PINNACLE
CONSULTING ENGINEERS

DB081

Outline Demolition & Construction Waste Management Plan

June 2021

EQUINIX

STRUCTURAL · CIVIL · DUE DILIGENCE · ENGINEERING MASTERPLANNING
FLOOD MANAGEMENT · INFRASTRUCTURE DESIGN
PRE-DEVELOPMENT ENGINEERING · BIM · TRANSPORTATION

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Approved by	**James Mayer**		Director	14/06/2021

VERSIONS

Number	By	Date	Context

CONTENT

1 INTRODUCTION

1.1 Summary

Equinix intent to apply for planning permission of a new Data hall on a site at the north east corner of Profile park, adjoining Falcon Way and Nangor Road

The proposed development shall comprise the following: -

Equinix (Ireland) Ltd. intend to apply for permission for development at this site of c.2.65ha on lands known as Plot 100, Profile Park, Nangor Road, Clondalkin, Dublin 22 (the site is bounded to the east and south by Grange Castle Golf Club, to the north by Nangor Road (R134) and to the west by an estate road known as Falcon Avenue). The development will consist of the following:

- Construction of a 3 storey (part 4 storey) data centre known as "DB8" to include data halls, electrical/plant rooms, offices, lobbies, ancillary staff areas including break rooms and toilets, stores, stair/lift cores throughout and photovoltaic panels at roof level. The total gross floor area excluding hot air plenums and external staircase is c.9,601sqm. The overall height of the data centre ranges from c.16m to c.20m to roof level and c.20m to c.24m including roof top plant, flues and lift overrun;
- Provision of 5 no. external generators, 8 no. fuel tanks and ancillary plant contained within a plant yard to the north of DB8;
- Provision of a water tank plant room, air cooled chillers and ancillary plant contained within a chiller plant yard to the south of DB8;
- Provision of a sprinkler pump room (c.23sqm), 2 no. sprinkler tanks (c.12m high each), heat recovery plant room (c.17sqm), ESB substation (c.44sqm), waste/bin stores (c.52sqm). Total floor area of ancillary structures and plant (c.303sqm);
- Provision of a delivery yard and loading bays, 64 no. car parking spaces, 5 no. motorcycle spaces, bicycle shelter serving 14 no. spaces, smoke shelter, internal access roads and footpaths, vehicular and pedestrian access to the west from Falcon Avenue and closure of existing vehicular entrances from Falcon Avenue;
- All associated site development works, services provision, drainage works including attenuation, landscape and boundary treatment works including berming, hedgerow protection areas and security fencing;
- No buildings are proposed above the existing ESB wayleave and SDCC watermain wayleave to the west and north of the site;
- The area to the south west of the site is reserved for a future data centre, subject of a separate application to South Dublin County Council;
- This application is accompanied by a Natura Impact Statement.

The purpose of this Outline Construction & Development Wate Management Plan (C&D WMP) is to ensure that waste arisings during the construction and demolition phase will be managed and disposed of in a way that ensures the provisions of the Waste Management Acts 1996 - 2008 and associated

Regulations and the Southern Region Waste Management Plan are complied with. It will also ensure that optimum levels of waste reduction, re-use and recycling are achieved.

1.2 Background

Compliance with this Waste Management Plan will ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible.

This Waste Management Plan also provides guidance on the appropriate collection and transport of waste from the site to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil and/or water).

This Waste Management Plan will have regard to national guidelines and policies:

- Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects, July 2006
- Construction and Demolition Waste Management – a handbook for Contractors and Site Managers – CIF/FAS (2002)
- CIRIA document 133 Waste Minimisation in Construction
- The Quality Protocol for the Production of Aggregates from Inert Waste
- A Resource Opportunity – Waste Management Policy in Ireland
- The guidelines outline the issues that need to be addressed at the pre-planning stage of a development, through to completion and are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

This CDWMP will include

- Predicted C&D wastes and procedures to prevent, minimise, recycle and reuse wastes.
- Waste disposal/recycling of C&D wastes at the site.
- Provision of training for waste manager and site crew.
- Details of proposed record keeping system.

• Details of waste audit procedures and plan.

• Details of consultation with relevant bodies i.e. waste recycling companies, Local Councils, etc

2 CONSTRUCTION & DEMOLITION WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Government issued a Policy Statement in September 1998, known as Changing Our Ways, which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this Strategy was to recycle at least 50% of C&D waste within a five-year period (by 2003), with a progressive increase to at least 85% over fifteen years (by 2013).

In response to the "Changing Our Ways" report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report titled 'Recycling of Construction and Demolition Waste' concerning the development and implementation of a voluntary construction industry programme to meet the governments objectives for the recovery of construction and demolition waste.

The National Construction and Demolition Waste Council (NCDWC) was launched in June 2002, as one of the recommendations of the Forum for the Construction Industry, in the Task Force B4 final report. The NCDWC subsequently produced Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects in July 2006 in conjunction with the Department of the Environment, Heritage and Local Government. There are threshold criteria set out in the Guidelines to determine whether a C&D WMP is required. The development requires a C&D WMP under the following criterion:

- New developments with an aggregate floor area in excess of 1,250 m2;
- Demolition/renovation/refurbishment projects generating in excess of 100m3 in volume, of C&D waste

The Guidelines outline the issues that need to be addressed at the pre-planning stage of a development all the way through to its completion. These Guidelines have been followed in the preparation of this document and include the following elements:

- Predicted demolition & construction wastes and procedures to prevent, minimise, recycle and reuse wastes;
- Waste disposal/recycling of C&D wastes at the site;
- Provision of training for waste manager and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan;
- Details of consultation with relevant bodies, i.e. waste recycling companies; and
- Dublin City Council, etc.

Other guidelines followed in the preparation of this report include the "Construction and Demolition Waste Management – a handbook for Contractors and Site Managers" published by FÁS and the Construction Industry Federation (2002).

Comprehensive reports regarding the quantities of C&D waste produced in Ireland have been compiled by the Environmental Protection Agency (EPA). National Waste (Database) Reports detailing, among

other things, C&D generation and the level of recycling, recovery and disposal of this material, provide estimates based on information from waste companies and contractors.

2.2 Regional Level

The proposed development is located in the Eastern Midlands Waste Region which covers the following councils:-

- Dublin City Council;
- Dun Laoghaire Rathdown County Council;
- Fingal County Council;
- South Dublin County Council;
- Kildare County Council;
- Louth County Council;
- Laois County Council;
- Longford County Council;
- Offaly County Council;
- Westmeath County Council;
- Meath County Council; and
- Wicklow County Council.

The Eastern Midlands Region Waste Management plan was published in 2015 and covers the period 2015-2021.

2.3 Legislative Requirements

One of the guiding principles of European waste legislation, which has in turn been incorporated into the Waste Management Act 1996 and subsequent Irish legislation, is the principle of "duty of care". This implies that the waste producer is responsible for waste from the time it is generated until its legal disposal (including its method of disposal). Following on from this is the concept of "polluter pays" whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for collection and transport of waste).

It is therefore imperative that the owners/managers of the site and any contractors engaged, undertake on and off-site management of waste in accordance with all legal requirements.

Waste contractors are typically engaged to transport waste off-site. Each contractor must comply with the provisions of the Waste Management Act 1996 (amended 2001) and associated Regulations. This includes the requirement that a contractor handle, transport and dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities. A collection permit to transport waste must be held by the relevant contractor, which is typically issued by the local authority where the majority of the contractors business takes place.

Waste receiving facilities must also be appropriately licensed/permitted. Operators of such facilities cannot legally receive any waste, unless in possession of a waste permit granted by the relevant local authority under the Waste Management (Facility Permit & Registration) Regulations 2007 or a waste

licence granted by the EPA. The permit/licence held will specify the type and quantity of waste that can be received, stored, sorted, recycled and/or disposed of at the specified site.

2.4 Regional Waste Management Service Providers and Facilities

Various private waste contractors offer waste collection services across the Eastern Midlands Waste Region. Details of waste collection permits (granted, pending and withdrawn) for the Region are contained within the Eastern Midlands Region Waste Management Plan.

The Eastern Midlands Region Waste Management Plan also sets out licensed waste management facilities and landfill sites across the region

3 DESCRIPTION OF PROJECT

3.1 Development Description

Equinix (Ireland) Ltd. intend to apply for permission for development at this site of c.2.65ha on lands known as Plot 100, Profile Park, Nangor Road, Clondalkin, Dublin 22 (the site is bounded to the east and south by Grange Castle Golf Club, to the north by Nangor Road (R134) and to the west by an estate road known as Falcon Avenue). The development will consist of the following:

- Construction of a 3 storey (part 4 storey) data centre known as "DB8" to include data halls, electrical/plant rooms, offices, lobbies, ancillary staff areas including break rooms and toilets, stores, stair/lift cores throughout and photovoltaic panels at roof level. The total gross floor area excluding hot air plenums and external staircase is c.9,601sqm. The overall height of the data centre ranges from c.16m to c.20m to roof level and c.20m to c.24m including roof top plant, flues and lift overrun;
- Provision of 5 no. external generators, 8 no. fuel tanks and ancillary plant contained within a plant yard to the north of DB8;
- Provision of a water tank plant room, air cooled chillers and ancillary plant contained within a chiller plant yard to the south of DB8;
- Provision of a sprinkler pump room (c.23sqm), 2 no. sprinkler tanks (c.12m high each), heat recovery plant room (c.17sqm), ESB substation (c.44sqm), waste/bin stores (c.52sqm). Total floor area of ancillary structures and plant (c.303sqm);
- Provision of a delivery yard and loading bays, 64 no. car parking spaces, 5 no. motorcycle spaces, bicycle shelter serving 14 no. spaces, smoke shelter, internal access roads and footpaths, vehicular and pedestrian access to the west from Falcon Avenue and closure of existing vehicular entrances from Falcon Avenue;
- All associated site development works, services provision, drainage works including attenuation, landscape and boundary treatment works including berming, hedgerow protection areas and security fencing;
- No buildings are proposed above the existing ESB wayleave and SDCC watermain wayleave to the west and north of the site;
- The area to the south west of the site is reserved for a future data centre, subject of a separate application to South Dublin County Council;
- This application is accompanied by a Natura Impact Statement.

3.2 Project Scope

Nature of Project: The development will involve the development of a disused and previously undeveloped site at the north east corner of Profile Park, Lucan, Co Dublin. The site has never been developed and comprises primarily of a stones up site with building rubble from surrounding site on the north east corner of the site. The site will be stripped and levelled to for a plateau for the building on the north of the site

Scope of Project:

- Removal of existing rubble and topsoil across the site
- Underground drainage;
- Excavation for the installation of new services and forming undercroft car park;
- Pouring of concrete structural elements;
- Blockwork rising walls;
- Cast insitu ground floor slabs and rising elements;
- Blockwork and brickwork rising elements;
- Pre-cast floors stairs and balconies;
- Aluminium windows and curtain walling; and
- Fit out of units

Contract Period: To be confirmed

Recycling Co-Ordinators: To be confirmed on appointment of main contractor

Recycling Contractor: A nominated and licenced recycling contractor.

Waste Handling Facility: Concrete, Soil and C& D general waste- A nominated and licenced waste handling facility.

Position	Name	Contract Details
Client	Park Shopping Centre Limited.	To be confirmed
Contractors Manager	To be confirmed on appointment of main contractor	To be confirmed
Waster Manager on Site	To be confirmed on appointment of main contractor	To be confirmed
Site Manager	To be confirmed on appointment of main contractor	To be confirmed

Table 1 Key Contacts

3.3 Waste Management Goal

This project aims to recycle, reuse or salvage the maximum as practically possible.

3.4 Diversion and Waste Prevention

Waste Materials fall into three categories for management, these are:

- Reduce
- Reuse
- Recycle

If surplus materials can be used in the permanent works they are classified as materials, which have been re-used. If they are surplus to requirements and need to be removed from site and they can be removed and used in their present form, they can be removed from site for re-use.

3.5 Recycling

If the surplus material cannot be re-used in its present form but could be used in a different form, it is sent for recycling such as 50x50 timber to make chipboard.

Waste will be minimized on-site by careful ordering of materials and scheduling of deliveries as required for use.

Any surplus materials which can be re-used will be stacked and stored for removal from site and re-use on other projects in their current form including undamaged timbers, clean unbroken blocks etc.

Some segregation of material will be carried out on site:

An area for skips will be formed and separate skips for the following will be provided

- Timber
- Metals
- Mixed waste
- Canteen waste – general and recyclable

Waste plastics and packaging compacting baler (owned by the Applicant or their agent) used for final segregation and baling of waste to allow for better utilization of skips.

Recycling and waste bins are to be kept clean and clearly marked in order to avoid contamination of materials.

As subcontractors commence works on site their waste will be reviewed and a separate skip will be provided should it be deemed appropriate e.g. Drylining plasterboard

All waste will be removed from site by an approved waste management contractor and brought to the nearest waste facility.

All C & D waste will be segregated at the waste facility for recycling and a breakdown of this waste will be provided from each company.

3.6 Contamination Prevention

A designated storage & waste are will be established on site where the skips will be located and a clear area provided for storage of materials suitable for re-use.

Skips will be clearly labelled to prevent cross contamination of waste. Applicant or their agent will have a colour coded skip management system for skips, e.g. yellow for plastics/packaging. red for timber, Blue for plasterboard etc.

Appropriately sized portable skips will be positioned in work areas for removal to the large skips. These skips will be clearly labelled to prevent cross contamination of waste

Canteens complete with bins for general waste and recyclable waste will be established on-site. Eating elsewhere will be prohibited in all other areas to prevent generation of food waste in other areas of the site.

3.7 Communication Measures

Pre-contract meetings will be held with subcontractors. As part of the agenda of these meetings project goals and requirements will be explained to ensure subcontractors fully understand their role in the achieving the least waste from the site. Waste prevention and recycling measures and expected waste materials for each individual contractor will be discussed and methodology of waste segregation and disposal agreed.

A copy of the construction waste management plan will be issued to all subcontractors.

Site Management will provide on-site briefing via induction on appropriate separation, handling, recycling, re-use and return methods to be used by all parties and at appropriate stages of the project where applicable. Toolbox talks will be carried out regularly on waste issues and all subcontractors will be expected to attend. This will ensure that everyone feels they are included and that their participation is meaningful.

Clear signage will be provided on skips indicating the type of waste permitted.

Site Management will monitor the effectiveness and accuracy during the routine site inspections.

4 WASTE ARISING AND PROPOSALS FOR MANAGING WASTE

4.1 Introduction

Waste will be segregated on site. The C&D WSA will have skips and receptacles for all recyclable wastes. The appointed waste contractor will collect and transfer the recyclable wastes as the receptacles are filled. The non-recyclable waste will be transferred to landfill. Numerous waste contractors in the Eastern Midlands Region are licenced to carry out this operation.

4.2 Bedrock, Blocks and Concrete

The majority of the waste C&D material will be clean, inert material and it is proposed to reuse it for construction purposes where possible.

Following desktop studies, it is unlikely that bedrock will be encountered during excavations. Any quantity generated will be re used on site where permissible.

4.3 Topsoil/ Subsoil

Topsoil and subsoil will be excavated to facilitate construction of the foundations and installation of underground services for the new build. Excess inert soils and subsoils excavated that are not required for use as fill on site will be disposed of or re-used offsite.

If the total amount of soil to be removed from the site will exceed 1,000 tonnes, the soil will be removed and disposed of by contractors licensed under the Waste Management Act of 1996 (as amended 2001), the Waste Management (Facility Permit & Registration) Regulations of 2007 and the Waste Management (Collection Permit) Regulations of 2007. The issuing of such a permit to contractors allows the contractor to use such fill material for landscaping and land reclamation, subject to conditions defined in the Permit.

The site manager will investigate whether nearby construction sites may require fill material, to both minimise the costs of transport and to reuse as much material as possible.

A site investigation will be carried out to determine the state of the soil/subsoil. If the site investigation establishes that some soil/subsoil excavated at the site was deemed to be contaminated appropriate measures will be taken to manage its excavation and removal as necessary.

During the construction phase the contaminated soil/subsoil (i.e. non- hazardous or hazardous) will be stored separately to the inert soil/subsoil, sampled and tested. The material will be appropriately classified as non-hazardous or hazardous in accordance with Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills, prior to being transported to an appropriately licensed facility by permitted contractors.

4.4 Soil & Stone – By Products

Classification of soil and stone, where appropriate, as a by- product, brings significant economic benefits as the material can be appropriately handled outside of waste legislation. The environmental benefits are also considerable, as the process facilitates the circular economy.

All such classification will be carried out in accordance with he EPA issued 'Guidance on Soil and Stone By-Products in the Context of Article 27 of the European Communities (Waste Directive) Regulations 2011' (June 2019)

Such notifications must be by the material producer or one who makes the notification with the express written consent of the material producer. The guidance calls for all notifications to ensure each and all by-product conditions are met, namely:

- Further use of the soil and stone is certain;
- The soil and stone can be used directly without any further processing other than normal industrial practice;
- The soil and stone are produced as an integral part of a production process; and,
- Further use is lawful in that the soil and stone fulfil all relevant product, environmental and health protection requirements for the specific use and will not lead to overall adverse environmental or human health

By-product decisions must be notified to the Agency using the online notification form.

Any article 27 notifications being notified to the Agency that relate to soil and stone material are required to have the following three templates signed and uploaded to the online notification form prior to notification:

1. Material Producer's Declaration;
2. Declaration of Soil and Stone Suitability - Civil, and
3. Declaration of Soil and Stone Suitability - Environmental.

4.5 Plastic

As plastic is now considered a highly recyclable material, much of the plastic generated during construction, primarily from packaging and material off-cuts, will be diverted from landfill and recycled. All recyclable plastic will be segregated at source and stored in a dedicated skip.

4.6 Cardboard

Cardboard packaging can also be recycled. Cardboard will be flattened and placed in a covered skip, to prevent it getting wet.

4.7 Timber

It is expected there will be timber waste generated from demolition activities, material off-cuts, damaged pieces and wooden pallets used for deliveries to site. Timber that is uncontaminated, i.e. free from paints, preservatives, glues etc., will be stored on site in a designated area for collection and recycling by a nominated waste contractor.

4.8 Metal

Steel is highly recyclable; there are numerous companies that will accept these materials. A segregated skip will be available for storage of metals on site pending recycling.

4.9 Plasterboard

There are currently a number of recycling services for plasterboard in Ireland. The Waste Manager will ensure that oversupply of plasterboard in the material deliveries is kept to a minimum. Excess plasterboard will be stored in a separate skip, pending collection for recycling.

4.10 Glass

A designated skip will be provided for any broken or other waste glass, which can then be recycled. The Waste Manager will liaise with the nominated waste contractor to establish any specific segregation requirements for waste glass (e.g. by colour or type).

4.11 Hazardous Materials

During actual construction activities, on-site storage of any hazardous wastes produced will be minimised, with off-site removal organised on a regular basis. Storage of all hazardous wastes on site will be undertaken so as to minimise exposure to on-site personnel (and the public) and to also minimise potential for environmental impacts. Hazardous wastes will be recovered wherever possible and failing this, disposed of appropriately and measures put in place to stop it occurring again.

4.12 Non-Recyclable Waste

There will be a general skip or other receptacle provided for non-hazardous C&D waste not suitable for reuse or recycling. This skip will include general wet waste (mixed food waste and food packaging), polystyrene, contaminated cardboard, contaminated plastic etc. Prior to removal, the receptacle will be examined by the Waste Manager (or delegate) to determine that recyclable materials have not been placed in there. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly.

4.13 Waste Management System

All information will be entered in a waste management system to be maintained on site. The main waste stream arisings, including surplus materials, which are likely to be generated during the project are illustrated in Table 2.

Waste Type	European Waste Classification Code	Waste Classification
Concrete, bricks, tiles, ceramics	**17 01**	
Concrete [Foundations, floor slabs (in-situ & hollowcore), beams & columns]	17 01 01	Non-hazardous
Concrete (blocks / bricks)	17 01 01	Non-hazardous
Clay Bricks (walls)	17 01 02	Non-hazardous
Mixtures of, or separate fractions of concrete, bricks and	17 01 07	Non-hazardous

ceramics (other than those mentioned in 17 01 06) (toilets / bathrooms)		
Wood, Glass, Plastic	**17 02**	
Wood	17 02 01	Non-hazardous
Glass	17 02 02	Non-hazardous
Plastic	17 02 03	Non-hazardous
Metals (Including Their Alloys)	**17 04**	
Copper, bronze, brass (sheeting, pipes, handles)	17 04 01	Non-hazardous
Aluminium (roller shutters, flashings)	17 04 02	Non-hazardous
Lead (flashings)	17 04 03	Non-hazardous
Iron & steel (reinforcement, roof beams, roof trusses, radiators, pipes)	17 04 05	Non-hazardous
Cables other than those mentioned in 17 04 10	17 04 11	Non-hazardous
Soil (including excavated soil from contaminated sites), stones and dredged spoil	**17 05**	
Soil and Stones other than those mentioned in 17 05 03	17 05 04	Non-hazardous
Insulation Materials and Asbestos-Containing Construction Materials	**17 06**	
Insulation materials containing asbestos*	17 06 01*	Hazardous*
Insulation materials other than those mentioned in 17 06 01 and 17 06 03 (underfloor, cavity & roof insulation)	17 06 04	Non-hazardous
Construction materials containing asbestos*	17 06 05*	Hazardous*
Gypsum-Based Construction Material	**17 08**	

Gypsum-based construction materials other than those mentioned in 17 08 01	17 08 02	Non-hazardous
Insulation materials containing asbestos*	17 06 01*	Hazardous*
Insulation materials other than those mentioned in 17 06 01 and 17 06 03 (underfloor, cavity & roof insulation)	17 06 04	Non-hazardous
Construction materials containing asbestos*	17 06 05*	Hazardous*

Table 2 Main Waste Types and Associated EWC Code

Note:

1 The selected European Waste Classification (EWC) codes provided are provisional only. In a number of instances more than one EWC may be considered appropriate. Care should be taken to ensure that the waste collectors permit includes all EWC codes specified in the appropriate documentation. In addition, there will be a requirement for a technically competent person to assess waste as it arises and to decide as to the classification of the material in accordance with the Hazardous Waste List.

2 For the purposes of this plan it is assumed that all of the soil and stone waste arising from the project will be categorised as inert. Analysis may be required prior to acceptance at certain facilities to demonstrate this assessment.

* Waste marked with an asterisk is considered as a hazardous waste pursuant to Directive 91/689/EEC on Hazardous Waste, European Waste Catalogue and Hazardous Waste List (Valid from 01/01/20002) EPA, Ireland.

4.14 Demolition Area

No demolition is required across the site.

4.15 Predicted Waste Arising

At this stage of the development the figures provided should be considered as provisional only; however, they do provide an indication as to achievable recycling rates. At a minimum, the contractor will be obliged to aim for an overall recycling rate of 83%, in accordance with the Waste Management Plan for the Dublin Region, 2005 - 2010.

During the construction phase, it is estimated that the quantities of C&D wastes/material surpluses will arise as in Table 3. The tonnage figures provided are indicative and based on conversion factors (subject to revision) presented in Table 3 as follows:

4.16 Demolition Waste

Table 3 shows the breakdown of demolition waste produced on a typical construction site.

Waste Type	%
Glass	3%
Concrete, Bricks, Tiles, Ceramics	64%
Plasterboard	4%
Asphalt, Tar and Tar products	6%
Metals	2%
Slate	8%
Timber	13%
Total Waste	100%

Table 3 Demolition Waste Generated on a Typical Irish Construction Site

	Total Waste	Reuse/Offsite		Recycle		Disposal	
Waste Types	tonnes	%	tonnes	%	tonnes	%	tonnes
Glass	0.0	0%	0.0	85%	0.0	15%	0.0
Concrete, Bricks, Tiles, Ceramics	0.0	85%	0.0	5%	0.0	10%	0.0
Plasterboard	0.0	0%	0.0	0%	0.0	10%	0.0
Asphalt, Tar and Tar products	0.0	0%	0.0	25%	0.0	75%	0.0
Metals	0.0	5%	0.0	80%	0.0	15%	0.0
Slate	0.0	0%	0.0	85%	0.0	15%	0.0
Timber	0.0	10%	0.0	40%	0.0	50%	0.0
Total	0.0		0.0		0.0		0.0

Table 3 - On and Off-Site Reuse, Recycle and Recovery Target Rates for Demolition Waste

Actual demolition waste production figures will be calculated prior to work commencing based on survey information for the site, including material types, wall thickness, building heights and depth of foundations.

The volume of the recycling produced through demolition will be used in the construction of the basement.

4.17 Soil Removal

Based on the levels of the proposed development there will be c. 11,000 m3 of cut from the proposed development.

4.18 Construction Waste Generation

The EPA has produced figures for the C&D waste recorded in the National Waste Database. This included a percentage breakdown of waste showing the percentage of each waste type in the C&D stream.

The US EPA has also produced figures for the characterisation of building-related C&D waste. Figures for the C&D waste generated per m2 in the building industry, for mixed use developments from this study have been used as a waste range per m2 for this site.

Table 4 shows the breakdown of the C&D waste types (from Irish EPA figures) produced on a typical site.

Waste Type	%
Soil & Stones	83%
Concrete, Bricks, Tiles, Ceramics, Plasterboard	13%
Asphalt, Tar and Tar products	1%
Metals	1%
Other	2%
Total Waste	100%

Table 4 Construction Waste Generated on a Typical Irish Construction Site

Waste Types	Waste Tonnes
Soil & Stones	112.4
Concrete, Bricks, Tiles, Ceramics, Plasterboard	17.6
Asphalt, Tar and Tar products	1.4
Metals	1.4

Other	2.7
Total	135.4

Table 5 Total Waste*

	Waste	Reuse/Offsite		Recycle		Disposal	
Waste Types	tonnes	%	tonnes	%	tonnes	%	tonnes
Soil & Stones	112.4	85%	95.51	0%	0.0	15%	16.9
Concrete, Bricks, Tiles, Ceramics, Plasterboard	17.6	20%	3.52	75%	13.2	5%	0.9
Asphalt, Tar and Tar products	1.4	0%	0.00	25%	0.3	75%	1.0
Metals	1.4	5%	0.07	80%	1.1	15%	0.2
Other	2.7	10%	0.27	40%	1.1	50%	1.4
Total	135.4		99.37		15.7		20.3

*Excludes cut/fill and estimated topsoil

Table 6 On and Off-Site Reuse, Recycle and Recovery Target Rates for Construction Waste

Any potentially contaminated material encountered will be classified and disposed of in accordance with Council Decision 2003/33/EC 10, which establishes criteria for the acceptance of waste at landfills. This is carried out by sampling and analysing the excavated material for a full waste acceptance criteria suite.

4.19 Proforma

The following proforma will be used to manage, motivate and reward the full adoption of the details outlined in the Construction & Waste Management Plan

RECYCLING OPERATIONS

Action ***	WHO	WHEN
☐ Choose bins/collection methods		
☐ Order bins - oversee delivery		
☐ Site bins/collection sites for optimum convenience		
☐ Sort or process wood		
☐ Sort or process metal		
☐ Sort or process cardboard		
☐ Sort or process drywall		
☐ Sort or process _____ (material)		
☐ Schedule material pickups/drop-offs		
☐ Protect materials from contamination		
☐ Document material pickups/drop-offs		

*** Depending on the service option chosen, these may be the responsibility of the field personnel, the hauler, a full-service recycling contractor, or the subcontractors.

COMMUNICATION PLAN - Except for mandatory items (*), check other items intended to be used.

Action	Who	When	Completed
☐ Complete Construction Waste Mgmt. Plan*			
☐ Hold Orientation/Kick-off Meeting*			
☐ Progress Update in Weekly Job-Site Meetings*			
☐ Encourage Just-In-Time Deliveries			
☐ Post Targeted Materials (Signage)			
☐ Distribute Tip Sheets for Job-Site Personnel			
☐ Post Goals/Progress (Signage)			

MOTIVATION PLAN - Except for mandatory items (*), check other items intended to be used.

Action	Who	When	Completed
☐ Use formal agreements committing Subs to program			
☐ Require Mis-Sorters to Re-Sort Bin			
☐ Provide Stickers, T-Shirts, or Hats			
☐ Public Recognition of Participating Subs			
☐ Letters of Recognition			
☐ Awards Luncheon			

EVALUATION PLAN - Except for mandatory items (*), check other items intended to be used.

Action	Who	When	Completed
☐ Perform Short Form Waste Audit			
☐ Perform Full Waste Audit			
☐ Perform Mid-Course Assessment			
☐ Perform Monthly Cost and Materials Tracking*			
☐ Perform Final Evaluation*			

4.20 Waste Management Packages

The following table outlines the material type, its disposal method and handling procedure. Quantity of materials will be updated upon appointment of a Main Contractor.

Material	Quantity	Disposal Method	Handling Procedure
Planter clearing debris		Keep separate for reuse and/or wood sale	Keep separated in designated areas on site
Clean dimensional and palette wood		Keep separate for reuse in onsite Demolition, or by site employees for either heating stoves or reuse in home projects.	Keep separated in designated areas on site. Place in "Clean Wood" container.
Plywood, OSB, particle board		Reuse Recycle	Reuse portion: Keep separated in designated areas on site. Landfill portion: Place in "Trash" container.
Painted or treated wood		Reuse Recycle	Reuse portion: Keep separated in designated areas on site. Landfill portion: Place in "Trash" skips.
Metals		Recycle at: Hammond lane Recycling	Keep separated in designated areas onsite. Place in "Metals" container.
Gypsum drywall		Recycle at: Panda Recycling Facility	Keep separate all demolished walls in a designated area.
Insulation		landfill	Keep separated in designated areas on site.
Flooring		landfill	Keep separated in designated areas on site.
Carpet and pad		Reuse or recycle with carpet manufacturer	
Glass		Glass Bottles: Recycle at: Panda Recycling Facility	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/Cardboard" container
Plastics		Plastic Bottles: Recycle at: Panda Recycling Facility Plastic bags:	Keep separated in designated areas on site. Place in "Glass/Plastic

		Reuse, landfill	bottles/Metal Cans/Mixed Paper/ Cardboard" container
Beverage Containers		Recycle at: Panda Recycling Facility	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/ Cardboard" container
Cardboard		Recycle at: Panda Recycling Facility	Keep separated in designated areas on site. Place in "Glass/Plastic bottles/Metal Cans/Mixed Paper/ Cardboard" container

Table 7 Waste Management Packages

4.21 Tracking and Documentation Procedures for Off Site Waste

At the time of writing, the Main Contractor is yet to be appointment. Therefore, the waste stream destinations illustrated below is for information only. Upon appointment of the Main Contractor, the final destination of the Waste Stream Destinations will be confirmed with Dublin City Council.

All waste will be weighed and documented. Waste will be weighed on a site weighbridge if available and also independently by the contractor (either by weighing mechanism on the truck or at the receiving facility). These records will be kept on site (both hard and soft copies).

All movement of waste and the use of waste contractors will be undertaken in accordance with the Waste Management Act 1996, Waste Management (Facility Permit & Registration) Regulations 2007, and the Waste Management (Collection Permit) Regulations 2007. This includes the requirement for all waste contractors to have a waste collection permit issued by local authority where the majority of the contractors business takes place. The Waste Manager will maintain a copy of all waste collection permits.

If the waste is being transported to another site, a copy of the waste permit or EPA Waste Licence for that site must be provided to the waste manager. If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) document must be obtained from Dublin City Council (as the relevant authority on behalf of all local authorities in Ireland) and kept on site along with details of the final destination (permits, licences, etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

In all instances, the contractor will look for proof from the waste facility that they have received it. Where loads are taken off by individual waste disposal contractors, the Main Contractor will record each license plate and load type. Before payment is made to the wate contractor proof of disposal from the receiving recovery facility will be required. No payment will be made until this proof is provided.

Waste destination streams are for information only and subject to review upon appointment of Main Contractor. Permit/licence numbers to be checked prior to appointment of waste contractor. Recover facilities are for reference only.

Waste	EWC Code	Collected by	Sorting Facility	Recovery Facility	
MSW Municipal Waste	20 03 01	Panda Waste Permit NWCPO-14-11193-05	Panda Transfer Station, Ballymount Licence W0039-02	Panda, Beauparc Site W0140-04	Licence
			Panda Baling Station, Ballymount Licence W0003-03	Panda, Beauparc Site W0140-04	Licence
Mixed Dry Recyclables	20 03 01	Panda Waste Permit NWCPO-14-11193-05	Panda Materials Recovery Facility Licence W0238-01	Panda, Beauparc Site W0140-04	Licence
				Panda Materials Recovery Facility Licence W0238-01	
Compost / Organic	20 01 08	Panda Waste Permit NWCPO-14-11193-05	Panda Baling Station, Ballymount Licence W0003-03	Panda, Beauparc Site W0140-04	Licence
Glass	20 01 02	Panda Waste Permit NWCPO-14-11193-05	Rehab Enterprises, Naas, Co. Kildare Licence W0279-02	Rehab Enterprises, Naas, Co. Kildare Licence W0279-02	
		Batt Enterprises Permit NWCPO-14-11315-01	Batt Enterprises, Garristown, Dublin Permit WFP-FG-13-0001-01	Batt Enterprises, Garristown, Dublin Permit WFP-FG-13-0001-01	
		Rehab Enterprises Permit WCP-DC-10-1257-01	Rehab Enterprises, Naas, Co. Kildare Licence W0279-02	Rehab Enterprises, Naas, Co. Kildare Licence W0279-02	
Bulky Waste	20 03 07	Panda Waste Permit NWCPO-14-11193-05	Panda Transfer Station, Ballymount Licence W0039-02	Panda, Beauparc Site W0140-04	Licence
			Panda Cappagh Site Licence W0261-02	Panda, Beauparc Site W0140-04	Licence
Timber	17 02 01	Panda Waste *Permit NWCPO-14-11193-05*	Panda Transfer Station, Ballymount *Licence W0039-02*	Panda, Beauparc Site W0*140-04*	Licence
			Panda Cappagh Site *Licence W0261-02*	Panda, Beauparc Site W0*140-04*	Licence
			Irish Packaging Recycling, Ballymount *Licence W0263-01*	Export	
C&D Waste	17 09 04	Panda Waste *Permit NWCPO-14-11193-05*	Panda Transfer Station, Ballymount *Licence W0039-02*	Panda, Beauparc Site W0*140-04*	Licence

Table 8 Waste Stream Destinations

REFERENCES

Waste Management Act 1996 (S.I. No. 10 of 1996) as amended by the Waste Management (Amendment) Act 2001 and associated regulations:

Waste Management (Facility Permit and Registration) Regulations, S.I No. 821 of 2007 as amended 2008 (S.I No. 86 of 2008).

Waste Management (Collection Permit) Regulations S.I No. 820 of 2007 as amended 2008 (S.I No 87 of 2008).

Waste Management (Packaging) Regulations 2003 (S.I. No. 61 of 2003)

Waste Management (Licensing) Regulations 2000 (S.I 185 of 2000) as amended 2002 (S.I 336 of 2002)

Waste Management (Planning) Regulations 1997 (S.I. 137 of 1997)

Waste Management (Landfill Levy) Regulations 2002 (S.I 86 of 2002)

Eastern Midlands Region Waste Management Plan 2015-2021.

Waste Management – Changing Our Ways, A Policy Statement, Department of Environment and Local Government, 1998.

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

"Construction and Demolition Waste Management – a handbook for Contractors and Site Managers", FÁS and the Construction Industry Federation, 2002.

Characterisation of Building-Related Construction and Demolition Debris in the United States, US EPA, June 1998.

Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.

Council Directive 1999/31/EC, on the landfill of waste

Notification of by-product decisions by economic operators under Article 27 of the European Communities (Waste Directive) Regulations 2011, S.I. No. 126 of 2011

Guidelines for Construction Management 5.0 -DLRCC

Guidelines for Waste Storage Facilities 1.1 – DLRCC

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Design Guidance

Clima-Pave™ permeable paving provides a structural pavement suitable for both pedestrian and vehicular traffic depending on design. The water management and permeable functionality of the pavement is largely dependent on the correct specification and design of the pavement to meet the unique requirements of the individual site. The correct specification, testing and installation of aggregates is of paramount importance with any permeable paving system to ensure the finished pavement meets both initial and long term design requirements.

We advise that all permeable pavements require a site-specific design which should be carried out in accordance with BS 7533-13:2009 'Pavements constructed with clay, natural stone of concrete pavers. Part 13 Guide for the design of permeable pavements constructed with concrete paving blocks and flags, natural stone slabs and setts and clay pavers'.

We can provide a design service to customers who require a site specific design to be carried out for their project. In order to carry out this, we require a completed Clima-Pave™ Permeable Paving Design form available to download from our website, from our Sales team or can be requested by emailing technical@kilsaran.ie. This form should be returned via email with the supporting information about the site to enable a design to be carried out.

The information required includes:

- **Drawings of proposed site layout in AutoCad**
- **Full existing and proposed site levels for the pavement**
- **Full site investigation report to establish ground conditions and soaked CBR values of the sub-grade at formation level**
- **Infiltration values from soak-pit testing to BRE 365**
- **Overall drainage design strategy for the site**
- **Planning requirements or conditions for the site relating to paving and drainage (e.g. discharge limits)**
- **Any other pertinent site specific information or client / contractor requirements**

Design Guidance Basics

The below information is provided for guidance purposes only at project conception stage to allow appraisal of a permeable pavement system. Full independent advice should be sought from both the Consulting Engineer and the Contractor prior to the commencement of works. A full site-specific design will always be required in accordance with the above guidelines and BS 7533-13:2009.

The design information below is based on BS 7533-13:2009 which should also be consulted at project appraisal stage.

Types of Permeable Pavement

There are three main types of permeable pavement commonly used on sites:

System A – Full Infiltration: All water from the pavement is infiltrated to the ground

Suitable for sites with good ground conditions, higher CBR values and soils which will readily allow water to dissipate through the ground. These favourable conditions are rarely encountered on larger sites.

System B – Partial Infiltration: Most water infiltrated to ground with excess water piped off

Suitable for sites with medium ground conditions. The soil will infiltrate some of the water in the system. When storm events occur and water builds up in the system due to the soil being at capacity for drainage, perforated pipes are laid in the bottom of the sub-base to deal with the excess, taking it to the surface water drainage system. This is the most commonly used type of permeable pavement.

System C – Fully Tanked System: No water is allowed to infiltrate to ground

This type of system is used where poor sub-grade drainage conditions exist (heavy clays), where the stability of the sub-grade would diminish if extra surface water was introduced, or where ground water levels are within 1 metre of the formation level (system could gain water). In this system the sub-base acts essentially as an attenuation tank, wrapped in an impermeable polythene membrane and all water is piped out.

Selection of Pavement Type

The type of permeable pavement system to be adapted is based primarily on site ground conditions, site suitability and the permeability values of the sub-grade encountered on site from infiltration soak-pit testing. Table 1 gives guidance on the suitability of the three types of permeable pavement system.

Table 1: Guidance on selection of a pavement system

		System A - total infiltration	System B - partial infiltration	System C - no infiltration
Permeability of subgrade defined by coefficient of permeability, *k* (m/s)	10^{-4} to 10^{-3}	✓	✓	✓
	10^{-6} to 10^{-5}	✗	✓	✓
	10^{-10} to 10^{-9}	✗	✗	✓
Highest recorded water table within 1000mm of formation level		✗	✗	✓
Pollutants present in subgrade		✗	✗	✓

Selection of Pavement Sub-Base Thickness

The design of the sub-base for the permeable pavement should take into account the traffic loadings likely to use the pavement. It is essential to take into account any future increase in traffic volume and any HGV traffic which may use the pavement irrespective of how frequent. The correct loading category should be then selected from Table 2 taking into account the above considerations. It should be noted that no layers of the permeable pavement are designed for site traffic to use them and when finished the permeable pavement surface should not be trafficked by site traffic vehicles which are heavier than that for which the pavement was designed. It is advisable to complete paving works after all other work in the vicinity has been completed.

Typical build up details for each traffic category are illustrated on page 20 and 21 for guidance purposes.

Table 2: Loading Categories

1 DOMESTIC PARKING	2 CAR	3 PEDESTRIAN	4 SHOPPING	5 COMMERCIAL	6 HEAVY TRAFFIC
No Large Goods Vehicles	Emergency Large Goods Vehicles only	One Large Goods Vehicles per week	Ten Large Goods Vehicles per week	100 Large Goods Vehicles per week	1000 Large Goods Vehicles per week
Zero standard axles	**100 standard axles**	**0.015msa**	**0.15msa**	**1.5msa**	**15msa**
Patio	Car Parking Bays and Aisles	Town/city Pedestrian Street	Retail development delivery access route	Industrial Premises	Main road
Private Drive	Railway Station platform	Nursery Access	School/college access road	Lightly Trafficked Public Road	Distribution Centre
Decorative feature	External Car Showroom	Parking area to residential development	Office block delivery route	Light Industrial development	Bus Station (bus every 5 minutes)
Enclosed Playground	Sports Stadium Pedestrian route	Garden centre external display area	Deliveries to small residential development	Mixed retail/ industrial development	Motorway Truck Stop
Footway with zero vehicle overrun	Footway with occasional overrun	Cemetery Crematorium	Garden centre delivery route	Town Square	Bus Stop
	Private drive/ footway crossover	Hotel Parking	Fire Station Yard	Footway with regular overrun	Roundabout
		Airport Car Park with no bus pickup	Airport Car Park with bus to terminal	Airport landside roads	Bus Lane
		Sports Centre	Sports Stadium access route/ forecourt		

msa = millions of standard 8,000 kg axles

Sub-Base Thickness For Water Storage

The sub base depth must also take into consideration the water storage requirements for the site. The depth of sub-base may have to be adjusted to allow for increased site specific water storage. Further guidance on hydraulic factors can be found in BS 7533-13:2009 section 5.4.

Adjustment To Pavement Design For Low CBR Sub-Grade

In the case of CBR values below 5%, either ground improvement work will be required for the site, or the thickness of the coarse graded aggregate sub-base will have to be adjusted in accordance with 5.6.3 and table 9 of BS 7533-13:2009

Permeable Paving Aggregates

All materials used as permeable paving aggregate must comply to the grading and physical requirements below, as well at the general requirements of BS EN 12620 and BS EN 13242. Sub-base laying course materials should be clean, sound, non-friable and sound crushed rock material. Rounded gravel materials are not recommended for sub-base layers. The jointing material may be either clean crushed material or clean gravel material. The materials should be tested to confirm that it meets the requirements below.

The contractor shall also ensure that on-going deliveries to site are checked frequently for grading, shape and inspected to ensure cleanliness.

During installation on site, great care and attention must be paid to ensure that the aggregates are kept free of contamination and deleterious matter. Construction traffic cannot be allowed to traverse the layers of permeable paving aggregates during installation.

4/40mm Coarse Graded Permeable Paving Aggregate

Sieve Size (mm)	Percentage Passing
80	100
63	98-100
40	90-99
31.5	-
20	25-70
10	-
4	0-15
2	0-5

4/20mm Coarse Graded Permeable Paving Aggregate

Sieve Size (mm)	Percentage Passing
40	100
31.5	98-100
20	90-99
10	25-70
4	0-15
2	0-5

2/6.3mm Laying Course Paving Aggregate

Sieve Size (mm)	Percentage Passing
14	100
10	98-100
6.3	80-99
2	0-20
1	0-5

3mm Jointing Grit

Sieve Size (mm)	Percentage Passing
40	100
8	100
6.3	95-100
4	85-99
2	15-35
1	0-10
0.063	0.0-1.5

Property	Category to BS EN 13242 or BS EN 12620
Grading	4/20 (preferred) or 4/40 as per table above
Fines Content	F4
Shape	FI20
Resistance to Fragmentation	LA30
Water Absorption to BS EN 1097-6:2000	WA2
For water absorption > 2% Magnesium Sulfate Soundness	MS18
Resistance to Wear	MDE20
Acid Soluble Sulfate Content	AS0.2
Total Sulfur	≤1% by mass
Recycled Aggregates	Seek guidance from Kilsaran Technical Department

Materials for HGV Trafficked Areas

For loading category 3 and above as detailed in Table 2 page 17, these pavement types are designed to accommodate HGV traffic either on an occasional or more frequent basis. The pavement structure therefore requires a 'stiffening layer' to accommodate the HGV traffic which exerts significantly increased loading on the pavement. This stiffening layer can be either a hydraulically-bound coarse graded aggregate (porous no fines concrete) as detailed below and shown on the section details on pages 20 and 21 or alternatively a 80mm thick layer of DBM macadam as detailed below.

DBM Macadam Material

The DBM material should be an AC 32 Dense Base complying with the requirements of BS EN 13108-1 and should be supplied and installed to meet the requirements of BS 594987:2010. The DBM should be punctured after installation at 750mm centres with 100mm diameter holes. The holes should be fully filled and compacted with the appropriate coarse graded permeable paving aggregate as used in the layer underneath.

Hydraulically-Bound Coarse Graded Aggregate (Porous No Fines Concrete)

Porous concrete provides a stiffening transfer layer in concrete block permeable pavements which are to receive heavier traffic loads. The lack of sand (fines) in the mixture allows the material to act as a transfer drainage layer, whereby the open-graded matrix of the material allows for 20%-30% voids within the compacted volume of the material. Special measures are to be taken in the production, installation and curing of this material. Kilsaran can provide information and guidance on this upon request.

Product Standard	BS EN 14227-1
Material Compositon	Hydraulically Bound Coarse Graded Aggregate is a mixture of a coarse aggregate (usually 20mm nominal size), cement and water.
Typical Compressive Strength	Class C5/6 in accordance with IS EN 14227-1,Table 2 Line 4. Other strength classes available upon request from supplier.