all aspects waste management throughout the different stages of the project including waste assessment

and characterisation, implementation of the CDWMP (and associated target recycling rates), and effective communication of the objectives with all the operatives associated with the project (including site staff, external contractors and suppliers). The C&D Waste Officer shall be responsible for the management of the construction waste compound.

A key objective of the nominated person will be the maintenance of accurate records on the quantities of waste / surplus materials generation and management. The recording of summary information will further assist the implementation of the plan.

6.0 CONSTRUCTION WASTE MANAGEMENT & DISPOSAL

- It is proposed that from the outset of construction activities, a dedicated and secure compound containing bins, and/or skips, and storage areas, into which all waste materials generated by construction site activities, will be established within the active construction phase of the development site.

- Spill kits shall be located within the waste compound with clearly labelled instructions on how they shall be used to clean up fuel/oil spills.

- All vehicle and plant oils and liquid construction materials shall be stored in impermeable storage units.

- All diesel-powered generators shall be inspected on at least a weekly basis by a delegate of the project manager to ensure it is not leaking diesel or oils.

- All empty containers containing residual quantities of oils, greases and hydrocarbon-based liquids shall be stored in a dedicated bunded receptacle in the waste compound.

- In order to ensure that the construction contractor correctly segregate waste materials, it is the responsibility of the C&D waste officer to ensure all staff are informed by means of clear signage and verbal instruction and made responsible for ensuring site housekeeping and the proper segregation of construction waste materials.
- It will be the responsibility of the C&D waste officer to ensure that a written record of all quantities and natures of wastes exported off-site are maintained on-site in a Waste File at the Project office.

- It is the responsibility of the C&D waste officer that all contracted waste haulage drivers hold an appropriate Waste Collection Permit for the transport of waste loads and that all waste materials are delivered to an appropriately licenced or permitted waste facility in compliance with the following relevant Regulations:

  Waste Management (Collection Permit) Regulations 2007 (SI No. 820 of 2007)
  Waste Management (Collection Permit) Amendment Regulations 2008 (SI No. 87 of 2008)

Waste Management (Facility Permit and Registration) Regulations S.I.821 of 2007 and the Waste Facility Permit under the Waste Management (Facility Permit and Registration) Amendment Regulations S.I.86 of 2008.

- Typical Waste materials that are to be generated or anticipated to be generated by construction works are classified as follows under *Section 17 Construction and Demolition Wastes* of the European Waste Catalogue (EWC) as detailed in Table 4.

- It is proposed that waste materials will be collected and stored in separate clearly labelled skips in a predefined waste storage area in the site compound and that these materials will be collected by a Permitted Waste Contractor holding an appropriate Waste Collection permit in compliance with *Waste Management (Collection Permit) Regulations 2007 (SI No. 820 of 2007) and Waste Management (Collection Permit) Amendment Regulations 2008 (SI No. 87 of 2008)* and that they will be sent for disposal or further processing to appropriately Permitted / Licensed Waste Facilities in compliance with *Waste Management (Facility Permit and Registration) Regulations S.I. No. 821 of 2007 and the Waste Management (Facility Permit and Registration) Amendment Regulations S.I. No. 86 of 2008.*

- Prior to the commencement of the Project, the C&D waste officer shall identify a permitted Waste Contractor who shall be employed to collect and dispose of all inert and hazardous wastes arising from the project works. In addition, the C&D waste manager shall identify all waste licensed / permitted facilities that will accept all expected waste exported off-site and will maintain copies of all relevant Waste Permits / Licences as required.

- All waste soils prior to being exported off-site, shall be classified as inert, non-hazardous or hazardous in accordance with the *EPA's Waste Classification Guidance – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* document dated 1st June 2015 to ensure that the waste material is transferred by an appropriately permitted waste collection permit holder and brought to an appropriately permitted or licensed waste facility.

Construction Waste Compound Design

A dedicated and secure construction waste storage compound shall be located adjacent to the site offices. The C&D Waste Manager shall be responsible for the management of the construction waste compound. The area shall be demarcated by fencing and shall be of sufficient size to house a minimum of 4 x 20 cubic yard roll on roll off skips for construction waste materials and 1 x 14 cubic yard covered skip for mixed municipal wastes generated by site staff.

All subcontractors shall be instructed by the C&D Waste Officer to remove their waste off-site from their work areas on a daily basis

Signage shall be installed at each skip to clearly identify the nature of waste that may be placed within it.

Spill kits and mobile bunds as shown in Figures 3 & 4 will located within the waste compound.

Figure 2 Typical construction waste segregation compound design

Individual construction waste skips shall accommodate waste wood, metal, plastics, gypsum products.

Figure 3 Oil Spill Kit

Figure 4 Bund for waste oil container storage

7.0 ON-SITE WASTE REDUCTION REUSE RECYCLING AND MANAGEMENT

Waste will arise on the project mainly from bulk excavation and general construction activities and site infrastructure construction. The site management team will order materials and arrange storage in order to minimise the potential for waste on site.

- Materials will be ordered on an *"as needed"* basis to prevent over supply
- Materials shall be correctly stored and handled to minimise the generation of damaged materials
- Materials shall be ordered in appropriate sequence to minimise materials stored on site
- All staff and Sub contractors shall be advised through tool box talks on how to dispose of their waste correctly on-site.
- Sub-Contractors will be instructed to remove off-site all waste generated from their activities on a daily basis.
- Concrete blocks, engineering bricks and clay bricks that are surplus will be broken up and used for hardstanding areas.
- Excess wood will be segregated in separate skips and sent for recycling. The site management will police to make sure that the segregation of the wood skip is kept exclusively for wood.
- Plastic arising from general waste or packaging will be segregated and stored in separate skips. Again, the site management team will ensure that there is no contamination of the segregated skips on site.
- Top soil that is required for the soft landscaping will be measured and this quantity will be retained on site. The soil that will have to be removed off site will be removed to a licenced landfill facility. The C&D Waste Manager. will keep records of the removal and the certification on file on site.
- Any hazardous material discovered during the course of the construction shall be reported to the C&D Waste Manager. The relevant authorities will be informed and an agreed method for the removal of the hazardous material.
- Construction waste material such as damaged or broken concrete slabs, blocks, bricks and tiles generated that is deemed by the Project Engineer to be suitable for reuse on the Project site for ground-fill material will be processed if necessary, by on-site mobile crushing plant. This initiative shall provide a positive environmental impact to the construction phase as follows:
  - Reduction in the requirement for virgin aggregate materials from quarries
  - Reduction in energy required to extract, process and transport virgin aggregates

- Reduced HGV movements associated with the delivery of imported aggregates to the site
- Reduced noise levels associated with reduced HGV movements
- Reduction in the amount of landfill space required to accept C&D waste

Waste Soils & Stones

The Project Engineers, Barret Mahony Consulting Engineers, have estimated that c. 30,000m^3 of soils will be excavated to depths between 4.5m – 7m to facilitate the development and exported from the site.

It is predicted that up to 4,500m^3 of soils shall be retained for landscaping works.

Soils at the site have been classified following WAC testing by Ground Investigations Ireland and the completion of a Waste Classification Assessment. The **Waste Classification Report & Subsoil Assessment** is included as Appendix III to this report.

The scope of the work undertaken to facilitate the waste classification exercise included the following:

- Excavation of twelve (12 No.) trial pits;
- Collection of subsoil samples for chemical analysis;
- Environmental laboratory testing;
- Waste classification; and
- By-product suitability assessment.

In order to assess materials, which may be excavated from site, in terms of waste classification, a selection of samples collected were analysed for a suite of parameters which allows for the assessment of the soils in terms of total pollutant content for classification of materials as hazardous or non-hazardous (RILTA Suite). The suite also allows for the assessment of the soils in terms of suitability for placement at various categories of landfill.

The suite was selected due to no evidence of specific contaminants of concern highlighted in the site history. The laboratory testing was competed by Element Materials Technology (EMT) in the UK; EMT is a UKAS accredited laboratory. The soil classification of the Waste Classification Report & Subsoil Assessment is included in Appendix III.

In total, thirty (30 No.) samples were assessed using the HazWasteOnLineTM Tool. The location of the trial pits are illustrated in the Figure below.

Figure 1 Location of Trial Pits

The assessment concluded that on-site soils are classified with LoW Code 17 05 04 may be classified as non-hazardous and are defined as a Category A Criteria as follows. Soil and Stone only which are free from anthropogenic materials such as concrete and timber. Soils must be free from "contamination" e.g. PAH's, Hydrocarbons and Asbestos. Category A material can be disposed/recovered at unlined soil recovery facilities.

By-product Suitability (Article 27 Declarations)

Based on the analysis of the samples collected from the on-site excavations the material sampled is free of contamination. The material sampled was comprised of natural subsoils which were free of anthropogenic materials. Following an appraisal of the chemical analysis and the absence of anthropogenic materials the subsoils sampled are suitable for removal from site as a by-product which *will not lead to overall adverse environmental or human health impacts*.

Based on the WAC analysis, it is intended to declare the excavated soils a by-product to the EPA in accordance with Article 27 of the European Communities (Waste Directive) Regulations 2011 and the EPA publication "Guidance on Soil and Stone By-Products in the context of Article 27 of the European Communities (Waste Directive) Regulations – Version 3 June 2019.

The notification of a potential by-product gives industry an opportunity to demonstrate, with an appropriate level of rigour, that:

- the material can have a further use and no longer be defined as waste;
- the material can be used as a 'secondary' resource in place of, and fulfilling the same role as a non-waste derived or virgin 'primary' resource; and
- the material can be used without causing overall adverse impacts to the environment or human health.

The by-product test is made up of four conditions, which represent the requirements of Article 27. All four of the following 'conditions' must be met for an economic operator to decide that a production residue is a by-product:

1. further use of the material is certain;
2. the material can be used directly without any further processing other than normal industrial practice;
3. the material is produced as an integral part of a production process; and
4. further use is lawful in that the substance or object fulfils all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

Based on the type of material to be excavated i.e. virgin soils, the fact that it is being excavated to facilitate the proposed development and the results of the WAC analysis, conditions 2-4 above are met.

Regarding Condition 1, at this stage, it is too early to identify a specific site where the material would be used. This is because, it is necessary first to secure planning permission to have certainty regarding the availability of the by-product and only then can a further use be identified. However, having regard to the scale of development taking place in Dublin, it is reasonably expected that there will be projects seeking to avail of this by-product. The selected location will be identified in the notification to the EPA.

Having regard to the WAC analysis, it is deemed unlikely that the excavated soils would be rejected by the EPA as a by-product. Notwithstanding, should this situation arise the excess soils would be exported for authorised recovery. All construction waste and soils will only be exported to authorised waste facilities holding a valid Waste Licence, Waste Facility Permit or a Certificate of Registration.

Construction waste material will be exported of site by the following permitted waste collection contractors and shall be transferred to the following facilities:

Waste Soils Carrier Shannon Valley NWCPO-15-11613-01
Receiving Soils Facility Shannon Valley, Ballynamona, Summerhill, Co. Meath.
Waste Facility Permit MH-19-0003-02

General Construction Waste Carrier Thorntons Waste Collection Permit NWCPO-09-01190-05
Receiving Facility Thorntons Recycling Centre, Kileen Road, Dublin 10
Waste Licence W0044-02

Invasive Species
Species listed on the Third Schedule of S.I. 477/2011 (as amended)
Chapter 11, Biodiversity is contained within Volume II of the EIAR. A survey for invasive species was undertaken by the project ecologists, Scott Cawley. It identified that there are none present on site. It is not intended to import soils to the site as part of the proposed development and accordingly there is no risk of importing invasive species.

8.0 WASTE RECORD KEEPING

It is the responsibility of the C&D Waste Officer that a written record of all quantities and natures of all wastes reused / recycled and exported off-site during the project are maintained in a Waste File at the Project office.

The following information shall be recorded for each load of waste exported off-site:

- Waste Type EWC Code and description.
- Volume of waste collected.
- Waste collection contractor's Waste Collection Permit Number and collection receipt including vehicle registration number.
- Destination of waste load including Waste Permit / Licence number of facility.
- Description of how waste at facility shall be treated i.e. disposal / recovery / export
- Details of all Article 27 declarations

The waste records shall be issued to Fingal County Council as required / requested.

Where practicable, a computerised monitoring tool may be employed. This system will enable the Contractor to measure and record the quantity of waste generated, and identify possible savings on wastage. Thus, each consignment of C&D waste taken from site will be subject to documentation and recording. An indicative template is contained in Appendix II to ensure that full traceability of materials to its final destination.

Verifiable and validated tracking and authorisation documentation will be maintained for all wastes destined for re-use, recovery, recycling or disposal. Justification will also be provided where a disposal option had been employed.

9.0 CONSTRUCTION WASTE MANAGEMENT AUDITING

The effectiveness of a Waste Management Plan (WMP) and its implementation, will be subject to regular audits by the C&D Waste Officer throughout the duration of the project in accordance with the Audit Plan (to be developed during the works).

The regular audits will focus on materials inputs to the project and the waste outputs for each operation identifying additional opportunities for waste reduction, re-use and recycling.

The audits will also investigate the operational factors and management policies that contribute to the generation of waste and identify appropriate corrective actions, where necessary.

Performance targets will be developed, e.g. an 85% overall recycling target, successes and failures will be recorded and Action Plans will be developed to address any issue which arise.

Inspections of the waste storage areas will be undertaken on a weekly basis, issues relating to housekeeping, inappropriate storage and / or segregation will be actioned at the earliest practicable opportunity.

The C&D Waste Officer will record the findings of the audits, including waste types identified, quantities of waste arising, final treatments and cost, in a report to be available to the Local Authority as required during the course of the works.

Details of the inputs of materials to the construction site and the outputs of wastage arising from the project will be investigated and recorded in the Final Waste Audit, which will identify the amount, nature and composition of the waste generated on the site.

The Final Waste Audit will examine the manner in which the waste is produced and will provide a commentary highlighting how management policies and practices may inherently contribute to the production of construction and demolition waste.

The measure waste quantities will be used to qualify the costs of management and disposal in a Waste Audit Report, which will also record lessons learned from these experiences, which can be applied to future projects.

10.0 WASTE EXPORT PERMITS/LICENCES

It is the responsibility of the C&D Waste Officer that a written record of all quantities and natures of all wastes reused / recycled and exported off-site during the project are maintained in a Waste File at the Project office.

The groundworks contractor will be responsible for the excavation of soils and their subsequent transport off-site to a permitted waste acceptance facility.

The groundworks contractor's vehicles exporting material off-site will operate under a valid Waste Collection Permit.

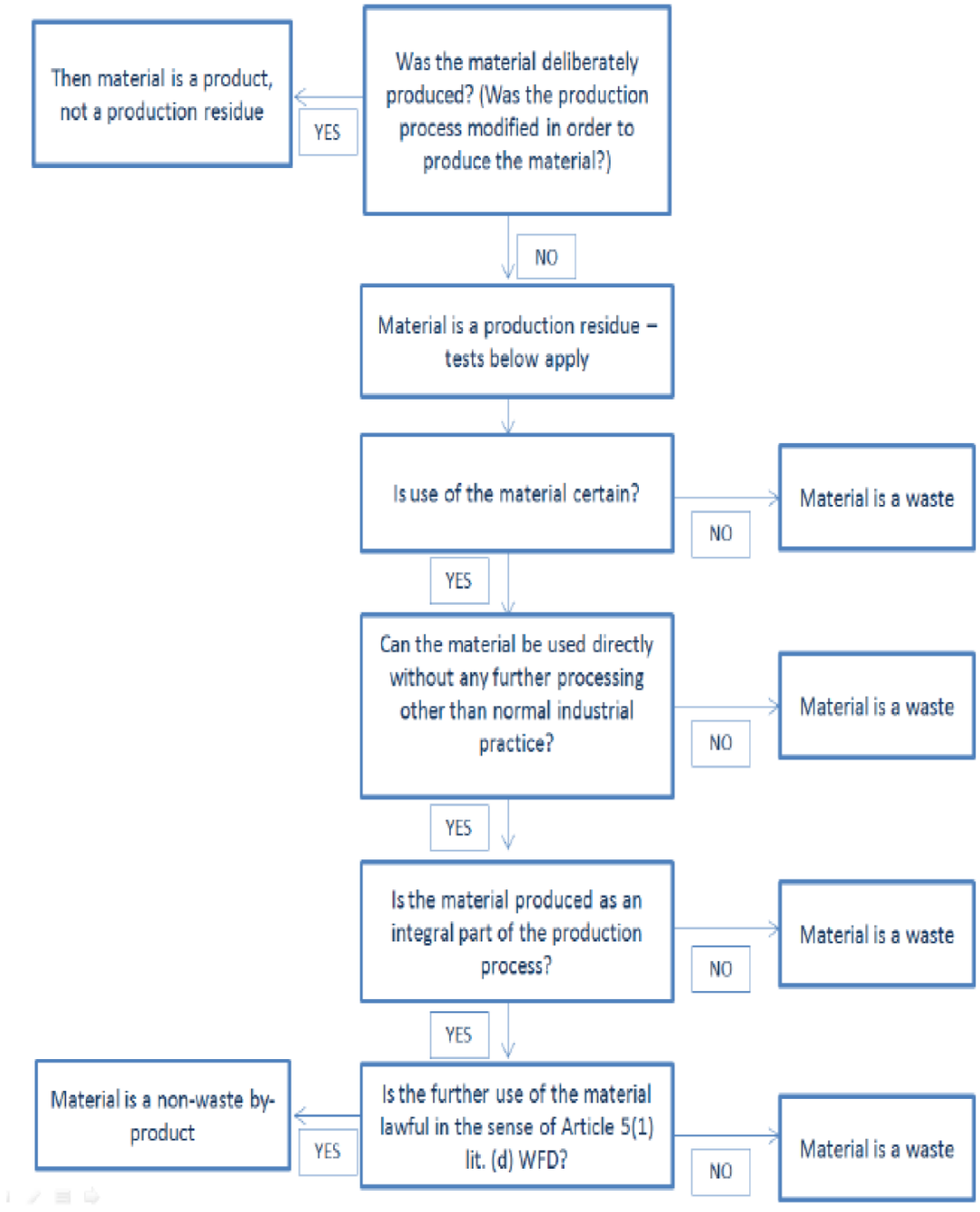
The groundworks contractor's vehicles shall transport waste materials from the site to appropriately permitted / licenced facilities.

Copies of all relevant Waste Collection Permits and Waste Facility Permits / Waste Licences shall be maintained by the C&D Waste Officer and are detailed below in Appendix I.

All monthly waste logs shall include the gate receipt from the facility accepting the waste load. This receipt shall correspond with the load removed from site.

Appendix I

Decision tree for determining whether a material is a by-product



APPENDIX II

Exported waste off-site Monthly Log

Date	Haulier	Waste Collection Permit #	Vehicle Reg	Waste Description	LoW Code	Load Size (tonnes)	Facility to which waste sent	Facility Waste Permit / Licence Number	Waste Receipt Filed Y / N	Waste Descriptions	LoW Code
				Soil and Stones	17 05 04					17 05 04	Soils and Stones other than those mentioned in 17 05 03
										17 01 07	Mixture of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
										17 01 01	Concrete
										17 01 02	Brick
										17 01 03	Tiles and Ceramics
										13 02 08*	Engine, gear and lubricating oils
										16 01 07	Ferrous Metal
										20 03 01	Mixed municipal waste (Canteen)
										17 02 01	Wood
										17 02 02	Glass
										17 02 03	Plastic
										17 04 07	Mixed Metals
										17 08 02	Gypsum based construction materials
										NOTE	This list is not final and shall be expanded as wastes are generated

APPENDIX III

GII Waste Classification Report and Subsoil Assessment

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Ground Investigations Ireland

Howth Road

Glenveagh Properties PLC

Waste Classification Report and Subsoil Assessment

January 2020

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DOCUMENT CONTROL SHEET

Project Title	Howth Road
Engineer	Barrett Mahoney Consulting Engineers
Client	Glenveagh Properties PLC
Project No	9298-12-19
Document Title	Subsoils Assessment and Waste Classification Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	P Moloney	B Sexton	B Sexton	Dublin	09 January 2020

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client. The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

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APPENDICES

1.0 Preamble

Ground Investigations Ireland (GII) was appointed by Barrett Mahony Consulting Engineers (BMCE) on behalf of Glenveagh Properties PLC (Glenveagh) to carry out a Waste Classification and Subsoil Assessment for a proposed residential development in Howth, Dublin 13. All site investigation works were carried out under the supervision of a GII Geo-Environmental Engineer. The site investigation works were completed in December 2019.

2.0 Purpose & Scope

It is understood that as part of the proposed development there will an excavation to accommodate a basement structure and as such the material which may be excavated and removed from site needs to be assessed in terms of waste disposal outlets or re use.

The purpose of the waste classification subsoil assessment exercise was as follows.

- Classification, in terms of waste management and final disposal outlets, of material that may require disposal following excavation during the construction phase; and
- Assess the materials suitability in terms of subsoil quality and potential environmental impact for removal from site as a by-product.

The scope of the work undertaken to facilitate the waste classification exercise included the following:

- Excavation of twelve (12 No.) trial pits;
- Collection of subsoil samples for chemical analysis;
- Environmental laboratory testing;
- Waste classification; and
- By-product suitability assessment.

3.0 Limitations

GII has prepared this report for the sole use of Glenveagh. No other warranty, express or implied, is made as to the professional advice included in this report or other services provided by GII.
The conclusions and recommendations contained in this report are based upon information provided by others and the assumption that all relevant information has been provided by those bodies from whom it has been requested. Information obtained from third parties has not been independently verified by GII, unless otherwise stated in this report.
This report has been prepared in line with best industry standards and within the project's budgetary and time constraints. The methodology adopted and the sources of information used by GII in providing its services are outlined in this report.

The work described was undertaken in December 2019, this report is based on the conditions encountered and the information available during that period. The scope of this Report and the services are accordingly factually limited by these circumstances.
GII disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to GII's attention after the date of the Report.
The conclusions presented in this report represent GII's best professional judgement based on review of site conditions observed during any site visit and the relevant information available at the time of writing. The opinions and conclusions presented are valid only to the extent that the information provided was accurate and complete.
The investigation was focused on a broad assessment of the subsoil quality across the site. The assessment did not extend to the identification of asbestos containing materials associated with any on-site structures, ground gases or groundwater.
The waste classification exercise is reflective of and applicable to the ground conditions on site at the time of the site investigation and sampling. Alterations to the ground conditions or any further excavations carried out on site following the investigation are not reflected in this report.

4.0 Site Location and Layout

The site is located on the southern side of Howth Road between Sutton Village and Howth Village (Figure 1 Appendix 1). At the time of the assessment the site was an open grassed field and was not in use. The lands to the south and east were occupied by a golf course. The site is bounded to the north by the Howth Road and housing to the west.

5.0 Site History

GII reviewed the aerial photographs and historical maps maintained by the Ordnance Survey of Ireland (OSI) and the google imagery records (Figure 2 to 4). These included the 6-inch maps that were produced between 1829 and 1842, the 25-inch maps that were produced between 1888 and 1913 and the 6-inch Cassini Maps that were produced between the 1830's and 1930's. The site is undeveloped on all historical maps. The site is in its current use on all reviewed historical aerial photographs.

6.0 Subsurface Exploration

6.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

6.2. Trial Pits

The trial pits were excavated using a JCB 3CX excavator at the locations shown in Figure 5. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

7.0 Ground Conditions

7.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil
- Cohesive Deposits

TOPSOIL: Topsoil was encountered in all the exploratory holes and was present to a maximum depth of 0.4m BGL.

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Topsoil and were described typically as *brown slightly sandy slightly gravelly CLAY with occasional subangular to subrounded cobbles*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

7.2. Groundwater

Groundwater was encountered in three locations TP-01, 05 and 12 at depths of 2.8m, 3.0m and 3.2m BGL respectively. The recorded groundwater inflows were minor. It should be noted that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors.

7.3. Laboratory Testing

In order to assess materials, which may be excavated from site, in terms of waste classification, a selection of samples collected were analysed for a suite of parameters which allows for the assessment of the soils in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous* (RILTA Suite). The suite also allows for the assessment of the soils in terms of suitability for placement at various categories of landfill. The parameter list for the RILTA suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The RILTA suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are pH, total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

In line with the requirement of Council Decision 2003/33/EC a leachate was generated from the solid samples which was in turn analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS). The suite was selected due to no evidence of specific contaminants of concern highlighted in the site history. The laboratory testing was competed by Element Materials Technology (EMT) in the UK; EMT is a UKAS accredited laboratory. The full laboratory report is included in Appendix 3.

8.0 Asbestos

Asbestos fibres were **not** detected in the samples. The laboratory did **not** identify asbestos containing materials (ACMs) in the samples.

9.0 Waste Classification

GII understands that any materials which may be excavated from site would meet the definition of waste under the Waste Framework Directive. This may not be the case at the time of excavation when all or some of the materials may have been declared a by-product in line with Article 27 of the European Communities (Waste Directive) Regulations 2011[1].

Excess soil and stone resulting from excavation works (the primary purpose of which is not the production of soil and stone) may be declared a by-product if all four by-product conditions are met.[2]

[1] S.I. No. 126/2011 - European Communities (Waste Directive) Regulations 2011 (Article 27).
[2] Irish EPA (June 2019), Guidance on Soil and Stone By-Products.

a) further use of the soil and stone is certain;

b) the soil and stone can be used directly without any further processing other than normal industrial practice;

c) the soil and stone is produced as an integral part of a production process; and

d) further use is lawful in that the soil and stone fulfils all relevant requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

Due to the varying levels of anthropogenic materials encountered in the made ground there are potentially two sets of List of Waste (LoW)[3] codes with "mirror" entries which may be applied to excavated materials to be removed from site.

1. 17-05-03* (soil and stone containing dangerous substances, classified as hazardous) or 17-05-04 (soil and stone other than those mentioned in 17-05-03, not hazardous); or
2. 17-09-03* (other construction and demolition wastes (including mixed wastes) containing hazardous substances) or 17-09-04 (mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03).

Where waste is a mirror entry in the LoW, it can be classified via a process of analysis against standard criteria set out in the Waste Framework Directive. The assessment process is described in detail in guidance published by the Irish (EPA Waste Classification, List of Waste & Determining if Waste is Hazardous or Non-Hazardous, June 2015) and UK regulatory authorities (Guidance on the Classification and Assessment of Waste: Technical Guidance WM3, 2015). The assessment involves comparison of the concentration of various parameters against defined threshold values.

The specific LoW code which should be applied to the material at each sample location is summarised in Table 1 below. These codes are only applicable where the material is being removed for site as a waste.

GII use HazWasteOnline™, a web-based commercial waste classification software tool which assists in the classification of potentially hazardous materials. This tool was used to determine whether the materials sampled are classified as hazardous or non-hazardous. The use of the online tool is accepted by the EPA (EPA 2014).

The conclusions presented in the report are based on GII's professional opinion. **It should be noted that the environmental regulator (in this case the EPA) and the waste acceptor (in this case a landfill operator) shall decide whether a waste is hazardous or non-hazardous and suitable for disposal at their facility.**

[3] Formerly European Waste Catalogue Codes (EWC Codes)

10.0 HazWasteOnLine™ Results

In total, thirty (30 No.) samples were assessed using the HazWasteOnLine™ Tool. All samples were classified as being non-hazardous. The complete HazWasteOnLine™ report for all samples is included in Appendix 4.

The specific LoW code which should be applied to the material at each SI location is summarised in Table 1 below. The assigning of the LoW code is based on observations recorded in the trial pits, an estimation of the % of anthropogenic material present and the results of the HazWasteOnline™ output. The final LoW codes applied at the time of disposal may vary due to variations in % of anthropogenic material observed in the excavation phase. Where there is in excess of 2%[4] anthropogenic material observed the LoW code 17 09 04 may be applied.

Table 1 LoW Codes

SI Location	Depth (m)	Hazardous/Non-Hazardous	Asbestos Type if Present	LoW Code
TP-01	0.00-1.00	Non-Hazardous	NAD[5]	17 05 04
TP-02	0.00-1.00	Non-Hazardous	NAD	17 05 04
TP-02	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-02	2.00-3.00	Non-Hazardous	NAD	17 05 04
TP-03	0.00-1.00	Non-Hazardous	NAD	17 05 04
TP-03	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-04	0.00-1.00	Non-Hazardous	NAD	17 05 04
TP-05	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-05	2.00-3.00	Non-Hazardous	NAD	17 05 04
TP-05	3.00-3.50	Non-Hazardous	NAD	17 05 04
TP-06	0.00-1.00	Non-Hazardous	NAD	17 05 04
TP-06	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-06	2.00-3.10	Non-Hazardous	NAD	17 05 04
TP-07	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-07	2.00-3.00	Non-Hazardous	NAD	17 05 04
TP-07	3.00-3.30	Non-Hazardous	NAD	17 05 04
TP-08	0.00-1.00	Non-Hazardous	NAD	17 05 04
TP-08	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-09	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-09	2.00-3.00	Non-Hazardous	NAD	17 05 04
TP-09	3.00-3.30	Non-Hazardous	NAD	17 05 04
TP-10	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-10	2.00-3.00	Non-Hazardous	NAD	17 05 04
TP-10	3.00-3.20	Non-Hazardous	NAD	17 05 04
TP-11	1.00-2.00	Non-Hazardous	NAD	17 05 04

[4] EPA (2017) - Draft Guidance Note on Soil Recovery Waste Acceptance Criteria.
[5] NAD – no asbestos detected.

SI Location	Depth (m)	Hazardous/Non-Hazardous	Asbestos Type if Present	LoW Code
TP-11	2.00-3.00	Non-Hazardous	NAD	17 05 04
TP-11	3.00-3.40	Non-Hazardous	NAD	17 05 04
TP-12	0.00-1.00	Non-Hazardous	NAD	17 05 04
TP-12	1.00-2.00	Non-Hazardous	NAD	17 05 04
TP-12	2.00-3.00	Non-Hazardous	NAD	17 05 04

11.0 Landfill Waste Acceptance Criteria

Waste Acceptance Criteria (WAC) have been agreed by the EU (Council Decision 2003/33/EC) and are only applicable to material if it is to be disposed of as a waste at a landfill facility. Each individual member state and licensed operators of landfills may apply more stringent WAC. WAC limits and the associated laboratory analysis are not suitable for use in the determination of whether a waste is hazardous or non-hazardous. The data have been compared to the WAC limits set out in Council Decision 2003/33/EC as well as the specific WAC which the EPA have applied to the Integrated Materials Solutions (IMS) Landfill in north County Dublin. The IMS landfill has higher limits for a range of parameters while still operating under an inert landfill licence. The WAC data considered in combination with the waste classification outlined in Section 12.0 allows the most suitable waste category to be applied to the material tested. The applicable waste categories are summarised in Table 2. A summary of the WAC data is presented in Appendix 5. The waste category assigned to each sample is summarised in Table 3.

Table 2 Waste Category for Disposal/Recovery

Waste Category	Classification Criteria
Category A Unlined Soil Recovery Facilities	Soil and Stone only which are free from[6] anthropogenic materials such as concrete, brock timber. Soil must be free from "contamination" e.g. PAHs, Hydrocarbons.
Category B1 Inert Landfill	Reported concentrations within inert waste limits, which are set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002). Results also found to be non-hazardous using the HWOL[7] application.
Category B2 Inert Landfill	Reported concentrations greater than Category B1 criteria but less than IMS Hollywood Landfill acceptance criteria, as set out in their Waste Licence W0129-02. Results also found to be non-hazardous using the HWOL application.

[6] Free from equates to less than 2%.
[7] HazWasteOnLine™ Tool.

Category C Non-Haz Landfill	Reported concentrations greater than Category B criteria but within non-haz landfill waste acceptance limits set out by the adopted EU Council Decision 2003/33/EC establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 and Annex II of Directive 1999/31/EC (2002). Results also found to be non-hazardous using the HWOL application.
Category C 1 Non-Haz Landfill	As Category C but containing < 0.001% w/w asbestos fibres.
Category C 2 Non-Haz Landfill	As Category C but containing >0.001% and <0.01% w/w asbestos fibres
Category C 3 Non-Haz Landfill	As Category C but containing >0.01% and <0.1% w/w asbestos fibres.
Category D Hazardous Treatment	Results found to be hazardous using HWOL Application.
Category D 1 Hazardous Disposal	Results found to be hazardous due to the presence of asbestos (>0.1%).

12.0 Final Waste Categorisation

All samples were assessed in terms of waste classification using the HazWasteOnLine™ tool and also the WAC set out in Council Decision 2003/33/EC and the IMS specific WAC to give a final waste categorisation to determine the most appropriate disposal route for any waste generated. The final and most applicable waste category for each sample is summarised in Table 3.

Table 3 Individual Sample Waste Category

Sample ID	Sample Depth (m)	Material Type	Waste Category	LoW Code
TP-01	0.00-1.00	Clay	A	17 05 04
TP-02	0.00-1.00	Clay	A	17 05 04
TP-02	1.00-2.00	Clay	A	17 05 04
TP-02	2.00-3.00	Clay	A	17 05 04
TP-03	0.00-1.00	Clay	A	17 05 04
TP-03	1.00-2.00	Clay	A	17 05 04
TP-04	0.00-1.00	Clay	A	17 05 04
TP-05	1.00-2.00	Clay	A	17 05 04
TP-05	2.00-3.00	Clay	A	17 05 04
TP-05	3.00-3.50	Clay	A	17 05 04
TP-06	0.00-1.00	Clay	A	17 05 04
TP-06	1.00-2.00	Clay	A	17 05 04
TP-06	2.00-3.10	Clay	A	17 05 04
TP-07	1.00-2.00	Clay	A	17 05 04
TP-07	2.00-3.00	Clay	A	17 05 04

Sample ID	Sample Depth (m)	Material Type	Waste Category	LoW Code
TP-07	3.00-3.30	Clay	A	17 05 04
TP-08	0.00-1.00	Clay	A	17 05 04
TP-08	1.00-2.00	Clay	A	17 05 04
TP-09	1.00-2.00	Clay	A	17 05 04
TP-09	2.00-3.00	Clay	A	17 05 04
TP-09	3.00-3.30	Clay	A	17 05 04
TP-10	1.00-2.00	Clay	A	17 05 04
TP-10	2.00-3.00	Clay	A	17 05 04
TP-10	3.00-3.20	Clay	A	17 05 04
TP-11	1.00-2.00	Clay	A	17 05 04
TP-11	2.00-3.00	Clay	A	17 05 04
TP-11	3.00-3.40	Clay	A	17 05 04
TP-12	0.00-1.00	Clay	A	17 05 04
TP-12	1.00-2.00	Clay	A	17 05 04
TP-12	2.00-3.00	Clay	A	17 05 04

13.0 By-Product Suitability

Based on the analysis of the samples collected from the on-site excavations the material sampled is free of contamination (PAHs, TPH, asbestos etc.). The material sampled was comprised of natural subsoils which were free of anthropogenic materials. Following an appraisal of the chemical analysis and the absence of anthropogenic materials the subsoils sampled are suitable for removal from site as a by-product which will *not lead to overall adverse environmental or human health impacts*. If the material is to be removed as a by-product then the producer of the by-product must demonstrate that all four criteria outlined in Section 9 have been satisfied.

14.0 Conclusions & Recommendations

The conclusions and recommendations given and opinions expressed in this report are based on the findings of the site investigation works and laboratory testing undertaken. Where any opinion is expressed on the classification of material between site investigations locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the findings at the site investigation locations.

14.1. Conclusions

14.1.1. Waste Classification

Based on the results of the HazWasteOnLine™ tool the material sampled across the site can be classified as non-hazardous.

14.1.2. Waste Categories

The most applicable waste category for each of the samples has been presented in Table 3, in all cases the samples have been classified as Category A indicating that the subsoils across the site if excavated and removed for disposal can be considered to be Category A.

14.1.3. Asbestos

Asbestos was **not** detected in the soil samples.

14.1.4. By-Product Suitability

The material sampled is suitable for removal from site as a by-product which will *not lead to overall adverse environmental or human health impacts*.

14.2. Recommendations

14.2.1. Waste Transfer

In the event that material is excavated for removal from site, any firm engaged to transport waste material from site and the operator of any waste facility that will accept subsoils excavated from this site should be furnished with, at a minimum, copies of the **full unabridged** laboratory reports and HazWasteOnLine™ report for all samples presented in this report.

The material on site if excavated and removed as a waste it should be removed to the most appropriate facility under the waste categories and LoW codes identified in Table 3. Potential outlets for the various waste categories are presented in Appendix 6, this list is not exhaustive and applicable at the time of the writing this report.

The material across the site if excavated should be removed from site to an appropriate facility under either the LoW code 17 05 04 or 17 09 04. Where during excavation there is noted to be in excess of 2% anthropogenic material the appropriate LoW code which should be applied is 17 09 04. The most appropriate LoW code based on the site investigation observations and testing is 17 05 04.

14.2.2. Removal of Material as a By-Product

The material sampled is suitable from an environmental impact perspective for removal from site as a by-product in line with Article 27 of the European Communities (Waste Directive) Regulations 2011. The material may only be declared a by-product if all four by-product conditions are met.

a) further use of the soil and stone is certain;

b) the soil and stone can be used directly without any further processing other than normal industrial practice;

c) the soil and stone is produced as an integral part of a production process; and

d) further use is lawful in that the soil and stone fulfils all relevant requirements for the specific use and will not lead to overall adverse environmental or human health impacts.

15.0 References

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