AIRFIELD DRAINAGE PROJECT

Volume III - Appendices

October 2023

NICHOLAS O'DWYER
an RSK company

daa plc

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Technical Appendix 2 – Scoping

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Appendix 2.1

Scoping Consultation Document

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Environmental Impact Assessment Scoping Consultation Document

Airfield Drainage Project

20771

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NICHOLAS O'DWYER

GENERAL NOTES

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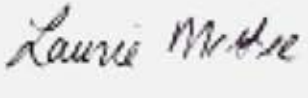
Signature [delete row if not required]		Signature [delete row if not required]	
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1 INTRODUCTION

1.1 Background

Nicholas O'Dwyer Ltd. (NOD) is preparing an Environmental Impact Assessment Report (EIAR) on behalf of daa plc for the proposed Airfield Drainage Project (ADP) at Dublin Airport. The EIAR will accompany a planning application to be made to the local planning authority, Fingal County Council under Section 32 of the Planning and Development Act, 2000 (as amended).

The ADP proposes significant upgrades to the surface water management infrastructure at Dublin Airport including upgrade of existing drainage infrastructure and construction of additional infrastructure to supplement the performance of the existing surface water management system at Dublin Airport. The proposed development is of a class under Schedule 5, Part 2 of the of the Planning and Development Regulations, 2001 (as amended) and requires EIA. Thus, the prospective applicant, daa, must prepare and submit an EIAR.

The purpose of the EIAR is to present the requisite information per Article 5(1)(a) to (f) of the amended EU EIA Directive[1] to enable the competent authority, Fingal County Council, to make a reasoned conclusion on the likely significant effects of the proposals on the environment.

This EIA Scoping Consultation Document presents the findings of the scoping exercise carried out thus far to inform the EIAR. This document also serves as a consultation tool for circulation among stakeholders for their feedback as part of the scoping exercise. It provides information on the proposed project to enable an understanding of the key issues which are likely to be important during the EIA and design process, and the scope and level of detail proposed to be included in the EIAR.

1.2 Requirement for an Environmental Impact Assessment

It was identified that the ADP is a project within Class 10 of Schedule 5, Part 2 of the Planning and Development Regulations, 2001 (as amended), which is given as:

> *10 (b) (iv) Urban development which would involve an area greater than 2 hectares in the case of a business district, 10 hectares in the case of other parts of a built-up area and 20 hectares elsewhere. (In this paragraph, "business district" means a district within a city or town in which the predominant land use is retail or commercial use.)*

Bearing in mind the broad scope and purpose of the EIA Directive (European Commission, 2017), this Class is included in the screening as the ADP is one to which the terms '*urban*' and *'infrastructure'* can relate due to its location within and adjacent to an operational airfield which is urban in character. Land use within the land ownership boundary, and surrounding the proposed development includes land used for airport operations, grassland, and agricultural land. Other developments not essential to this

[1] Directive 2011/92/EU as amended by Directive 2014/52/EU.

purpose are strictly controlled in the interest of aviation safety. It is considered that the site is within a built-up area where a threshold of 10 hectares (ha) applies.

The site of the proposed development is the total area of the site contained within the redline boundary of the planning application, including the area for temporary works. This site area is approximately 207 ha which exceeds the threshold of Class 10 (b) (iv) a built-up area, i.e., 10 ha. Therefore, an EIA is required in accordance with section 172 of the Planning and Development Act, 2000 (as amended).

1.3 Purpose of the Scoping Document

The purpose of scoping for EIA is to identify environmental factors for which potential significant environmental impacts may arise; to carry out consultation with stakeholders and confirm the scope of the EIAR; and to obtain information held by stakeholders that will be relevant to the proposed project.

Consultees are invited to contribute to the EIAR by suggesting baseline data, survey techniques, sensitive receptors and potential impacts that should be considered as part of the assessment process and in the preparation of the EIAR.

For this planning application which is to be made to the Fingal County Council local planning authority, this Scoping Consultation Document will be sent to the following consultees:

- Environmental Protection Agency (EPA);
- Dept. of Housing, Planning and Local Government;
- Dept. of Agriculture, Food and the Marine;
- Dept. of Communications, Climate Action & the Environment;
- Dept. of Culture, Heritage and Gaeltacht / Development Applications Unit;
- Inland Fisheries Ireland (IFI);
- Office of Public Works (OPW);
- Irish Aviation Authority;
- An Taisce;
- The Heritage Council;
- Fingal County Council (FCC);
- Dublin City Council (DCC);
- Local Authorities Waters Programme Office;
- Transport Infrastructure Ireland (TII); and
- National Transport Authority (NTA).

2 DESCRIPTION OF THE SITE & ITS SURROUNDINGS

2.1 Characteristics of the Site

Dublin Airport is located north of Dublin city and lies within the Fingal County Council administrative area. Dublin City Centre is located approximately 10 km south of the airport, while the town of Swords is located approximately 2 km north. A high-capacity road network surrounds the airport with the M1 to the east, the M50 to the south and the N2 to the west. Primary strategic road access to Dublin Airport is from the M1 motorway. Road access to the airport is via the M1 spur route and the existing R132 roundabout, see **Figure 2.1**.

The airport includes various land uses. Aspects associated with its operation include terminal buildings, aprons, taxiways, runways, hangars, and carparks. There is also a mix of other land use classes ancillary to the dominant operational uses including offices, car parking, logistics, industrial, and hospitality and leisure. An outer perimeter essentially defines Dublin Airport and delineates the airside[2]-landside[3] interface, as described in Fingal County Council's Dublin Airport Central Masterplan 2016[4].

The ADP site is located within the Dublin Airport boundary as shown in **Figure 2.2**. It is entirely within the administrative area of Fingal County Council. The ADP proposed works will be carried out in various areas airside, in the landside area known as the Eastlands[5] and across and along public carriageways (R108 and R132).

The upper Cuckoo sub-catchment is the largest sub-catchment at Dublin Airport and includes a large proportion of the operational airfield area at Dublin Airport. There is also a large greenfield area (approx. 170 ha), which currently consists of mostly agricultural lands, located in the upper reaches of the catchment. Stormwater runoff from this area is drained by the existing Airfield Trunk Culvert, which discharges these flows to the open channel section of the Cuckoo Supply Channel. Flows continue across the R132 to the Cuckoo Stream which conveys flows toward the Mayne River before ultimately discharging to Dublin Bay at the Baldoyle Special Area of Conservation (SAC) / Special Protection Area (SPA).

Refer to **Figure 2.3** for details of the Cuckoo sub-catchment and areas which contribute flows to the Airfield Trunk Culvert and the greenfield area as described above.

[2] Airside is the area in the airport campus which are within the Critical Part of the Security Restricted Area (CPRSA) boundary that requires Customs and Security clearance to allow access.

[3] Landside refers to areas in the Dublin Airport campus which are outside the CPRSA boundary.

[4] Fingal County Council. 2016. Dublin Airport Central Masterplan.

[5] The Eastlands refers to the area to the east of the R132 carriageway, which is bounded to the east by the M1 motorway, the south by the Dardistown Cemetery, and the north by the ALSAA (sport and social club) complex, and car hire facilities.

Figure 2.1: Location of Dublin Airport

Figure 2.2: Project boundary

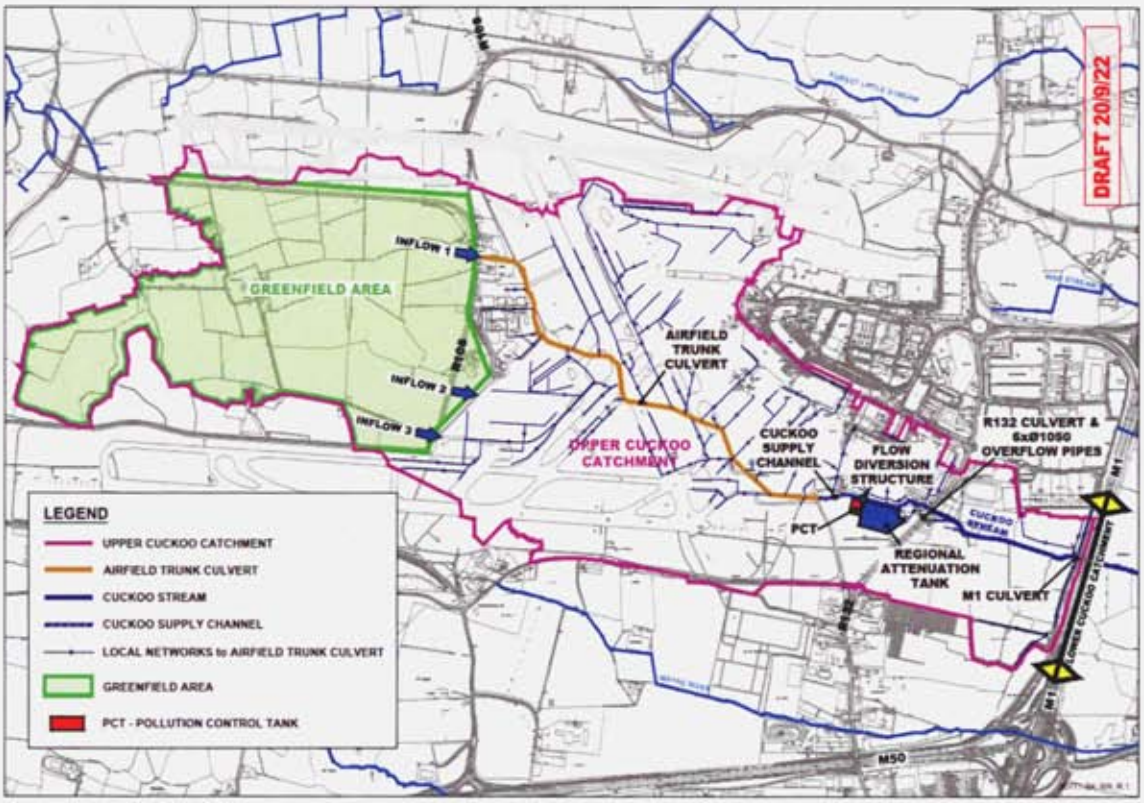

Figure 2.3: Upper Cuckoo catchment and indicative surface water network

2.2 Characteristics of the Surrounding Area

The Airport is surrounded by greenfield lands to the south, west and north and by the M1 motorway to the east. The adjacent land-uses (within 2 km of the Airport boundary) consist of a complex mosaic of land-uses that include, but are not limited to:

- Agriculture;
- Housing, commercial/industrial/retail in the nearby settlements of Swords and St. Margaret's;
- Parking and Transport;
- Specialist Infrastructure and Activities; and
- Specialist Rural Land-Uses.

2.2.1 Designated Areas

Key ecological sensitivities of the study area and surrounds include:

- European sites including coastal areas, marine and transitional waters and the associated aquatic ecology of the Broadmeadow Estuary, Baldoyle Estuary and Bull Island;
- Aquatic and riverine ecology including riparian (buffer) zones of the Mayne, Ward, Broadmeadow, Sluice and Santry Rivers as well as the Cuckoo Stream;
- Protected, Red-Listed Flora and Fauna species;

- Shellfish;
- Invasive Species;
- Shellfish Waters in downstream coastal areas.

There are no designated areas within the Airport itself.

There are six downstream European sites with a hydrological connection to the receiving watercourses in the Airport catchments (see **Figure 2.4**), namely:

- Malahide Estuary SAC and SPA;
- Baldoyle Bay SAC and SPA;
- North Bull Island SPA; and
- North Dublin Bay SAC.

The nearest European sites are Malahide Estuary SAC and SPA which are located approximately 4 km to the north-east of the airport. Baldoyle Bay SAC and SPA located approximately 6 km to the east of the airport. Malahide Estuary SPA and SAC are hydrologically linked to the Airport via the River Ward, while Baldoyle Bay SAC and SPA are directly linked to the Airport via the River Mayne.

Baldoyle Estuary (approximately 5 km to the southeast of the Airport campus), North Bull Island (approximately 7 km to the southeast of the Airport campus) and Rogerstown Estuary (approximately 10 km northeast of the Airport campus) are designated as both Nature Reserves and Ramsar sites. Broadmeadow Estuary/Malahide and Sandymount Strand/Tolka Estuary are other designated Ramsar sites located as shown in **Figure 2.4**.

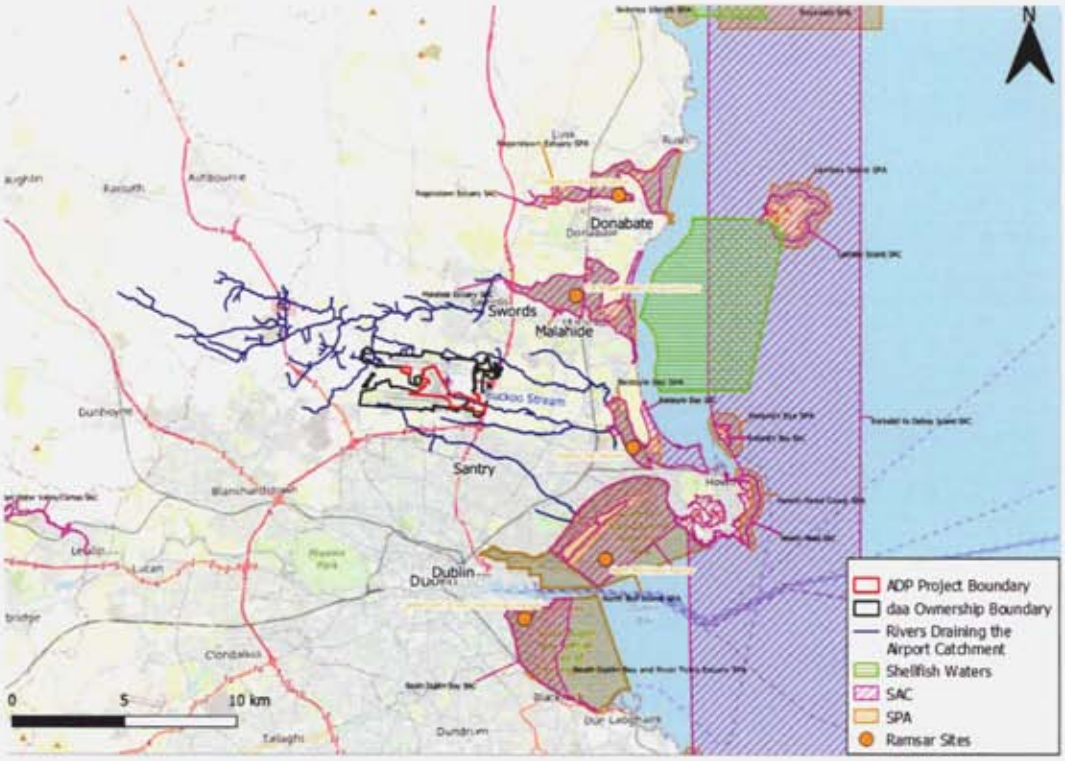

Figure 2.4: European and Ramsar designated sites

Table 2.1 lists the designated European sites that were identified in the study area.

Table 2.1: Designated European sites

European Sites		Distance from airport (km)	Main conservation interests
Designation	**Site Name**		
SAC	Baldoyle Bay	5.1	• Mudflats and sandflats not covered by seawater at low tide • *Salicornia* and other annuals colonising mud and sand • Atlantic salt meadows • Mediterranean salt meadows
	Howth Head	9.6	• Vegetated sea cliffs of the Atlantic and Baltic coasts • European dry heaths
	Lambay Island	13.9	• Reefs • Vegetated sea cliffs of the Atlantic and Baltic coasts • *Halichoerus grypus* • *Phoca vitulina*
	Malahide Estuary	3.9	• Mudflats and sandflats not covered by seawater at low tide • Salicornia and other annuals colonising mud and sand • Atlantic salt meadows • Mediterranean salt meadows • Shifting dunes along the shoreline with *Ammophila Arenaria* • Fixed coastal dunes with herbaceous vegetation
	North Dublin Bay	6.0	• Mudflats and sandflats not covered by seawater at low tide • Annual vegetation of drift lines • *Salicornia* and other annuals colonising mud and sand • Atlantic salt meadows • Mediterranean salt meadows • Embryonic shifting dunes • Shifting dunes along the shoreline with *Ammophila Arenaria*

European Sites		Distance from airport (km)	Main conservation interests
Designation	Site Name		
			• Fixed coastal dunes with herbaceous vegetation • Humid dune slacks • *Petalophyllum ralfsii*
	Rogerstown Estuary	7.2	• Estuaries • Mudflats and sandflats not covered by seawater at low tide • *Salicornia* and other annuals colonising mud and sand • Atlantic salt meadows • Mediterranean salt meadows • Shifting dunes along the shoreline with *Ammophila Arenaria* • Fixed coastal dunes with herbaceous vegetation
	South Dublin Bay	8.6	• Mudflats and sandflats not covered by seawater at low tide • Annual vegetation of drift lines • *Salicornia* and other annuals colonising mud and sand • Embryonic shifting dunes
	Rye Water Valley/Carton	13.4	• Petrifying springs with tufa formation • *Vertigo angustior* • *Vertigo moulinsiana*
	Ireland's Eye	10.0	• Perennial vegetation of stony banks • Vegetated sea cliffs of the Atlantic and Baltic coasts
	Rockabill to Dalkey Island	9.7	• Reefs • *Phocoena phocoena*
SPA	North Bull Island	6.0	• Wintering populations of light-bellied brent goose • Shelduck • Teal • Pintail • Shoveler • Oystercatcher • Golden plover • Grey Plover • Knot • Sanderling • Dunlin • Black-tailed godwit • Bar-tailed godwit • Curlew • Redshank • Turnstone • Black-headed Gull • Wetland and Waterbirds
	Rogerstown Estuary	7.6	• Greylag Goose • Light-bellied Brent Goose • Shelduck • Shoveler • Oystercatcher • Ringed Plover • Grey Plover • Knot • Dunlin • Black-tailed Godwit • Redshank • Wetland and Waterbirds
	Baldoyle Bay	5.1	• Light-bellied Brent Goose • Shelduck, Ringed Plover • Grey Plover • Bar-tailed Godwit • Wetland and Waterbirds
	South Dublin Bay and River Tolka Estuary	8.8	• Light-bellied Brent Goose • Oystercatcher • Ringed plover • Grey Plover • Knot • Sanderling

European Sites		Distance from airport (km)	Main conservation interests
Designation	Site Name		
			• Dunlin • Bar-tailed Godwit • Redshank • Black-headed Gull • Arctic Tern • Roseate Tern • Common tern
	Lambay Island	14.0	• Fulmar • Cormorant • Shag • Greylag Goose • Lesser Black-backed Gull • Herring Gull • Kittiwake • Guillemot • Razorbill • Puffin
	Howth Head Coast	11.5	• Kittiwake
	Ireland's Eye	9.8	• Cormorant • Herring Gull • Kittiwake • Guillemot • Razorbill
	Malahide Estuary	3.9	• Great Crested Grebe • Light-bellied Brent Goose • Shelduck • Pintail • Goldeneye • Red-breasted Merganser • Oystercatcher • Golden Plover • Grey Plover • Knot • Dunlin • Black-tailed Godwit • Bar-tailed Godwit • Redshank • Wetland and Waterbirds

There are no Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHAs) within or directly adjacent to the Airport campus. The closest pNHAs to the Airport campus are Santry Demesne (approximately 1.2 km to the south), Feltrim Hill (approximately 1.8 km to the north-east, Sluice River Marsh (approximately 4.4 km to the east) and Malahide Estuary (approximately 3.5 km to the east). **Figure 2.5** shows pNHAs and NHAs.

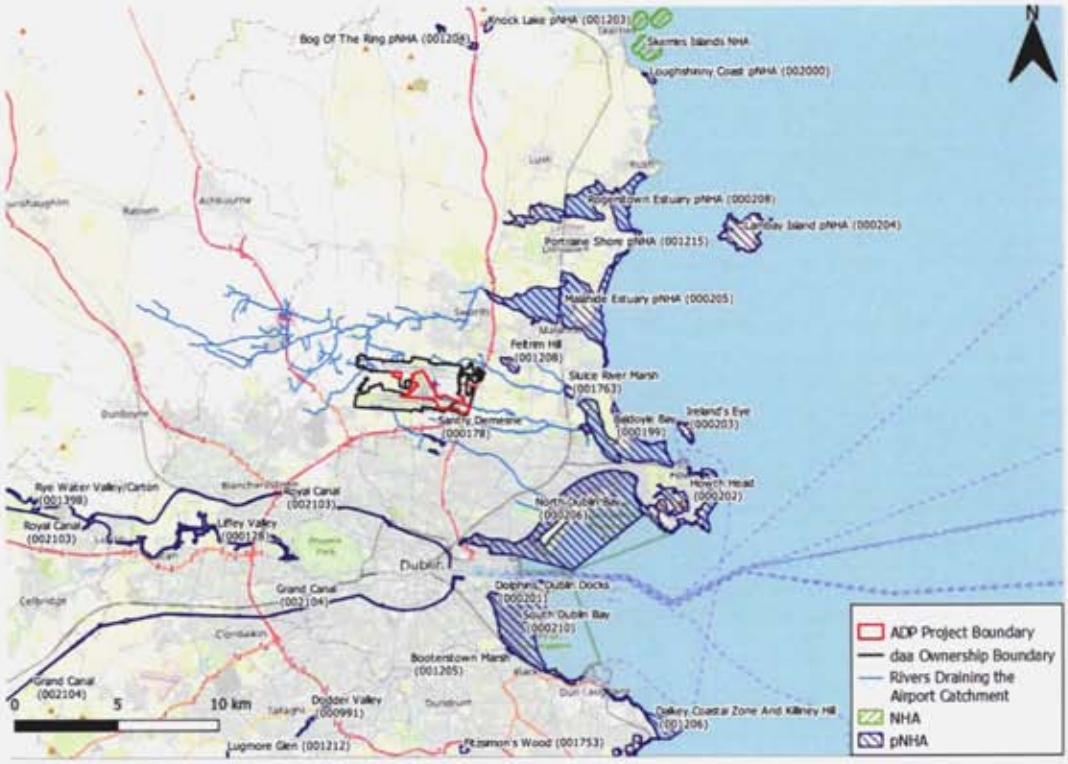

Figure 2.5: Nationally designated and proposed sites

Fingal Nature Development Areas are designated locations where nature conservation can be combined with existing activities such as farming, forestry, quarrying and recreation (e.g., golf courses). The areas and land-uses have been selected because of their existing or potential value for wildlife. There are two Nature Development Areas adjacent to the study area, one to the north (Forest Little) and one to the south (Ballymun), both are golf courses.

North Bull Island was designated as a United Nations Educational Scientific and Cultural Organisation (UNESCO) Biosphere Reserve in 1981 because of its rare and internationally important habitats and wildlife. The designation was extended to the wider Dublin Bay area in 2015, reflecting the Bay's significant environmental economic, cultural and tourism importance and now covers 300 km^2. The Airport campus is adjacent to the transition area, or area of cooperation of the Biosphere. The transition area in a UNESCO Biosphere Reserve is the larger outermost area of the reserve and is where people work and live, using resources in a sustainable manner. The Dublin Bay transition area covers 173 km^2 and includes residential areas, harbours, ports and industrial and commercial areas. Much of the lower Mayne, Santry and Sluice catchments are located within the transition area and buffer zones and flow into the core areas (Tolka and Baldoyle Estuaries, North Bull Island). **Figure 2.6** shows the Dublin Bay Biosphere Reserve Zones.

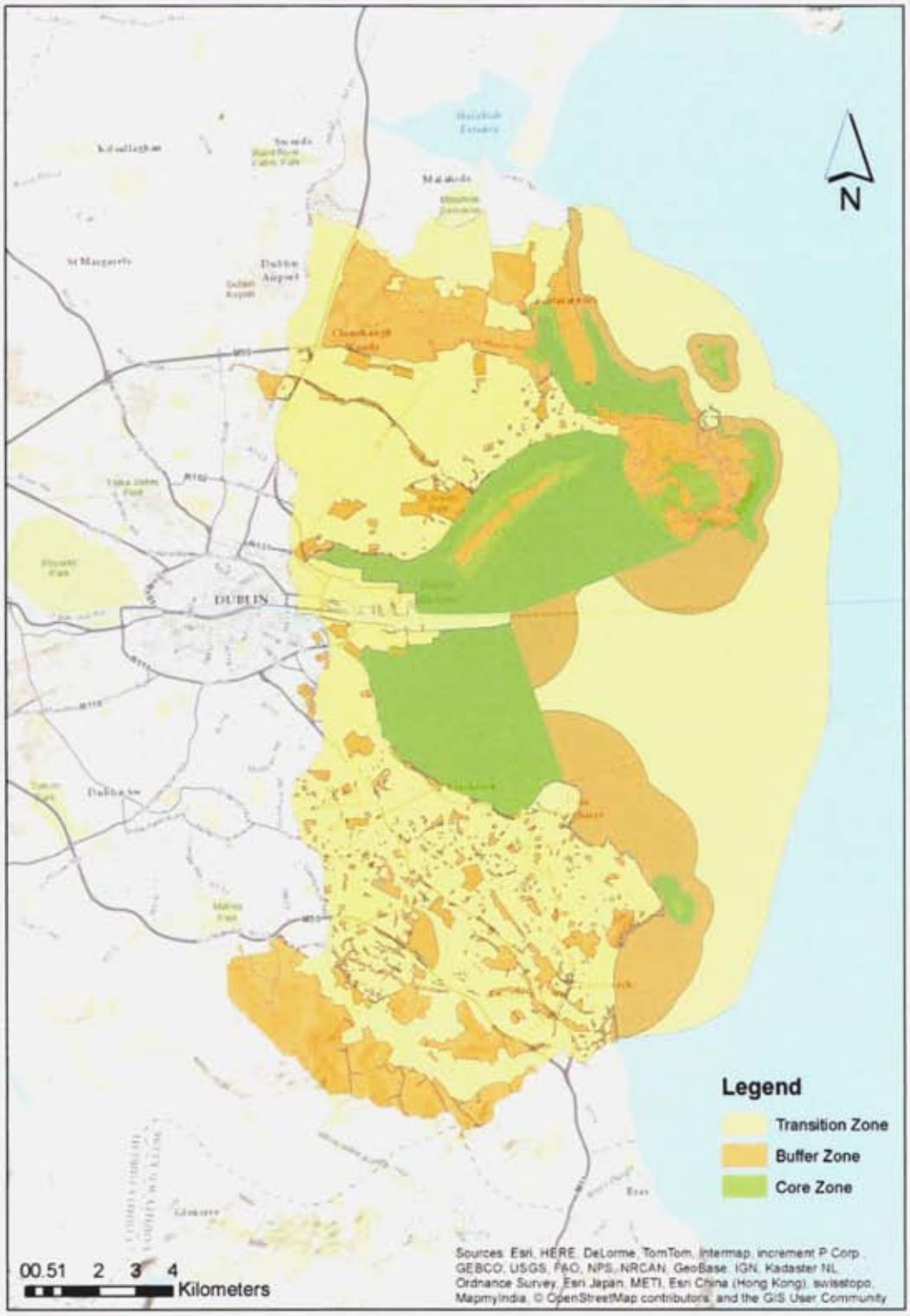

Figure 2.6: Dublin Bay Biosphere Reserve

2.2.2 Water

2.2.2.1 Surface Water

There are four river sub basins that drain the Airport campus. These are the Mayne_010, Santry_010, Ward_030 and Sluice_010 rivers. The river sub basin areas are the watershed areas that are drained by the river waterbodies of the same name. **Figure 2.7** shows each of the river sub basins as they relate to the airport (outlined in purple) and the status of the surface water bodies as designated under the Water Framework Directive.

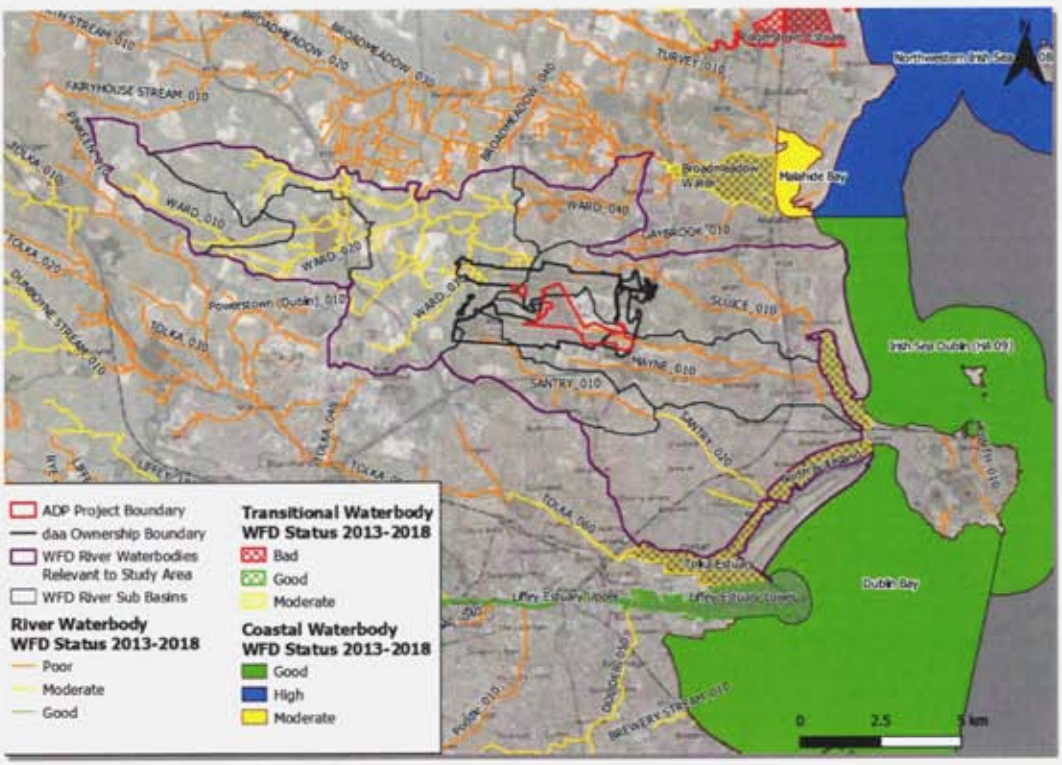

Figure 2.7: WFD water bodies and their status

2.2.2.2 Groundwater

The Geological Survey of Ireland (GSI) rates aquifers according to both their vulnerability to pollution and their productivity. The GSI also rates aquifers based on the hydrogeological characteristics and on the value of the groundwater resource. Aquifer productivity rates the value of the groundwater resource.

Most of the aquifers underlying the ADP boundary are classified as 'low vulnerability' with smaller localised areas to the north-west of the airfield classed as 'moderate vulnerability' and 'high vulnerability'. None of the groundwaters underlying proposed works areas are classed as 'extreme vulnerability'.

2.2.3 Cultural Heritage

Three designated heritage assets are located within the airport campus. These are buildings on the County Record of Protected Structures (RPS) and National Inventory of Architectural Heritage (NIAH), and recorded monuments as follows:

- The old Central Terminal Building built in 1937, listed in the Register of protected Structures (RPS 612) and the National Inventory of Architectural Heritage (NIAH 11349006);
- The Church of our Lady Queen of Heaven (RPS 864; NIAH 11349001) which dates to 1964; and
- A thatched, detached, single-storey cottage (RPS 064; NIAH 11349003).

Two Recorded Monuments occur in the vicinity of the site:

- HA7: Toberbunny Well (DU014-023 is a well located within the ADP boundary; and
- HA9: The Boot Inn (DU014-090) is a Recorded Monument of local significance located adjacent to the west boundary of Dublin Airport at Pickardstown. It is a two-storey, four-bay building of post-1700 date located to the east of the R108. The ADP boundary is approximately 165m east of this building.

Given the previous discovery of archaeological remains in the North Runway project area, and the presence of a well (DU014-023), it is considered that there is archaeological potential in the project area which will be investigated further for the EIAR.

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.1 Project Scope

The ADP proposes significant upgrades to the surface water management infrastructure at Dublin Airport. The ADP comprises a series of drainage system enhancement measures and infrastructure proposals, including the upgrade of existing drainage infrastructure and the construction of additional infrastructure to supplement the performance of the existing surface water management system.

The primary objective of the ADP is to provide a nett improvement in the degree of protection afforded to the receiving waters by the surface water management system, in order to address the water quality objectives. It is proposed to achieve this through a series of drainage system enhancement measures and infrastructure proposals.

These proposals include the implementation of a new Contamination Detection and Response (CD&R) System and the provision of additional pollution control facilities. The network enhancements will intercept greenfield inflows at points upstream of the airport campus and convey them directly to the receiving waters. Some reconfiguration of existing networks will be necessary to achieve an integrated system with a consistent airfield-wide approach to flow segregation and pollution. These proposals are designed to provide robust protection to receiving waters and to improve their ecological quality in accordance with the Surface Water Regulations.

It is also proposed to provide hydraulic upgrades to the network. This will provide the network connectivity needed to facilitate the proposed flow segregation system, as well as increasing the hydraulic capacity in the network and alleviating historic capacity issues.

The design of the ADP also includes safeguarding measures to facilitate future developments at Dublin Airport. The inclusion of safeguarding measures is designed to uphold the principles of sustainable and coordinated development, avoiding the need for repeat work or abortive work, which can arise from individual ad-hoc developments.

The ADP drainage system enhancements and infrastructure proposals have been informed by the Drainage Masterplan (DMP), which is a long-term masterplan for drainage infrastructure at Dublin Airport. The DMP outlines a long-term phased and coherent approach to improvements in surface water and foul drainage infrastructure. The DMP considered hydraulic and surface water quality requirements having regard to EU Water Framework Directive (transposed into Irish law in the Surface Waters Regulations 2009), the Floods Directive, and the Habitats and Birds Directives.

3.2 Project Description

3.2.1 Alternatives

Alternative design approaches, operational philosophies, and alternative construction methodologies were all considered. Alternative layouts, i.e., alternative pipeline corridor routes and infrastructure locations, were also considered in detail. **Table 3.1** summarises

the various options analysed for the various aspects of the ADP and identifies the preferred option which is described in detail below.

Table 3.1: Summary of Alternatives Considered

ADP Proposal	Alternatives Considered	Preferred option
Alternative Design Solutions		
Contamination detection & Response	*Detection approach*: - Real surface water monitoring only; or - Weather-based monitoring only. *Flow segregation approach*: Three alternative approaches: - Having local decision points, which are located such that area are fully segregated *e.g.*, all runoff from a given set of stands are served by a dedicated decision point, while adjacent taxiways are served by a separate decision point; - Intermediate decision points, which divides the airfield into zones, based on the configuration of the network and the airport operations in that zone; or - Central decision points where runoff from several areas of different contamination risks is combined before passing through a DP.	Combination of pre-emptive & real-time detection devices. Following quantitative analysis, it was determined that the preferred approach is intermediate decision points. This involves dividing the airfield into zones and decision points would divide clean and contaminated runoff within each zone before it is allowed to mix with runoff from other zones. This approach was determined to provide the best balance between the effective segregation of flows, ease of access for maintenance and emergency response, operational flexibility and relatively low level of disruption to airport operations.
Trunk pipeline design of Clean Water Supply Pipelines (CWSPs)	*Conveyance method*: - Open channel; or - Closed conduit (underground). Closed conduits were only considered for conveying clean water. Closed conduits are to be used for all contaminated or potentially contaminated pipelines. *Greenfield inflow conveyance*: Alternatives were considered regarding whether to provide separate conveyance of greenfield inflows and clean flows from the airfield network or to convey them in a shared pipeline.	In general, closed conduits were preferred to facilitate conveyance under existing infrastructure and other utilities, and reduce risks associated with open channels, including health and safety risks relating to working close to water. The only open channel section is the localised diversion of the Cuckoo Supply Channel, which is an existing open channel. In this case, the proposed localised diversion does not present an increased safety risk and does not involve a crossing of airport infrastructure or utilities and is

ADP Proposal	Alternatives Considered	Preferred option
		therefore considered an acceptable solution. Following analysis, it was also decided to convey both greenfield inflows and airfield clean runoff in a shared pipeline to reduce the extent of construction required and to reduce the impact on airport operations.
Pollution control approach	The following alternatives were considered during the design of Pollution Control Facilities (PCFs): *Separate or combined storage*: - Separate storage of clean and contaminated runoff; or - Combined storage of clean and contaminated runoff in the same tank. *Local or central storage philosophy*: - Local storage philosophy; - Central PCF; or - Combined approach.	*Separate or combined storage*: The separate storage of clean and contaminated runoff is consistent with the project need as it segregates clean and contaminated runoff. This increases clean flow sand reduces contaminated runoff. Separate storage is therefore the preferred alternative. *Local or central storage*: A combined approach was selected to be implemented with all existing developments to be served by central storage, except for West Apron which would be served by local storage (WA-PT). This was determined based on consideration of the extent of construction and pipeline work required and the extent of land available for the location of tanks.
Clean Storage Approach (West Apron)	The following alternative design solutions were considered for the attenuation of runoff from West Apron: - Local storage of the design flood event (1:100 year + 30% Climate Change factor); - Central storage of the design flood event (1:100 year + 30% CC); or - Combined storage approach: Partial Local storage (up to 1:30 year) and provide central storage for the remainder of the design flood event (up to 1:100 year + 30% CC).	The local storage approach was identified as the most efficient design with the lowest impact on airport operational activities.

ADP Proposal	Alternatives Considered	Preferred option
Alternative Layouts		
Pipeline Corridor Route Selection	Pipeline corridor route selection was conducted for the following pipeline routes: - Clean Water Supply Pipelines; - Airfield Contaminated Pipelines; and - CPCF Trunk Contaminated Pipelines.	The following steps were undertaken for each route selection process: - Establish upstream interception points and downstream discharge points. *Screening steps*: - Topography screening; - Airport constraints to find a route which prioritises aviation safety and minimises the impact on critical airport operational activities; - Airport regulations and restrictions; - Environmental baseline screening; and - Interface with other planned developments, *e.g.*, the Underpass Project. When the above screening and exclusion zones were applied to each pipeline route, alternative route corridors were established between the fixed upstream interception points and their corresponding downstream discharge points. Detailed assessment of feasibility of the alternatives including consideration of planning, environmental, human, technical and cost issues was carried out to determine the preferred option.

3.2.2 Preferred Option

Figure 3.1 shows the proposed ADP layout. The ADP will incorporate several components as summarised in **Table 3.2** and briefly described hereunder.

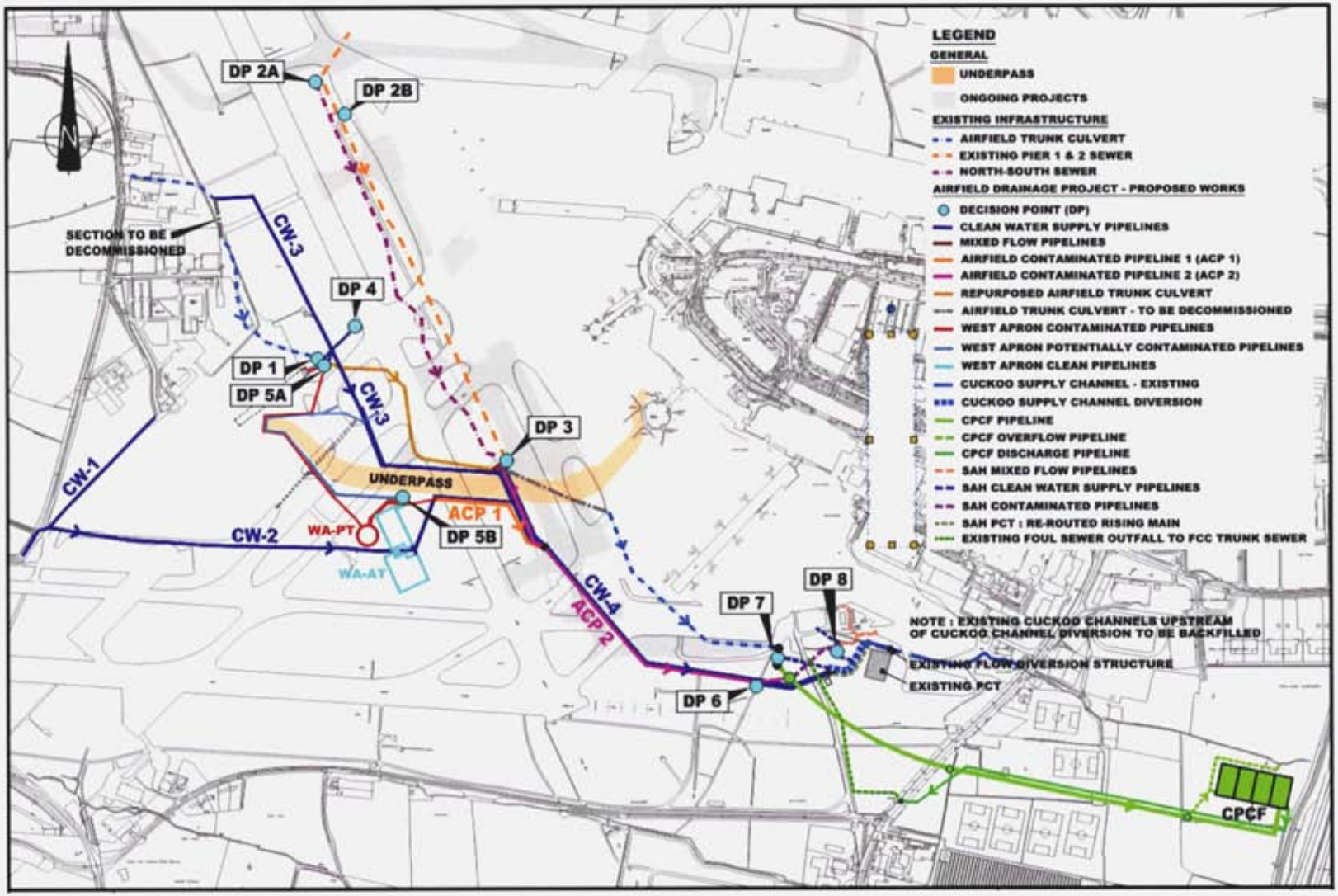

Figure 3.1: ADP layout

Table 3.2: Overview of proposed ADP

ADP Proposal	Description of the Proposed Development
CD&R System	A CD&R system has been designed strategically to maximise the segregation of flows from various "zones" within the airfield. This will serve to increase clean flow to receiving waters and protect receiving waters from contaminated surface water runoff. This system consists of detection devices, network "decision points" (DPs) and associated control kiosks.
Clean Water Supply Pipelines	New clean water supply pipelines (CW-1, CW-2, CW-3 and CW-4) are proposed to convey inflows from greenfield areas, and runoff from the airfield which has been identified as clean, to the receiving waters. This will provide a source of clean water to receiving waters. These pipelines will also provide additional hydraulic capacity to the airfield surface water network.
Airfield Contaminated Pipelines (ACP)	The proposed ACP1 and ACP2 are proposed to receive flows identified as contaminated by the CD&R and provide additional hydraulic capacity to the airfield surface water network.
West Apron Network upgrades	It is proposed to upgrade the West Apron surface water collection network. The upgrades include reconfiguration of the existing network, the proposed West Apron Attenuation Tank (WA-AT), implementation of local CD&R devices, network decision points and construction of the West Apron Pollution Tank (WA-PT).
South Apron (SA) Network Re-configuration	It is proposed to upgrade the existing surface water collection network in the vicinity of SA, to integrate the existing network with the proposed ADP network. The upgrades include reconfiguration of the existing network, construction of network decision points, upgrade of the existing Flow Diversion Structure (FDS) and reconfiguration of the existing Cuckoo Supply Channel.
Central Pollution Control Facility (CPCF) Trunk Contaminated Pipeline	A new trunk contaminated pipeline is proposed to convey contaminated surface water from the airfield to the CPCF, detailed below.
CPCF	A CPCF is proposed to protect receiving waters from contaminated surface water from the airfield. The CPCF includes pollution control tanks and a pumping station with a discharge to sewer. The CPCF also includes ancillary pipeline and Mechanical, Electrical, Instrumentation, Control and Automation (MEICA) works and an electrical substation.
Supervisory Control and Data Acquisition (SCADA) System	A centralised SCADA system is proposed to control the operation of the surface water network. This will require the construction of Control Kiosks, from which the SCADA system can be monitored and maintained. These kiosks will also require electrical power connections and further connections to communicate signals to the central SCADA system.
Change of Function of Existing Drainage Infrastructure	As a result of the proposed surface water network upgrades, the existing Airfield Trunk Culvert (ATC) will be reconfigured. The central section of the existing ATC (between DP1 and the connection point with ACP2) will be re-purposed as a contaminated pipeline. This section of the culvert will be re-labelled as the Re-purposed Airfield Trunk Culvert (RATC).

3.2.3 Pollution Control Infrastructure

3.2.3.1 Central Pollution Control Facility

A Central Pollution Control Facility (CPCF) is proposed to collect and manage contaminated surface water from the whole airfield. It comprises pollution storage tanks and pumping equipment to discharge contaminated flows to the public sewer. The CPCF is designed to protect water quality in the downstream receiving waters, in accordance with surface water quality objectives, and to mitigate the additional demand on existing infrastructure. The facility will serve to increase the resilience of the overall surface water management system against contaminated overflow events.

3.2.3.2 West Apron Pollution Tank

A West Apron Pollution Tank (WA-PT) is proposed to serve the local hardstand area at West Apron.

3.2.4 Contamination Detection and Response System

A contamination detection and response system (CD&R) will be implemented to segregate clean and contaminated flows across the existing and proposed surface water network, across the entire airfield. Flows will be segregated by diverting them to proposed designated clean and contaminated pipelines at network decision points. This system will increase flows to the receiving waters and reduce the volume that will be discharged to sewer.

Once operational, the airfield surface water network will be segregated into nine distinct zones, as shown in **Figure 3.2,** within each of which, the system 'decides' whether the water is clean or contaminated and directs it accordingly,

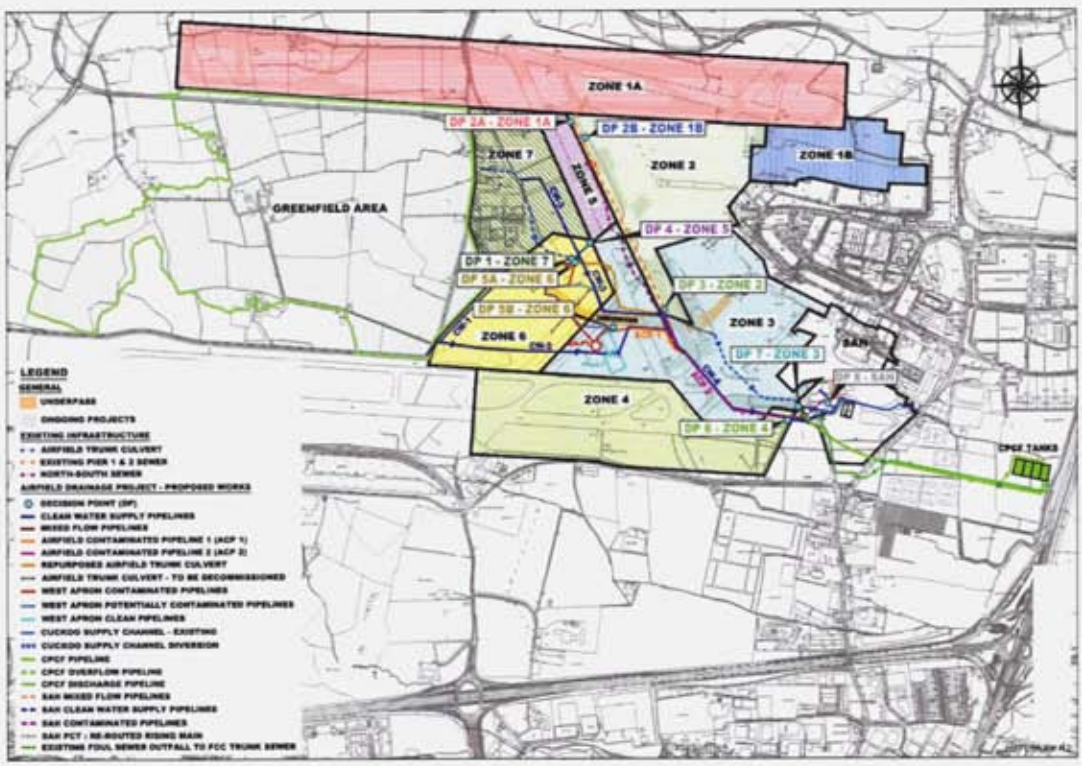

Figure 3.2: Proposed locations of network decision points

A combination of pre-emptive monitoring devices, to detect imminent contamination events, and real-time monitoring devices which indicate the current contamination status of surface water runoff will be used.

The CD&R System comprises monitoring devices which will be installed upstream of network decision points. These monitoring devices include analysers to detect the presence of contaminants in the runoff, temperature gauges (temperature triggers de-icing activities), and rainfall gauges (to analyse the depth of rainfall, which mobilises contaminants to the network). The diversion of flows is achieved by the response system, which consists of network decision point chambers with clean flow and contaminated flow outlets. These flow outlets are controlled by valves that open and close according to whether the runoff is identified as clean or contaminated. Clean flows are diverted to the designated clean pipes and are conveyed to the Cuckoo Supply Channel before continuing onward to the Cuckoo Stream. Contaminated flows will be conveyed to the CPCF to be stored before being pumped to the public foul sewer.

The CD&R system will operate under a safety-first approach which is designed to prioritise the protection of the environment in its decision-making process. For instance, the inclusion of pre-emptive monitoring devices is designed to pre-emptively engage the contamination system response when weather conditions indicate de-icing operations are imminent (or ongoing). This pre-emptive approach means that the system is ready to capture the start of the contamination event, i.e., the "first flush" of contaminated flow. The first flush typically contains the highest concentration of contaminants, and this system is specifically tailored to ensure that this highly contaminated flow is captured and not allowed to enter the receiving waters.

3.2.5 Additional Hydraulic Capacity

Additional hydraulic capacity will be provided through the construction of additional network pipelines for the separate conveyance of clean and contaminated surface water flows.

3.2.5.1 Clean Water Supply Pipelines

The proposed clean water supply pipelines comprise four trunk pipelines, labelled as CW1, CW2, CW3, and CW4 in **Figure 3.1** and **Figure 3.2**. The proposed clean water supply pipelines also include additional sections of pipeline to provide connectivity between the proposed network decision points and the above-detailed trunk clean water supply pipelines. All flows within clean water supply pipelines will be discharged to the re-configured Cuckoo Supply Channel and, ultimately, across the R132 to the Cuckoo Stream.

3.2.5.2 Airfield Contaminated Pipeline

There will be two Airfield Contaminated Pipelines (labelled ACP 1 and ACP 2 in **Figure 3.1** and **Figure 3.2)**. A third pipeline, the CPCF pipeline, receives contaminated flows and carries them to the proposed CPCF; part of this pipeline will include reconfiguration of the Airfield Trunk Culvert (ATC). The overall route of the proposed CPCF trunk contaminated pipeline is shown in **Figure 3.3**.

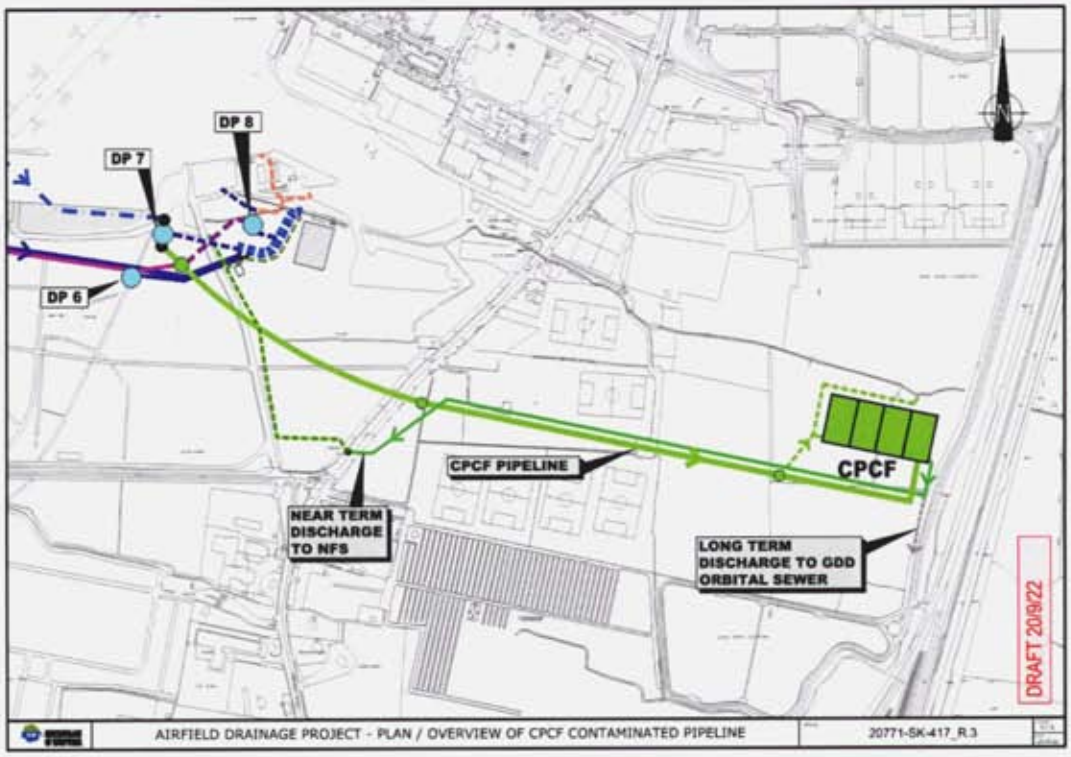

Figure 3.3: Overview of CPCF trunk contaminated pipeline

3.2.5.3 *West Apron*

Local hydraulic capacity upgrades will be carried out at West Apron, comprising the construction of new pipelines and a new attenuation tank, to alleviate existing capacity issues. **Figure 3.4** illustrates the proposed upgrades, which can be summarised as follows:

- Construction of local network upgrades, including slot drains and pipelines, to provide additional hydraulic capacity for the collection and conveyance of runoff from the West Apron hardstand;
- Installation of local CD&R devices, to identify whether runoff from West Apron is clean or contaminated, and network decision points to divert these flows to designated clean or contaminated pipelines according to their status;
- Construction of the proposed local West Apron Pollution Tank (WA-PT), comprising an underground storage tank (with a volume of 3,800m³), for the capture and storage of contaminated runoff, and a pumping station. The pumping station is proposed to be incorporated into the WA-PT storage tank structure and will discharge contaminated outflows to the proposed ACP1. The WA-PT will also include ancillary pipelines and MEICA equipment for the purpose of operational control; and

- Upgrade of the local West Apron clean attenuation system. This includes the construction of new West Apron Attenuation Tank (WA-AT). The existing Regional Attenuation facility is designed to attenuate a portion of the West Apron. The introduction of this additional attenuation volume at West Apron will free up capacity in the existing regional attenuation facility to serve other areas.

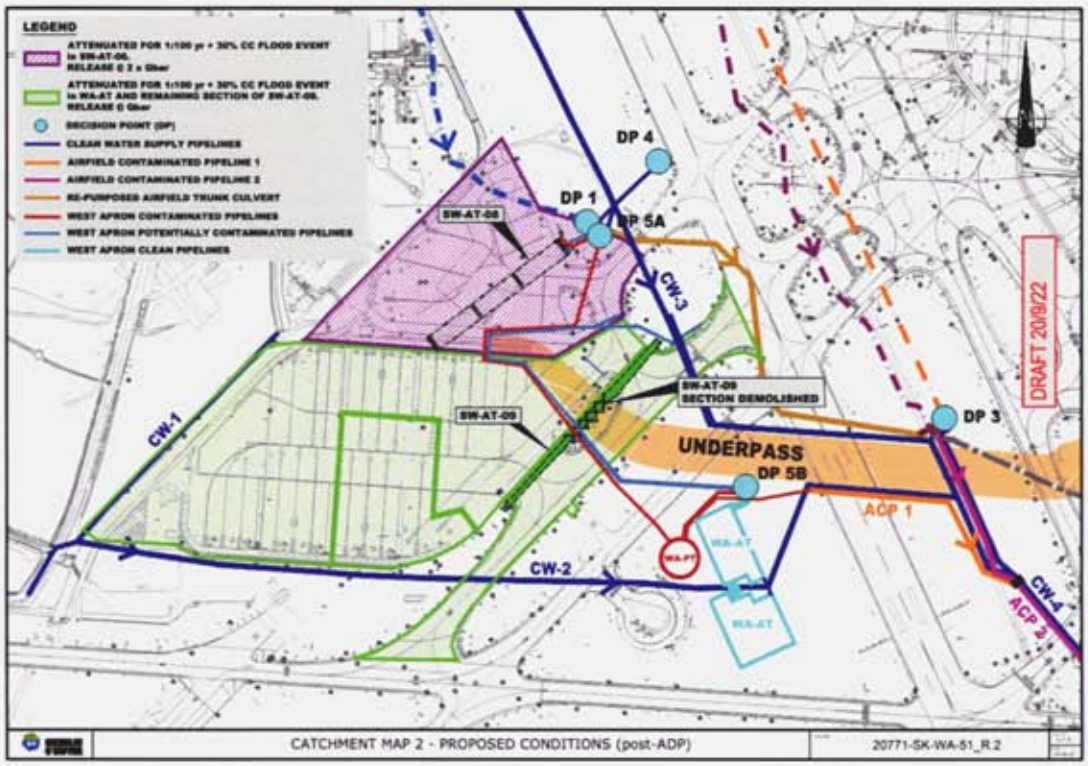

Figure 3.4. West Apron surface water network upgrades

3.2.5.4 *South Apron Network Reconfiguration*

As shown in **Figure 3.5**, the proposed works in the area include:

- reconfiguration of the South Apron (SA) network pipelines;
- construction of a network decision point (DP8);
- localised diversion of the existing Cuckoo Supply Channel;
- decommissioning of existing sections of the channel; and
- reconfiguration of the existing SA surface water network and upgrade of the existing Flow Diversion Structure.

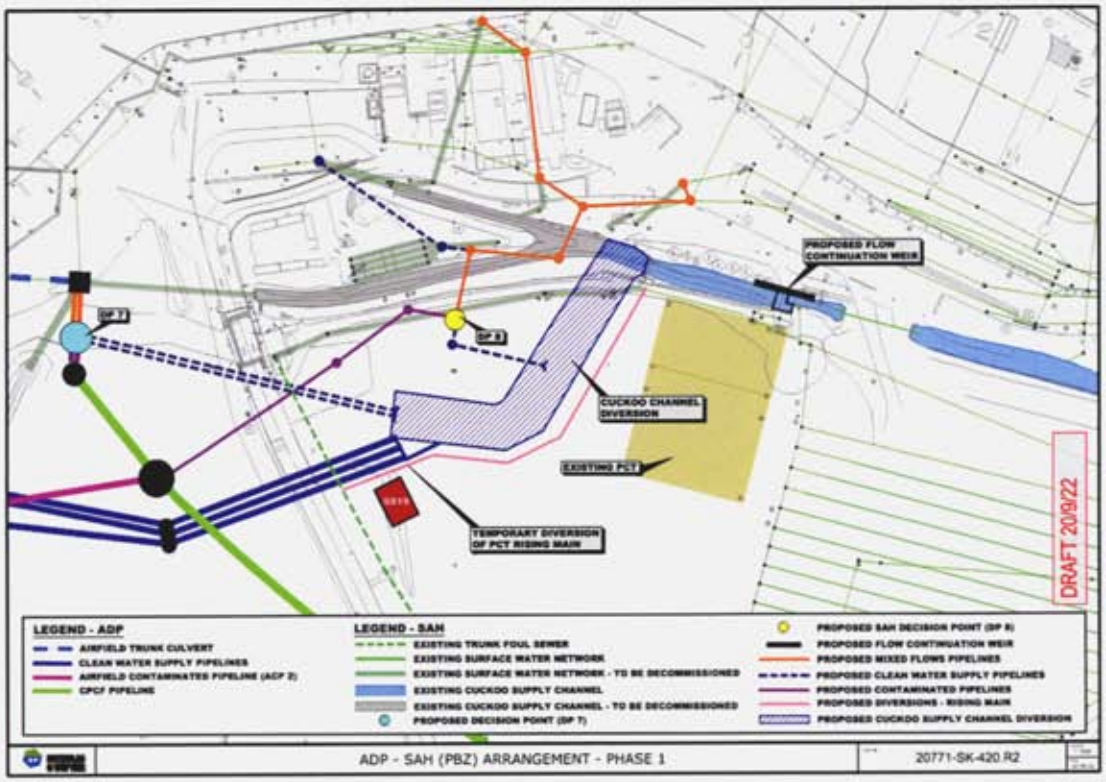

Figure 3.5: South Apron network reconfiguration

The existing SA network discharges all runoff to the existing Cuckoo Supply Channel where it mixes with runoff from the upstream airfield and is subject to flow monitoring. However, if this approach was to be maintained under the ADP approach, clean flows from the upstream airfield network could potentially become contaminated by unmonitored runoff from SA when they mix in the Cuckoo Supply Channel. For this reason, it is necessary to install a network decision point for flows from SA (DP8) so that only flows which are proven to be clean will be discharged to the Cuckoo Supply Channel. A new contaminated pipeline will need to be constructed to convey SA contaminated flows from DP8 to the CPCF Trunk Contaminated Pipeline.

It is also proposed to undertake a localised diversion of the existing Cuckoo Supply Channel, which will collect clean flows from the proposed Clean Water Supply Pipelines. A clean-flow pipeline will be constructed to convey clean flows from DP7 to the diverted Cuckoo Supply Channel. The alignment of the proposed diversion of the Cuckoo Supply Channel has been designed to safeguard area for future planned developments in the vicinity of the existing Cuckoo Supply Channel.

There is an existing Flow Diversion Structure (FDS) on the Cuckoo Stream. The FDS currently serves two functions, (i) to divert contaminated flow to the existing PCT; and (ii) to attenuate clean outflows to the Cuckoo Stream. Under the proposed arrangement, the FDS will no longer serve the contaminated diversion function as clean and contaminated flows will already have been segregated in the upstream network. The FDS will, however, continue to serve the attenuation function. As part of the upgrades, it is not proposed to alter the set points associated with the clean penstock which controls the rate of discharge to the downstream catchment. This means that there will be no impact to the maximum allowable outflow from the airfield to the downstream receiving waters.

It has been noted that some flood events have occurred in the vicinity of the FDS. This is attributed to the fact that there is currently no flow continuation weir incorporated in the existing design, as a flood relief measure for high-flow conditions. Hence, in high flow conditions, there is a risk of uncontrolled bank breaches in this area. Given the proximity of the FDS to SAH, it is imperative to airport operations that the flooding risk is controlled in this area. To achieve this, upgrades are proposed to the flow diversion structure and surrounding areas which are shown on **Figure 3.6** and summarised hereunder.

A Flow Continuation Structure (FCS) is proposed to be installed adjacent to the existing FDS, along the northern bank of the Cuckoo Supply Channel. The FCS will allow flows to overflow to the downstream Cuckoo Supply Channel when the capacity of the attenuation system is exceeded and water surcharges upstream of the FDS. The FCS will be comprised of:

- Flow Continuation Weir: A weir is proposed to be installed upstream of the FDS, parallel to the existing Cuckoo Supply Channel, along its northern bank. The weir is designed such that flows overtop the weir and continue to the Flow Continuation Channel rather than breaching the banks of the channel;
- Flow Continuation Channel: A concrete, rectangular channel is proposed to capture flows which overtop the proposed overflow weir. Flows in the channel will bypass the existing FDS and continue to the downstream section of the Cuckoo Supply Channel, during emergency high-flow conditions; and
- Raising Existing Banks: The level of the existing Cuckoo Supply Channel banks upstream of the FDS will be raised to ensure that flows do not breach the banks, even during high-flow conditions when the flow continuation weir will be in use.

Figure 3.6: Proposed upgrades to the existing flow diversion structure

3.2.6 Central Pollution Control Facility

The proposed Central Pollution Control Facility (CPCF) will be located at Eastlands, to the east of the R132. It will consist of a large below ground storage tank, which will hold contaminated runoff from the airfield prior to discharge to the public sewer. Flows will be discharged from the tank via a combination of a pumped rising main and a gravity pipeline, at discharge rates agreed with Irish Water. The construction of additional storage and pumping infrastructure is designed to protect the receiving waters from contaminated runoff.

The CPCF development includes all MEICA equipment required for its effective operation. Local controls will be provided for operational control of the CPCF and associated pumping equipment in a proposed kiosk located to the east of the CPCF. It is proposed to house all instrumentation and controls associated with the CPCF in this kiosk. All instrumentation and controls associated with the CPCF will be integrated with the site-wide central SCADA system.

It is proposed that a substation will be constructed as part of the development adjacent to the CPCF. This substation will provide an electrical power supply to serve the CPCF pollution storage tank, pumping station and ancillary MEICA equipment.

In addition to the pollution storage tanks and pumping infrastructure, the CPCF will also include the following ancillary developments:

- Interconnecting pipework and flow control mechanisms;
- CPCF control kiosk and associated equipment and instrumentation;
- Ancillary monitoring equipment and instrumentation;
- Emergency overflow pipelines;
- Passive odour control / ventilation facilities (including proposed vent stacks);
- Operational access facilities, including an access road and car parking area;
- An electrical substation; and
- Surface reinstatement and landscaping works.

The locations of the proposed CPCF developments are shown in **Figure 3.7**.

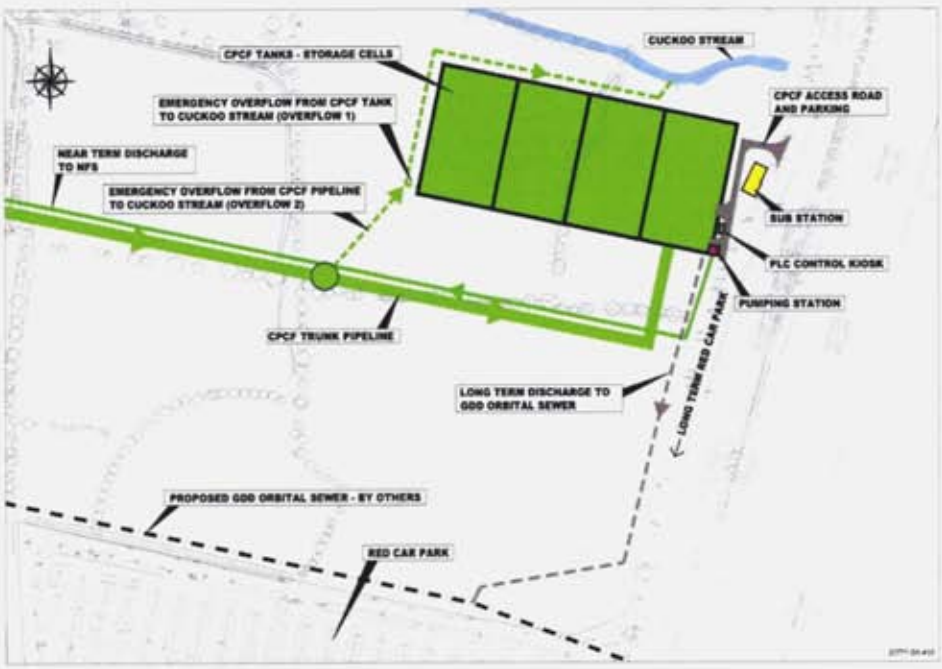

Figure 3.7: Central Pollution Control Facility layout

3.2.6.1 *Sewer Discharge Arrangements*

The proposed CPCF pumping station will pump flows from the CPCF to the public foul sewer at a controlled discharge rate, in accordance with the Trade Effluent Discharge Licence agreement with Irish Water. The proposed physical sewer discharge infrastructure involves a phased approach, with a near-term foul sewer connection to be constructed initially, followed by a long-term foul sewer connection.

The near-term sewer discharge will involve a pumped discharge to the existing North Fringe Sewer (NFS). This will remain in place until such time as Irish Water's Greater Dublin Drainage (GDD) project constructs and commissions the proposed orbital sewer. In the event that the GDD project is not implemented, the NFS option will remain in place as the long-term solution.

If the GDD orbital foul sewer does proceed as planned, the proposed long-term sewer discharge pipelines from the CPCF will discharge to the GDD orbital foul sewer. The proposed long-term sewer discharge solution would involve a combination of both gravity and pumped discharge pipelines. The combined gravity and pumped discharge solution means that, when contaminated water builds up to a sufficient height within the CPCF storage tank, flows can discharge via gravity to the public foul sewer, thereby minimising pumping costs and energy consumption.

3.2.7 SCADA System

A site-wide SCADA system is proposed to enable communication between each of the following elements of the surface water drainage network, in order to achieve an integrated airfield-wide system for surface water runoff management at Dublin Airport:

- The proposed CD&R System;
- The proposed CPCF, including associated pumping equipment and pipelines;
- The proposed West Apron Pollution Tank (WA-PT); and
- Ancillary MEICA equipment throughout the surface water network.

The airfield-wide SCADA system will provide sufficient operational flexibility to enable the system to respond to the real-time weather and flow conditions experienced at Dublin Airport. This means that the performance of the above-listed infrastructure can be optimised as required to protect the receiving waters from potential contamination.

The proposed SCADA system will be controlled by Programmable Logic Controllers (PLCs). These PLCs will feed data to control panels which are to be housed in control kiosks for inspection, and intervention as required, by operations personnel.

The proposed locations of SCADA control kiosks and associated electrical power supplies are shown in **Figure 3.8**.

Back-up power arrangements contingencies are proposed to ensure the continuous effective operation of the SCADA system and the surface water network during emergency events. It is also proposed to provide server redundancy and contingency communication arrangements to enable effective communication and communication of critical data during an emergency event / system failure.

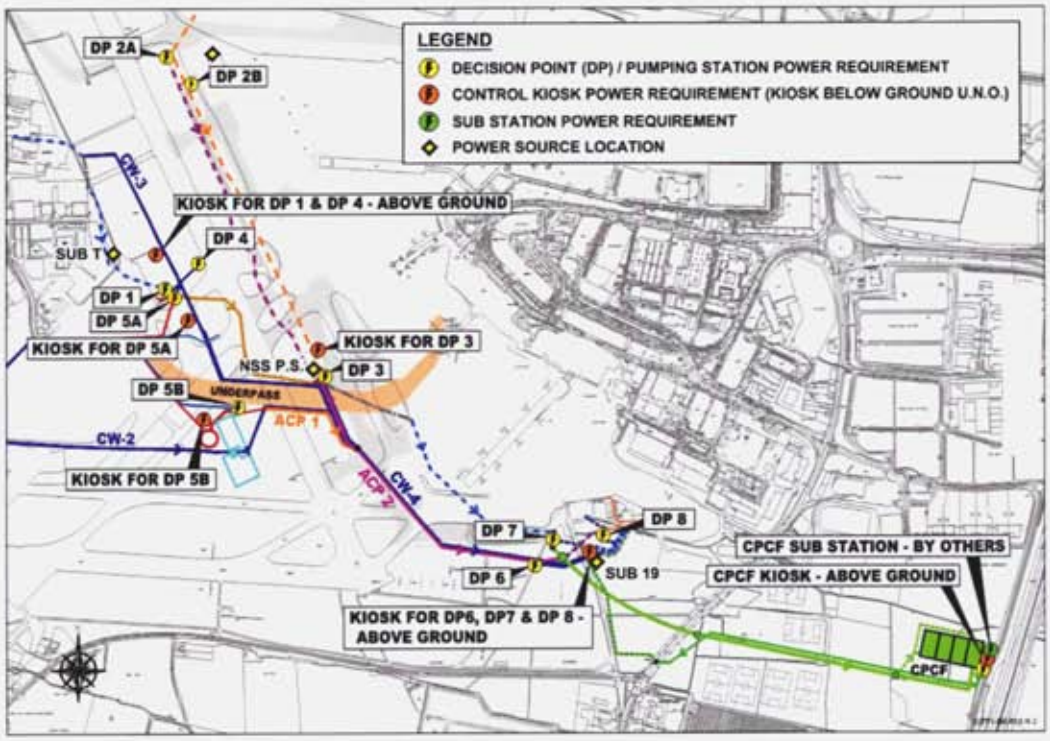

Figure 3.8: ADP facilities requiring electrical power supplies

3.2.8 Existing Infrastructure

As mentioned, part of the existing ATC will be reconfigured as part of the proposed surface water network upgrades. The existing Airfield Trunk Culvert currently serves as the main trunk pipeline for all surface water generated within the airfield at Dublin Airport, and it also conveys the greenfield inflows from areas outside of the airfield, in the upper Cuckoo Stream catchment. Under the proposed arrangement, part of the ATC will be reconfigured as part of the proposed flow segregation approach.

Greenfield inflows from outside the airfield and clean flows from the airfield will be diverted away from this pipeline, via the proposed network decision points and Clean Water Supply Pipelines, with the result that the central section of the ATC will be re-purposed as a contaminated surface water pipeline. The section of the ATC between DP1 and the proposed connection point with the ACP will become known as the Re-purposed Airfield Trunk Culvert (RATC) as it will only convey contaminated flows. The RATC will convey these contaminated flows to the ACP, which in turn flows to the proposed CPCF trunk contaminated pipeline and, ultimately, to the proposed CPCF.

The section of the existing ATC upstream of DP 1 will remain unchanged.

The section of the existing ATC immediately downstream of the proposed ACP connection point will be decommissioned as all flows from the RATC will be diverted to the ACP instead of continuing along the ATC.

Further downstream, the existing ATC will be retained and will continue to collect potentially contaminated runoff from the hardstand surrounding area. These locally collected flows will flow to a proposed network decision point (DP7) which will convey clean flows to the Cuckoo Supply Channel and contaminated flows to the CPCF trunk contaminated pipeline.

The ADP also proposes to re-purpose the existing N-S Sewer to enable flows from the North Runway and North Apron Pollution Control Facilities (PCFs) to be redirected depending on the measured concentration relative to the concentration limits.

3.2.9 Operational Flexibility

The ADP will seek to ensure greater operational flexibility in the network to maximise the efficiency of the system in controlling the varying conditions experienced at Dublin Airport. As described, the system is designed to be responsive to real-time observed conditions.

The proposed ADP developments include safeguarding measures to facilitate planned future developments. These safeguarding measures include the provision of additional hydraulic capacity in the network and the futureproofing of infrastructure for future expansion. This holistic, coordinated approach is designed to support the efficiency and sustainability of future developments at Dublin Airport. The inclusion of these safeguarding measures will reduce the need for future repeat construction at a given location, with the result that the combined impact of current and future developments on airport operations is reduced. This means there would be less operational disruption and fewer temporary closures of airport infrastructure (e.g., taxiways and runways) during future developments, as well as an increased efficiency of construction works and reduced cumulative environmental impact.

3.3 Construction

3.3.1 Site Access

Access to the airfield for the proposed works will be via Gate 22 off Old Airport Road.

3.3.2 Construction Logistics

The construction logistics associated with the proposed construction of the ADP developments will be detailed in the preliminary Construction Environmental Management Plan (pCEMP and the Construction Traffic Management Plan (CTMP).

The pCEMP will address the following key construction logistics information:

- Details of the proposed construction compounds. This includes details of the main construction compounds, local compounds and construction consolidation centres (CCCs);
- Details of working procedures, operational constraints and consents and permitting requirements for works in both airside and landside locations; and
- The protection, diversion, and replacement of utilities.

It will also provide information regarding the potential construction methodologies which are anticipated to be used for the delivery of the following infrastructure:

- Network pipelines (open-cut excavation vs trenchless construction);
- Pollution Control Facilities (PCFs);
- Surface water attenuation tanks;
- Network decision points and associated control kiosks; and

- Cuckoo Supply Channel diversion and associated structures.

The CTMP will include descriptions of the following key construction logistics information:

- Construction access routes, including details of access points to the Critical Part of the Security Restricted Area (CPSRA);
- Access restrictions and permitting / accreditation requirements which apply at airside (within the CPSRA) and landside (outside the CPSRA) locations; and
- The impact of the proposed works on public roads.

The works will be implemented in line with a phasing plan designed to minimise disruption of current operations.

3.3.3 Demolition and De-commissioning

No demolitions of above-ground buildings or structures are proposed as part of the ADP. However, the construction of some proposed ADP developments will necessitate the decommissioning and / or removal of certain elements of underground surface water infrastructure.

The North-South Sewer pumping station and the associated rising main will be decommissioned. The North-South Sewer consists of a section of gravity sewer in the north of the airfield which flows to a pumping station, from where flows are pumped to the existing 900mm diameter trunk foul sewer serving Dublin Airport. Instead, the ADP proposes to divert flows from the North-South Sewer gravity pipeline to a proposed ADP decision point.

Sections of existing surface water pipelines and ancillary structures will require demolition and / or decommissioning. The requirements for management and disposal of construction and demolition waste are detailed in the pCEMP

The protection, diversion and replacement of existing utilities may also be required at certain locations, to facilitate the proposed drainage infrastructure developments, as detailed in the pCEMP.

3.4 Operation

3.4.1 Access and Parking

Access will be required to several surface water infrastructure assets throughout the operation phase, to facilitate their operation, inspection and maintenance. Access will be required to surface water infrastructure assets within the airfield and also to those located at the Eastlands site, during the operational phase of the proposed surface water system.

The surface water assets within the airfield can be accessed, during the operational phase, via three existing access points to the airfield. Local access to individual surface water infrastructure assets will be gained via the existing airfield road network. Details of these access points and the existing airfield road network are provided in the pCEMP.

The existing access road which serves the existing car hire facility, will be modified to provide access to the Eastlands site. Local access to surface water assets within the Eastlands site will be provided in the form of a new access road to be constructed as part of the ADP. Three parking spaces at the CPCF for operational vehicles are proposed.

3.4.2 Operation of the ADP

As described, the airfield-wide SCADA system will control the operation of the CD&R, PCFs (CPCF and all local PCFs) and ancillary MEICA equipment and instrumentation.

A key requirement of the proposed integrated control system is to facilitate operational flexibility in the performance of each constituent element. This operational flexibility enables the system to adjust and optimise performance in response to the real-time conditions (e.g., weather, flow, contamination status) experienced at Dublin Airport.

Non-default operations may be required when either the pollution control automated system fails to operate as required for any reason, an unforeseen incident / event occurs, or extreme weather conditions occur which require additional intervention beyond the automated response. Non-default operation is required in these cases to ensure the system is restored to correct operation or to optimise system performance in response to the exceptional conditions experienced.

The system has been subjected to a rigorous risk assessment procedure to ensure that it can effectively respond to the broad range of runoff and weather conditions or operational scenarios which can arise at Dublin Airport. The following Operational Procedures (OPs) have been prepared to describe the operation of the system, under a range of default and non-default operational conditions:

- OP 1.1: De-icing and anti-icing operations.
- OP 1.2: De-icer chemical spillage events.
- OP 2: Fuel / oil spillage events.
- OP 3: Snow melt events.
- OP 4.1: PCF tank exceedance mitigation and emergency responses.
- OP 4.2: Sewer discharge rate adjustment to optimise system performance.

The EIAR addresses details of the proposed contingency arrangements for emergency scenarios such as a power cut, equipment failure, a SCADA communication failure or a SCADA server crash.

4 SCOPE OF THE ASSESSMENT

4.1 Introduction

In conducting their assessments and preparing the EIAR, the NOD team will follow the guidelines and useful reference documents, including:

- Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, May 2022);
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements" (EPA, 2003);
- Advice Notes for Preparing Environmental Impact Statements Draft (EPA, September 2015);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (Department of Housing, Planning and Local Government, August 2018); and
- European Commission Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU) (European Commission, 2017).

4.2 The EIAR Team

The Dublin Airport Authority has engaged NOD to coordinate surveys, consultations and prepare the EIAR for the ADP. **Table 4.1** lists the companies working on the EIAR with NOD.

Table 4.1: EIAR Project Team

Environmental Factor	Expert addressing factor
EIAR Coordination	Nicholas O Dwyer Ltd.
Non-technical summary	Nicholas O Dwyer Ltd.
Project description, alternatives considered, policy context, future development considerations, disasters and emergencies, and climate	Nicholas O Dwyer Ltd.
Population and human health	Nicholas O Dwyer Ltd.
Landscape and visual amenity	Stephenson-Halliday Ltd.
Land, soil, geology & hydrogeology	AWN Consulting Ltd.
Hydrology	AWN Consulting Ltd.
Air quality & climate	AWN Consulting Ltd.
Noise & vibration	AWN Consulting Ltd.
Waste management	AWN Consulting Ltd.
Material Assets	Nicholas O'Dwyer Ltd.
Archaeology & cultural heritage	Courtney Deery Ltd.
Biodiversity (including habitats, birds, mammals, aquatic, invasive species)	Altemar Ltd.

4.3 Scope of the EIAR

The EIAR will document the current condition of the environment within the zone of influence (which is determined depending on the environmental factor under assessment) of the proposed development site, and through desk studies, field work, modelling, and analysis, will identify the likely significant effects, if any, of the proposed development on the environment. The assessment process will serve to highlight any areas where mitigation measures may be necessary to address potential adverse effects by incorporating them into the design or include measures to limit their effects to within acceptable levels, in accordance with established standards and guidelines.

The objectives of the EIA and design process is to facilitate the best environmental design that achieves the objectives of the project proposal and ensures that it can be sustainably accommodated in the surrounding environment.

4.3.1 General Structure

The information to be contained in an EIAR is specified in Schedule 6 of the Planning and Development Regulations, 2001 (as amended) and in the updated EIA Directive 2014/52/EU. The EIAR for the ADP will describe the existing environment in terms of each of the environmental factors, the likely significant effects of the proposed development, and the proposed mitigation measures, under chapter headings for each environmental factor.

The EIAR will be presented in four volumes. Volume I will be a Non-Technical Summary, which is a condensed and easily comprehensible version of the EIAR document. The Non-Technical Summary will be a concise statement of the significant findings and recommended actions presented in the EIAR. Volume II will contain the chapters of the

report, presented in two parts. Part 1 will include an introduction, project description, alternatives considered, policy context, disasters and emergencies, future development and climate. Part 2 will comprise chapters for each environmental factor. Volume III will contain technical appendices related to each chapter, and Volume IV will present figures and visualisations in an A3 volume.

4.3.2 Use of Standards and Methodologies

Industry-wide, best practice methodologies and standards will be used in preparation of the EIAR. The classification of effects in the EIAR will follow the definitions provided in Section 3.7 of the EPA's Guidelines on the Information to be contained in Environmental Impact Assessment Reports (May 2022). Effects will be described in terms of quality, significance, extent, probability, duration and frequency, and type as relevant. A 'Do Nothing' effect will also be predicted in respect of each environmental factor in the EIAR. Residual effects which will arise following the application of mitigation measures will be presented, where applicable, for each environmental aspect of the EIAR.

Impacts of the proposed development on all environmental aspects will be assessed in terms of the construction, operational and decommissioning phases of the proposed development, including whether any new effects are likely to arise from impact interactions, and potential cumulative impacts with other projects.

4.3.3 Environmental factors & potential impacts

4.3.3.1 Population and Human Health

The assessment of the potential effects of the proposed development on the population and human health of the receiving community will be assessed by way of a desk study of data sourced from the Central Statistics Office, Fingal County Council including the County Development Plan, Fáilte Ireland, Pobal, HSE, and other literature pertinent to the area.

Aspects to be addressed in this chapter include:

- characteristics and health of the population;
- employment and economic activity;
- community benefit;
- land-use;
- community facilities and amenity;
- tourism;
- health and safety; and
- vulnerability to accidents and natural disasters

Potential impacts from the proposed development relate primarily to the construction stage including noise, dust, and traffic disruption. These would be short-term temporary impacts that will be managed as set out in Construction Environmental Management Plan for the project which will be provided with the EIAR. During the operation stage, potential impacts related mainly to extreme events or abnormal operation, such as in the event of potential flooding, will be assessed. This assessment will be informed also by the Flood Risk Assessment which will be prepared as part of the planning application.

4.3.3.2 *Biodiversity*

The presence of Annex I (Habitats Directive) habitats, if any, will be recorded, and their condition assessed. Comment will be made on the significance of species recorded such as Irish Red Data Book status or presence of flora protected under the Irish Flora Protection Order (1999). Potential impacts on mammals and birds will also be covered in the EIAR.

The potential impacts on the aquatic environment will be assessed in the EIAR including consideration of effects on surface water flows and water quality. Changes in these parameters could impact habitats and species of conservation interest. Indicators include fish and invertebrate populations in the aquatic environment. The WFD assessment will help to inform the EIAR assessment in this regard and will be included with the planning application.

The AA screening will determine whether an NIS will be required in respect of the European Sites located downstream of the Cuckoo Stream. The EIAR will consider the findings of the AA process. Other considerations include potential impact to riparian habitat/vegetation and invasive species.

Aspects to be addressed in the biodiversity chapter include designated areas; flora in the existing environment, including habitat mapping; fauna in the existing environment, including bats, other terrestrial and aquatic species; invasive alien species; and proposals for mitigation and enhancements.

Impacts on flora and fauna, including birds and the aquatic ecology, will be assessed in terms of the construction, operational and decommissioning phase of the proposed development. Potential impacts of the ADP on biodiversity include loss of habitat in the footprint of the development; damage to habitats during construction and impacts on water dependent habitats resulting from changes to drainage in the site (including potential positive impacts).

4.3.3.3 *Hydrology*

The nature of the ADP involves direct intervention to the management of the surface water of the site. Data gathered during project development, including modelling results, will be used to assess the impacts of the proposals on surface water. A monitoring programme will be developed to determine whether predicted impacts on flow and water quality are, in effect, achieved; whether predictions made are accurate; and to monitor the effectiveness of any proposed mitigation. An ongoing, long-term programme will allow daa to determine whether any changes to the hydrology resulting from the project will result in positive impacts to the receiving waters that could help to improve its status in the long-term.

During construction, potential negative impacts include contamination of watercourses from surface water runoff passing through the construction site, and damage or disturbance to the Cuckoo Stream. Appropriate mitigation measures will be proposed in the EIAR and o preliminary CEMP.

A site-specific flood risk assessment will be undertaken, and potential downstream receptors such as infrastructure or dwellings and designated conservation sites including hydrological connectivity with the project will be considered. A WFD assessment will also inform the assessment of impacts on hydrology in the EIAR.

4.3.3.4 *Land, Soils, Geology, Hydrogeology*

A desk study review of the land, soil, geology, and hydrogeology (ground water) of the area will be carried out, including inspection of any records available from Geological Survey of Ireland (GSI), wells database, aquifer protection zones, and site investigation records, to determine the bedrock and overburden geology. The desktop study will also review locations relative to any geological heritage areas and consultation will be undertaken with the GSI where relevant.

An assessment will be undertaken to determine if there are any significant effects on the environment with respect to the requirements for the proposed development (construction and operation). Mitigation measures for soil and dust management during construction will be reviewed and proposed as necessary.

4.3.3.5 *Noise*

Noise will require a site visit and baseline noise survey to determine the prevailing noise level representative of the site and nearest noise sensitive locations. All surveys will be performed in accordance with ISO 1996: "Description Measurement and Assessment of Environmental Noise". All measurements will be taken using Class 1 Precision Sound Level Meters and associated hardware.

Noise sensitive receptors within 150m of the ADP boundary include houses, commercial premises, the Boot Inn, farmyards, and an industrial estate and ALSAA recreational grounds. Other noise sensitive receptors include Dardistown Cemetery, which is located adjacent to the Eastlands work area, approximately 50m from the ADP boundary at its closest point, and Silloge Golf Course, located approximately 750m south of the ADP project boundary.

It is noted, however, that the existing operations at the airport result in a relatively noisy environment.

4.3.3.6 *Air & Climate*

The air quality and climate chapter will consider the potential impacts of the ADP and any additional ancillary activities. The assessments will include the impact of the proposed development during the construction phase and associated greenhouse gas (GHG) emissions during construction and operation.

The baseline survey will reference EPA monitoring data which is representative of the current location which lies in Zone A of the 4 Air Quality Monitoring Zones (A-D) in Ireland.

Air Quality - Construction Dust

A review of the construction phase impacts, including excavations on ambient PM10, PM2.5 and dust deposition will be assessed. A qualitative assessment of the potential for dust nuisance and the remediation measures to be employed will be included. The appraisal will be carried out to assess the risk to sensitive receptors of dust soiling and health impacts due to the construction phase in accordance with the Institute of Air Quality Management's publication "Management Guidance on the Assessment of Dust from Demolition and Construction"[6]. A dust minimisation plan will be formulated based

[6] IAQM (2014) Guidance on the Assessment of Dust from Demolition and Construction

on the specific construction activities to be carried out and by drawing on best practice guidance from both the UK and the USA.

Air Quality - Road Traffic

The UK DMRB screening model developed by the UK Highways Agency[7] will be employed to identify the risk of an exceedance of the air quality standards from the proposed development.

Concentrations of NO_2 and PM10 during the construction year, opening year and development year, both with and without the proposed development, will be determined for the most sensitive residential receptor points in the vicinity of the proposed development. The predicted ambient concentrations will be converted into the appropriate format for comparison with the EU limit values.

Climate

In assessing the impact of the proposed development on climate, and cognisant of Ireland's National Climate Action Plan 2021, the following will be conducted:

- desktop assessment of current national GHG emissions from available EPA data;
- review of regulations and standards relevant to the assessment; and
- assessment of construction and operational stage activities likely to produce GHG emissions impacting climate.

The climate impact assessment will involve an assessment of the impact of the traffic generated from the proposed development on GHG emissions by quantifying the GHG emissions for the "do minimum" and "do something" scenarios. Modelling will be carried out using the UK DMRB screening assessment model in line with the most recent UK Highways Agency guidance[8]. Results will be compared against Ireland's climate targets for future years.

4.3.3.7 Landscape & Visual

As described, the ADP will be situated primarily within the existing airfield which has been substantially modified by aviation infrastructure. The receiving environment is therefore of very low sensitivity to the type of development proposed. The area where the CPCF would be located is a greenfield site allocated for future airfield expansion. Most of the proposed development will be beneath ground level and situated in currently developed land where sensitive landscape features and visual receptors are absent. Thus, the landscape and visual impacts associated with construction would be of short duration and temporary with negligible permanent effects. The CPCF location is more sensitive due to the presence of hedges and pasture fields. There will be above ground components adjacent to the existing road that leads to airport parking. These will be small in scale and impacts on landscape character and visual amenity will be very limited.

[7] UK Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3

UK Highways Agency (2019) UK Design Manual for Roads and Bridges (DMRB), Volume 11, Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 LA 105 Air quality

[8] UK Highways Agency (2019); and UK Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 14 LA 114 Climate

Given the characteristics of the proposed development and the nature of the effects described above, this chapter will present an appraisal of effects and will be used to inform mitigation. The appraisal will focus on the CPCF area and pipeline. It will identify important features in the landscape and where views of the proposed development during construction and operation are likely to occur. Annotated photopanels will be included.

4.3.3.8 Archaeology and Cultural Heritage

This chapter of the EIAR for the ADP will address archaeological heritage, and architectural and cultural heritage. The assessment of potential effects of the proposed development on the archaeology and cultural heritage resource of the project site and surrounding area, will be assessed for the construction, operation, and decommissioning phases. The assessment of impacts on architectural and cultural heritage will be carried out in accordance with the Architectural Heritage Protection Guidelines for Planning Authorities (Department of Arts, Heritage, and the Gaeltacht, 2011).

It is likely that potential significant impacts arising from the proposed development on the monuments of historical value can be avoided by ensuring that works are not carried out within their vicinity, outside of an agreed buffer. Thus, mitigation by avoidance will be the preferred approach.

4.3.3.9 Material Assets

This chapter will address utilities, traffic, and waste as required.

Traffic & Transport

The traffic impact assessment will address the traffic impacts on the road network from the construction, operation and decommissioning of the proposed ADP. The assessment will include consideration of the supply of materials, plant, and equipment. An CTMP is being prepared and will be included with the EIAR.

Aviation & Utilities

Reference will be made to the Drainage Master Plan (DMP) for information on utilities and additional requirements in this regard as well as any associated potential risks. Aviation requirements, security and standards will be presented as relevant in the context of the proposed ADP and any potential significant implications.

Waste

This section will present waste quantities, EWC codes, management, and treatment options for the construction phase. Any potential waste streams that may be generated as part of the operational phase will also be described and waste management options discussed in line with the waste management hierarchy.

4.3.3.10 Impact Interactions and Cumulative Effects

Potential interactions of effects between the various aspects of the environment addressed in the EIAR will be presented in a matrix. The matrix will highlight the occurrence of new impacts, whether positive or negative, which may arise from impact interactions during all phases of the proposed development.

Each EIAR chapter will consider the cumulative impacts of the proposed ADP with other projects currently proposed or in development within and near the site, and in the surrounding community.

4.3.3.11 Schedule of Mitigation Measures

A schedule of all proposed mitigation measures relating to the construction, operation and decommissioning phases for the proposed ADP as set out for each environmental aspect of the EIAR will be presented. The pCEMP which will be presented as an Annex to the EIAR and will incorporate the proposed mitigation measures.

The proposed mitigation measures will be grouped together according to their environmental field/topic and presented under the following headings:

- Construction Management;
- Drainage Design and Management;
- Soils and Geology;
- Surface Water;
- Flora and Fauna;
- Noise;
- Air Quality/Dust;
- Landscape and Visual;
- Traffic; and
- Cultural Heritage.

Presenting the mitigation proposals in this format, will provide an easy to audit list that can be reviewed and reported on during the future phases of the project.

4.4 Other Assessments

As mentioned, in addition to the EIAR, an Appropriate Assessment Screening and a Natura Impact Statement if required, will also be prepared in line with the requirements of the EU Habitats and Birds Directives. A WFD Assessment and Flood Risk Assessment will also be carried out. These will inform the EIAR and will be submitted as standalone documents with the planning application.

Appendix 2.2

Scoping Responses

NICHOLAS O'DWYER

daa

An Roinn Tithíochta,
Rialtais Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

Our Ref: **G Pre00296/2022**
(Please quote in all related correspondence)

27 January 2023

Krista Farrugia
Principal Environmental Consultant
Unit E4,
Nutgrove Office Park,
Nutgrove Avenue,
Dublin 14,
D14 V3F6

Via email: kfarrugia@nodwyer.com

Re: Response in relation to query regarding EIA Scoping Consultation for proposed Airfield Drainage Project (ADP) at Dublin Airport

A chara

I refer to correspondence received in connection with the above.

Outlined below are underwater archaeological observations/recommendations of the Department co-ordinated by the Development Applications Unit.

Underwater Archaeology

The Department has reviewed the enquiry from Ms Krista Farrugia dated 13.12.2022 and notes the comments received regarding whether an Underwater Archaeological Impact Assessment (UAIA) is required. The Department recommends that the archaeological consultant appointed to write the Cultural and Archaeological Heritage chapter of the Environmental Impact Assessment Report (EIAR) includes an assessment of the waterways as follows:

A. A desktop assessment that addresses the underwater archaeological and built (including riverine/fishing/industrial) heritage of the proposed development area. The assessment shall include a full inventory and mapping of the sites of all identified archaeological/cultural heritage features and structures (including those identified underwater and bridges, fording points) and shall also include maps/drawings that clearly indicate any proposed impacts on these assets/areas of archaeological potential arising from the proposed project. The UAIA shall assess all proposed in-water development and shall also assess any proposed Site Investigation impacts and potential secondary or indirect impacts such as construction works to facilitate access and areas of scouring as a result of potential changes in hydrology.

B. The EIAR should comment on the degree to which the extent, location and levels of all proposed works and other sub-surface/in-water works required for a development may impact upon any underwater cultural or archaeological remains. This report should be illustrated with appropriate plans, sections and photographs. Where archaeological materials are shown to be present, further mitigation measures will be required. These may include recommendations for institution of appropriate buffer zones, redesign to allow for preservation in situ, dive surveys, metal detection surveys or excavation and/or monitoring as deemed appropriate. The Department will advise the developer with regard to these matters. No construction works shall commence until the Department has had the opportunity to fully evaluate the findings of the UAIA and the Department's recommendations have been received by the Planning Authority.

The above observations/recommendations are based on the papers submitted to this Department on a pre-planning basis and are made without prejudice to any observations that the Minister may make in the context of any consultation arising on foot of any development application referred to the Minister, by the planning authority, in his role as statutory consultee under the Planning and Development Act, 2000, as amended.

You are requested to send any further communications to this Department's Development Applications Unit (DAU) at manager.dau@npws.gov.ie, or to the following address:

The Manager
Development Applications Unit (DAU)
Government Offices
Newtown Road
Wexford
Y35 AP90

Is mise, le meas

Sinéad O' Brien
Development Applications Unit
Administration

From: Matthew Carroll [redacted]
Sent: 29 November 2022 16:42
To: Krista Farrugia
Cc: Roisin O'Callaghan
Subject: FW: Inland Fisheries - EIA Scoping Consultation Document for Airfield Drainage Project, Dublin Airport

Hi Krista,

My colleague, Roisin will be away for the foreseeable future and passed on the EIA Scoping Consultation Document for Airfield Drainage Project, Dublin Airport for comment.
I have had limited involvement in previous consultation process; however, the proposed project involves substantial infrastructural works on the existing drainage network, which may result in direct or indirect discharges of deleterious materials into adjoining surface water courses during the construction phase of the project.
Section 4.3.3 of the EIA- SCD, Environmental factors & potential impacts, sub-section 4.3.3.4 Land, Soils, Geology, **Hydrogeology** states that "*An assessment will be undertaken to determine if there are any significant effects on the environment with respect to the requirements for the proposed development* ***(construction and operation). Mitigation measures for soil and dust management during construction will be reviewed and proposed as necessary***".
Sub-section 4.3.3.11 Schedule of Mitigation Measures states "*A schedule of all proposed mitigation measures relating to the construction, operation and decommissioning phases for the proposed ADP as set out for each environmental aspect of the EIAR will be presented. The pCEMP which will be presented as an Annex to the EIAR and will incorporate the proposed mitigation measures.*".
The recognition of the necessity of mitigation measures to protect the aquatic environment is welcomed by IFI.
There can be no further deterioration of status in any surface water body resulting from the construction or operational phases of the proposed project, and it is recommended that robust and site-specific mitigation measures are incorporated into the pCEMP which should be incorporated into the final CEMP to protect surface waters.

Please see below, general commentary on infrastructural projects involving large scale civil works that may possibly impact adjoining water courses.
When drafting the pCEMP for the EIAR, IFI's GUIDELINES ON PROTECTION OF FISHERIES DURING CONSTRUCTION WORKS IN AND ADJACENT TO WATERS, may be helpful.

- IFI have published the following guidelines which should be referred to at the design stage of a project to ensure protection of the aquatic environment. GUIDELINES ON PROTECTION OF FISHERIES DURING CONSTRUCTION WORKS IN AND ADJACENT TO WATERS https://www.fisheriesireland.ie/sites/default/files/migrated/docman/2016/Guidelines%20Report%202016.pdf

- IFI are opposed to any culverting or re-routing of any surface water course, temporary or otherwise, pre or post construction phases, except for in extreme or emergency situations. We would also encourage that the application of nature-based solutions (where feasible) be incorporated as part of the drainage attenuation design for surface water management as opposed to hard engineering solutions, such as underground attenuation tanks.

- All discharges from the site must follow the European Communities (Surface Water) Regulations 2009 and the European Communities (Groundwater) Regulations 2010.

- Pipe laying activities, general ground works and pipe connections poses a high risk of suspended solids and other deleterious matter entering surface waters, especially where there is existing connections on-site to the surface water drainage network, which is hydraulically connected to water courses.
  If pumping is required from excavations such as thrust and reception pits or land trenches along the route, then water must be treated before discharge to any existing drainage network. There can be no direct pumping of contaminated water from the works to a watercourse at any time.

- Ground preparation and associated construction works, including large-scale topographic alteration, the creation of roads, buildings, and footpaths, have significant potential to cause the release of sediments and various pollutants into surrounding watercourses. Pollution of the adjacent freshwaters from poor on-site construction practices could have a significantly negative impact on the fauna and flora of surface water systems. A comprehensive and integrated approach for achieving stream protection during construction and operation (in line with international best practice) should be implemented. Construction works must be planned in a manner which prevents extensive tracts of soils from being exposed at any time and arrangements must be made for the control and management of any contaminated water resulting from construction.

Regards,
Matt

Matthew Carroll

Fisheries Environmental Officer

Inland Fisheries Ireland- Dublin

Iascach Intíre Éireann
Inland Fisheries Ireland

[redacted]

Matthew Carroll
Fisheries Environmental Officer

[redacted]

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From: INFO <Information@tii.ie>
Sent: 25 November 2022 15:31
To: Krista Farrugia
Cc: Laurie McGee
Subject: RE: TII - EIA Scoping Consultation Document - Airfield Drainage Project, Dublin Airport

Dear Ms. Farrugia,

Thank you for your email of 10 November 2022 regarding the above. The position in relation to your enquiry is as follows.

The issuing of this correspondence is provided as best practice guidance only and does not prejudice Transport Infrastructure Ireland's (TII) statutory right to make any observations, requests for further information, objections or appeals following the examination of any valid planning application referred.

With respect to EIAR scoping issues, the recommendations indicated below provide only general guidance for the preparation of an EIAR, which may affect the national road network. Future Luas, Metro and BRT alignments are a matter for the National Transport Authority (NTA).

The EIAR scoping document provided describes the project for daa plc as the proposed Airfield Drainage Project (ADP) at Dublin Airport that "proposes significant upgrades to the surface water management infrastructure at Dublin Airport including upgrade of existing drainage infrastructure and construction of additional infrastructure to supplement the performance of the existing surface water management system at Dublin Airport."

TII notes that additional surface water drainage infrastructure, including a new Central Pollution Control Facility (CPCF) with control pumping station into which a new trunk contaminated pipeline is proposed to convey contaminated surface water from the airfield, is indicated at Figure 3.1: ADP layout that indicates the spatial layout of the preferred ADP option. The proposed CPCF is indicated to be located just west of the M1 and just south of the Cuckoo Stream, indicated as running under the M1 at Figure 2.3: Upper Cuckoo catchment and indicative surface water network.

At this location the M1 forms part of TII Motorway Maintenance and Renewals Contract (MMaRC) Network A. Therefore, please be advised that:

- Consultation with the Motorway Maintenance and Renewals Contract Network A Contractor is required, via the relevant road authorities, in relation to any works proposed, including signage, that may affect the motorway/national roads and associated junctions in terms of operational requirements such timetabling.

- Sufficient information should be submitted with the planning application to demonstrate that the proposed development will not have a detrimental impact on the capacity, safety or operational efficiency of the national road network, including its drainage services in the vicinity of the site. Significant improvements to the national road network have been overseen by County Councils, as road and planning authorities for their respective areas, in collaboration with TII. There is an onus and a policy requirement on road and planning authorities to safeguard the national investment made. In particular, TII advise that national road surface

water drainage regimes are constructed with the objective of disposing of national road surface water only, it is important that capacity in the drainage regime is retained to address this essential strategic function. TII will not support proposals for development to discharge or impact national road drainage infrastructure.

In relation to the EIAR, the developer/scheme promoter should have regard, inter alia, to the following:

- Consultations should be had with the relevant Local Authority/National Roads Design Office with regard to locations of existing and future national road schemes,

- TII would be specifically concerned as to potential significant impacts the development would have on the national road network (and junctions with national roads) in the proximity of the proposed development,

- The developer should assess visual impacts from existing national roads,

- The developer should have regard to any Environmental Impact Statement and all conditions and/or modifications imposed by An Bord Pleanála regarding road schemes in the area. The developer should in particular have regard to any potential cumulative impacts,

- The developer, in conducting Environmental Impact Assessment, should have regard to TII Publications (formerly DMRB and the Manual of Contract Documents for Road Works),

- The developer, in conducting Environmental Impact Assessment, should have regard to TII's Environmental Assessment and Construction Guidelines, including the Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (National Roads Authority, 2006),

- The EIAR should consider the Environmental Noise Regulations 2006 (SI 140 of 2006) and, in particular, how the development will affect future action plans by the relevant competent authority. The developer may need to consider the incorporation of noise barriers to reduce noise impacts (see Guidelines for the Treatment of Noise and Vibration in National Road Schemes (1st Rev., National Roads Authority, 2004)),

- It would be important that, where appropriate, subject to meeting the appropriate thresholds and criteria and having regard to best practice, a Traffic and Transport Assessment (TTA) be carried out in accordance with relevant guidelines, noting traffic volumes attending the site and traffic routes to/from the site with reference to impacts on the national road network and junctions of lower category roads with national roads. TII's Traffic and Transport Assessment Guidelines (2014) should be referred to in relation to proposed development with potential impacts on the national road network. The scheme promoter is also advised to have regard to Section 2.2 of the NRA/TII TTA Guidelines which addresses requirements for sub-threshold TTA,

- The designers are asked to consult TII Publications to determine whether a Road Safety Audit is required,

- In the interests of maintaining the safety and standard of the national road network, the EIAR should identify the methods/techniques proposed for any works traversing/in proximity to the national road network,

- In relation to haul route identification, the applicant/developer should clearly identify haul routes proposed and fully assess the network to be traversed. Separate structure approvals/permits and other licences may be required in connection with the proposed haul route, including where temporary modification to the road network may be required. Consultation with relevant PPP Companies and MMaRC Contractors may also be required. All structures on the haul route should be checked by the applicant/developer to confirm their capacity to accommodate any abnormal load proposed, including abnormal weight load,

- In relation to any cabling and potential connection routing, the scheme promoter should note locations of existing and future national road schemes and develop proposals to safeguard proposed road schemes. In the context of existing national roads, alternatives to the provision of cabling along the national road network, such as alternative routing or the laying of cabling in private lands, should be considered in the interests of safeguarding the investment in and the potential for future upgrade works to the national road network. The cable routing should avoid all impacts to existing TII infrastructure such as traffic counters, weather stations, etc. and works required to such infrastructure shall only be undertaken in consultation with and subject to the agreement of TII, any costs attributable shall be borne by the applicant/developer. The developer should also be aware that separate approvals may be required for works traversing the national road network and motorway network.

Notwithstanding any of the above, the developer should be aware that this list is non-exhaustive, thus site and development specific issues should be addressed in accordance with best practice.

I trust that the above comments are of use in your EIAR preparation.

Yours sincerely,

Alban Mills
Senior Regulatory & Administration Executive
Ref No. TII22-120888

TII

www.tii.ie info@tii.ie +353 (0)1 646 3600

From: Krista Farrugia [redacted]
Sent: Thursday 10 November 2022 14:50
To: Landuse Planning <LandUsePlanning@tii.ie>
Cc: Laurie McGee [redacted]
Subject: TII - EIA Scoping Consultation Document - Airfield Drainage Project, Dublin Airport

Dear Sir/Madam,

Dublin Airport Authority (daa) has instructed Nicholas O'Dwyer Limited to conduct an Environmental Impact Assessment and an application for planning permission for the proposed Airfield Drainage Project (ADP). We are writing to provide you with details of the proposed project and to request any information that TII may have that would assist us in the Environmental Impact Assessment of the proposed project.

Please find attached an Environmental Impact Assessment Scoping Consultation Document. If you can offer any information or wish to comment on the proposals, we would be grateful for your reply by close on Friday 9th December 2022.

If you do not have any comments to make or do not hold any information relevant to the proposed project, I would be grateful if you would please indicate same in reply to this email.

Responses to the consultation can be sent by email or by post to contact details below.

If you should require any further information, please contact the undersigned.

Kind regards,

Krista Farrugia BSc, MSc, PgDip, PIEMA
Principal Environmental Consultant

NICHOLAS O'DWYER
an RSK company

[redacted]

[redacted]

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Technical Appendix 4 – Construction and Environmental Management Plan

NICHOLAS O'DWYER

daa

AIRFIELD DRAINAGE PROJECT

Construction Environmental Management Plan

D22029-NOD-XXX-XX-XXX-RP-C-520-0049 RevD

October 2023

NICHOLAS O'DWYER

daa plc

AIRFIELD DRAINAGE PROJECT

D22029-NOD-XXX-XX-XXX-RP-C-520-0049 REVD

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

Nicholas O'Dwyer Ltd
Consulting Engineers
Nutgrove Office Park
Nutgrove Avenue
Dublin 14

October 2023

PROJECT NO. Project No.					
Revision	**Reason for Revision**	**Prepared by**	**Reviewed by**	**Approved by**	**Issue Date**
A	ADP Planning Application –	PC	PC	MH	02/03/2023
B	daa comments incorporated	PC	PC	MH	April 2023
C	daa comments incorporated	PC	AT	MH	May 2023
D	daa comments incorporated	PC	AT	MH	October 2023

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APPENDICES

Appendix A. Construction Traffic Management Plan

1 PURPOSE

This Construction Environmental Management Plan (CEMP) has been prepared by Nicholas O'Dwyer Ltd. (NOD) on behalf of Dublin Airport Authority (daa) for the proposed Airfield Drainage Project (ADP), which is the subject of a planning application to the local planning authority of Fingal County Council (FCC). This Planning Design Report describes the design of the proposals included in the planning application. The final CEMP will be developed further at the construction stage, on the appointment of the main contractor to the project to address the requirements of any relevant planning conditions, including any additional mitigation measures that are conditioned.

The ADP proposes significant upgrades to the surface water management infrastructure at Dublin Airport. The ADP comprises a series of drainage system enhancement measures and infrastructure proposals, including the upgrade of existing drainage infrastructure and the construction of additional infrastructure to supplement the performance of the existing surface water management system. For further details of the proposed development refer to the Planning Report, Engineering Design Report and the Planning Drawings.

This CEMP identifies the minimum standards of environmental controls together with monitoring, inspection and reporting mechanisms to be adopted for all construction works related to the ADP. The CEMP demonstrates how potential construction phase impacts on the surrounding environment were considered early in the design stage of the ADP. It provides a framework for daa and the appointed managers, designers, and contractors to manage, and where practicable, minimise negative environmental effects during construction of the proposed development.

The CEMP identifies the current construction environmental risks within and around the environs of Dublin Airport and outlines the associated controls to be adopted during all construction works. It provides site-specific recommendations and refers to general best practice procedures to be complied with when working on a construction project at Dublin Airport.

For clarity 'construction' is considered to include all site preparation, enabling works, demolition, materials delivery, materials and waste removal, construction activities to include temporary offices, temporary welfare facilities, temporary staff parking, temporary laydown areas and associated engineering works.

The CEMP will be provided as part of the contract tender documents. The appointed contractor will be required to adopt all the recommendations and best practices outlined herein, and to develop a detailed CEMP. The development of the detailed CEMP shall adhere to:

- the requirements in this CEMP;
- daa's standard contract documentation (specifications, appendices and airport directions);
- mitigation measures as set out in the Environmental Impact Assessment Report (EIAR); and Appropriate Assessment (AA) as may be applicable; and
- any relevant conditions on a planning permission which may be forthcoming for the ADP.

The implementation of the CEMP will ensure:

- Compliance with any conditions attached to any planning approval granted for the project.
- Compliance with all relevant environmental legislation and regulations.
- That environmental protection and control measures and any specific mitigation measures are adopted throughout the construction of the proposed development;
- That the environmental risks associated with the construction of a Project of this nature are properly and effectively managed at all times.

Where conflicts and/or discrepancies exist between these documents, the appointed contractor shall write to daa seeking clarification of which document is the most applicable for the works. In all cases conditions set out in the planning consent shall be adhered to. Compliance with this CEMP does not absolve the appointed contractor or its sub-contractors from compliance with all legislation and bylaws relating to their construction activities.

This CEMP provides a framework to:

- describe the programme for environmental management during construction;
- implement the monitoring and mitigation measures in the EIAR;
- outline the principles and minimum standards required of the contractor for preparation of the detailed CEMP and associated method statements, and throughout construction;
- identify the relevant roles and responsibilities for developing, implementing, maintaining and monitoring environmental management; and
- outline the procedures for communicating and report on environmental aspects of the proposed development throughout construction.

This CEMP outlines the range of potential types of construction methods, plant and equipment which may be used by any contractor appointed to enable their impacts to be assessed for the purposes of the consenting authority's environmental impact assessment and appropriate assessment prior to making a decision on the planning application.

2 ENVIRONMENTAL REGULATORY REQUIREMENTS

The following is a non-exhaustive list of the documents referred to in this CEMP including key legislation, best practice guidance for construction works, and specific aviation related Directions and Guidance for works in and around Dublin Airport. These documents, and any other relevant documents (*i.e.,* planning permission documentation including planning consent), shall be consulted when preparing the detailed CEMP.

Key Legislation

- Water Framework Directive (2000/60/EC);
- Local Government (Water Pollution) Act, 1977–1990;
- Water Quality (Dangerous Substances) Regulations, 2000;
- Groundwater Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances;
- S.I. No. 41 of 1999 Protection of Groundwater Regulations;
- S.I. No. 9 of 2010 and amendment (2016) European Communities Environmental Objectives (Groundwater) Regulations;
- S.I. No. 272 of 2009 and amendments (2015 and 2019) European Communities Environmental Objectives (Surface Waters) Regulations;
- Wildlife Act, 1976 (as amended).
- Flora Protection Order, 2015.
- Birds Directive (79/409/EEC)
- Habitats Directive (92/43/EEC)
- European Communities (Water Policy) Regulations, 2003 Environmental Protection Agency and Local Authorities;
- Local Government (Planning and Development) Act 2000 (as amended).
- National River Basin Management Plan 2018 - 2021
- National Biodiversity Action Plan 2017 – 2021

- Fingal County Development Plan 2017 – 2023
- Fingal County Development Plan 2023 – 2029 Draft Plan
- Dublin Airport Local Area Plan 2020

Best Practice Guidance

- CIRIA C689 Culvert Design and Operation Guide (2010)
- CIRIA C532 Control of water pollution from construction sites (2001)
- CIRIA C762 Environmental Good Practice on site (4th Edition) (2016)
- CIRIA Report C648 Control of Pollution from Linear Construction Project; Technical Guidance;
- CIRIA Handbook C650 Environmental good practice on site;
- CIRIA Handbook C651 Environmental good practice on site checklist;
- BS5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites. Noise
- BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations
- Guidelines on protection of fisheries during construction works in and adjacent to waters Inland Fisheries Ireland (2016);
- Dublin City Council (2005) Greater Dublin Strategic Drainage Study (GDSDS): Technical Documents of Regional Drainage Policies. Dublin: Dublin City Council;
- National Roads Authority Guidelines for the crossing of watercourses during the construction of national road schemes (TII, 2008).
- Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes (TII)
- Guidelines for the Treatment of Bats during to the Construction of National Road Schemes (TII)
- Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (National Roads Authority, December 2010)

- EPA (2021) Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects
- EPA IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities

Dublin Airport Directions for works in and around the Aerodrome

- Airport Direction D-O Construction Projects. Specific to Airside construction Projects
- Airport Direction D-E Emergency Response. Airside, Fuel spillages, fires and other emergency procedures
- Airport Direction D-O Environment and Pollution. Environmental standards for the Dublin Airport Site/Campus
- Airport Direction D-O Spillages/FOD
- Airport Direction D-O Wildlife and habitat Management

Guidance Documents for construction works at Dublin Airport

- Construction Contractor's Health & Safety and Environmental Rules for working on daa Infrastructure Manual
- AMD Guidelines Control Dust Fume and Smoke
- daa Control of Noise and Vibration
- daa Temporary Traffic Management Requirements Specification Covering High Risk Works
- daa Standard Traffic Management Plans Covering Low and Medium Risk Works requiring traffic Management
- daa Drainage Policy

3 SUPPORTING STUDIES & DOCUMENTS

This CEMP takes account of information from the planning application documentation and various surveys and studies undertaken to support the planning application. The reports listed below should be consulted for detailed information, as required.

3.1 Planning Application Documentation

This CEMP has been prepared with reference to the following reports which have been produced in support of the planning application for the proposed ADP:

The planning application contains the requisite forms, statutory notices, and the supporting documentation and planning drawings listed below.

Section 1 Cover Letter
Section 2 Planning Application Form
Section 3 ANCA (Airport Noise Competent Authority) Form
Section 4 Confirmation receipt of notification to EIA Portal
Section 5 Classes of Development
Section 6 Planning Fee
Section 7 Newspaper Notice
Section 8 Site Notice
Section 9 Drainage Overview Document
Section 10 Planning Report
Appendix 10A – Draft Drainage Management Plan (DMaP)
Appendix 10B – Surface Water Monitoring Plan

Section 11 Engineering Design Report
Appendix 11A: Operational Control Philosophy;
Appendix 11B: Pollution Control Facility Tank Sizing Report;
Appendix 11C: Energy Loading Report;
Appendix 11D: Technical Memorandum;
Appendix 11E: Utility Correspondence;
Appendix 11F: Engineering Design Report Figures.

Section 12 Construction Environment Management Plan (CEMP)
Appendix 12A: Construction Traffic Management Plan (CTMP)

Section 13 Flood Risk Assessment
Section 14 Appropriate Assessment (AA) Screening Report
Section 15 Natura Impact Statement (NIS)
Section 16 Environmental Impact Assessment Report (EIAR)
Volume 1:
16A EIAR Summary
Volume 2:

Main Report: Part 1:

16B Chapter 1: Introduction
16C Chapter 2: EIA Methodology
16D Chapter 3: Project Need and Alternatives
16E Chapter 4: Project Description
16F Chapter 5: Policy Context
16G Chapter 6: Disasters and Emergencies
16H Chapter 7: Future Developments

Environmental Factors: Part 2:

16I Chapter 8: Population & Human Health
16J Chapter 9: Biodiversity
16K Chapter 10: Hydrology
16L Chapter 11: Land, Soils, Geology & Hydrogeology
16M Chapter 12: Noise & Vibration
16N Chapter 13: Material Assets (Waste Management)
16O Chapter 14: Material Assets (Traffic and Utilities)
16P Chapter 15: Air Quality & Climate (including Greenhouse Gas Assessment)
16Q Chapter 16: Archaeology and Cultural Heritage
16R Chapter 17: Landscape & Visual Impact
16S Chapter 18: Cumulative Impacts & Interactions
16T Chapter 19: Summary of Mitigation Measures

Volume 3:

16U Appendices: Technical Appendices to the EIAR

Volume 4:

16V Drawings and Figures

Section 17 Water Framework Directive Assessment Screening Report
Section 19 Planning Drawings (A1 Drawings)

3.2 Environmental Surveys

An EIAR has been prepared for the ADP planning application. Reports from baseline surveys undertaken for the EIAR were reviewed in preparing this CEMP.

Field surveys were undertaken in 2022 to establish the baseline conditions, including surveys pertaining to habitats and biodiversity. A biodiversity study was carried out by Altemar Ltd. based on this information, as well as a desktop study. The findings of the field surveys and the

biodiversity study are provided in Chapter 9 of the Environmental Impact Assessment Report (EIAR) which is provided in Section 16 of this Planning Application.

This section summarises the key findings of the surveys and the biodiversity study. It should be noted that the airside portion of the proposed site includes active runways, apron and managed airside lands and is actively managed to deter biodiversity. The management of biodiversity within the airport is covered under the daa specific Wildlife and Habitat Management Plan (WHMP, 2022) and is in line with the European Union Aviation Safety Agency Wildlife Hazard Management Guide. Opportunities to promote increased biodiversity are therefore significantly restricted within, and adjacent to, the airfield, due to aviation safety requirements.

Habitat Survey

There are three main areas within the planning boundary and their habitat types are summarised below:

- Landside campus - This primarily consists of built land with roads, buildings and carparks;
- Airfield – Within the higher security zone are runways, aprons and significant areas of managed grasslands, in addition to onsite buildings; and
- Outside these areas (at Eastlands) there is farmland with grasslands and several arable fields, surrounded by hedgerows within the planning boundary.

Figure 3-1 shows the habitats in the vicinity of the ADP development. The Cuckoo Stream, drainage ditches and hedgerows on site would be seen as the most important habitats on site because of the linear nature of the elements providing biodiversity corridors and bat foraging routes to the surrounding areas. No habitats of conservation significance were noted within the site outline.

Figure 3-1: Habitats on ADP site[1]

Invasive Species

No rare or threatened plant species of conservation value were noted during the field assessment. Records of rare and threatened species from the National Biological Data Centre (NBDC) were examined. No rare or threatened plant species were recorded in the vicinity of the proposed site. No rare or plant species of conservation value were noted during the field assessment. Records of rare and threatened species from NBDC and NPWS were examined. No rare or threatened plant species were recorded in the vicinity of the proposed site. No invasive plant species that could hinder removal of soil from the site during groundworks, such as Japanese knotweed, giant rhubarb, Himalayan balsam or giant hogweed were noted on site.

While there are no invasive species within the site, there is a known area of Japanese Knotweed in close proximity to the site. This area is located to the west of West Apron, in a location outside of the airfield. An invasive species management plan has been undertaken at this location since 2019 in order to control, reduce and, if possible, eradicate the extent of Japanese Knotweed. The 2022 surveys identified a small area of Japanese knotweed in a hedgerow to the west of the airfield, at the same location.

[1] *Fossit Classification Codes and Descriptions*
https://heritagemaps.ie/documents/fossittclassification_heritagemaps.pdf

Terrestrial Mammals

Badgers have been noted [redacted] (see **EIAR – Chapter 9**). However, no badgers or badger activity was noted on site during the site surveys. Otters (*Lutra lutra*) activity or holts were not noted on site. No evidence of deer was noted on site. Hedgehogs (*Erinaceus erinaceus*) have been recorded by NPWS within the 10km square. No hedgehogs were seen during the site visits (15th & 20th January 2023) but may be present on site. Irish hares (*Lepus timidus hibernicus*) were noted within the grasslands within the airfield. Evidence of rabbit (*Oryctolagus cuniculus*) and fox (*Vulpes vulpes*) activity was noted on site, particularly to the east of the R132. However, hedgehogs (*Erinaceus erinaceus*), Irish hares (*Lepus timidus hibernicus*), rabbit (*Oryctolagus cuniculus*) and fox (*Vulpes vulpes*) were all recorded by Ball et al. (2023) using camera traps in 2022 within the airport. No protected terrestrial mammals were noted east of the R132.

Birds

The airfield is actively managed to deter birds. In addition, the area to the east of the R132 is directly beneath the flight path of planes landing within Dublin Airport. As such it is a highly disturbed environment.

As outlined in the breeding bird assessment in **Technical Appendix 9.1 of Chapter 9** '*Thirty-two Bird species were recorded at the Dublin Airport site over three breeding bird surveys in May and June 2022. Of these species recorded eleven species were proven breeding on-site these being – Blackbird, Robin, Wren, Song Thrush, Blue Tit, Coal Tit, Long-tailed Tit, Goldcrest, Chaffinch, Willow Warbler and Hooded Crow. Breeding species recorded on-site that are amber-listed on Birdwatch Ireland's Bird of conservation concern in Ireland 2020-2026 were Willow Warbler and Goldcrest.*'

A wintering bird assessment was carried out in 2022-2023 consisting of 10 surveys over the course of the winter. Species recorded that are red listed as a wintering species of conservation concern (Birdwatch Ireland's birds of conservation concern in Ireland 2020-2026) that were recorded on-site were Snipe, Oystercatcher and Redwing, each recorded in small numbers, a peak count of Snipe occurring on January 20th (six birds in wet area's near stream at northeast area of site), a maximum Oystercatcher count was eight birds on February 26th and a maximum count of 25 Redwing on January 20th. Amber-listed Gull species were noted to forage in small numbers on the playing fields at the west side of the site. The selection of passerine species recorded was typical of that which might be expected in a semi-urban Dublin setting.

Bat Survey

During the 2022 surveys, bat assessments were carried out, including emergence surveys from trees and hedgerows. There were no seasonal or climatic constraints as surveys were undertaken within the active bat season in good weather conditions with temperatures of greater than 10^0C after dark. Winds were very light and there was no rainfall. Foraging activity of Soprano Pipistrelle, Common Pipistrelle and Leisler's bats were noted along the hedgerows on site. No trees of moderate or high bat roosting potential are noted within the proposed development site.

Amphibians/Reptiles

The common frog (*Rana temporaria*) was not observed on site. However, frogspawn was noted beside the drainage ditch. There are features within the site boundary that could be important to frogs including the grassland and drainage ditches. The common lizard (*Zootoca vivipara*) or smooth newt (*Lissotriton vulgaris*) were not recorded on site.

Aquatic Ecology Survey

An aquatic survey of the Cuckoo Stream (landside) was carried out by Prof. Joe Caffrey. The site survey was supplemented by an additional assessment of the airside environment by Bryan Deegan (CIEEM) on the 25th October 2022. The aquatic ecology walkover indicated little, if any, suitable habitat for salmon or trout in the watercourses within, or adjacent to Dublin Airport. No instream biodiversity was noted within the airfield.

Nonetheless, the surface water quality objectives outlined in the Dublin Airport Drainage Management Plan (DMaP) are central to the project purpose of the ADP. A key priority during the design of the ADP drainage proposals was to ensure that any impacts on water quality will be positive and support compliance with the water quality objectives of the WFD.

In addition to the surveys undertaken as part of the ADP EIAR previous surveys conducted in 2019/2020 were also consulted in the preparation of the CEMP. The findings of these surveys are contained in the following documents:

- Environmental Baseline Report (April 2020) with appended technical reports as follows:
  - Appendix 10A Cultural Heritage
  - Appendix 11A Habitat and Flora Survey
  - Appendix 11B Mammal Survey
  - Appendix 11C Bat Survey
  - Appendix 11D Amphibian Survey

  - Appendix 11E Bird Survey
  - Appendix 11F Aquatic Ecology Walkover Survey
- Dublin Airport Ecology Surveys: Interim Technical Note with accompanying Figure 1 (September 2020).

This CEMP is a live document. It will be updated to develop a detailed CEMP with new information as it becomes available from sources including further environmental surveys, the EIAR and schedule of mitigation measures, the appropriate assessment and mitigation measures (as may be applicable), the planning application documentation, and the planning conditions of a planning permission which may be forthcoming. All relevant information will be captured within the CEMP, which will be treated as a live document.

4 AIRFIELD DRAINAGE PROJECT (ADP) DESCRIPTION

4.1 Background

The purpose of the ADP is described as follows:

- To provide a nett improvement in the degree of protection afforded to the receiving waters by the surface water management system, in accordance with the planning and environmental requirements of the relevant EU Directives, national and local plans and legislation, as well as daa's Sustainability Strategy.
- To optimise the performance of the surface water management system at Dublin Airport for improved efficiency, greater operational flexibility and resilience to a broad range of extreme weather events.
- To increase the hydraulic capacity of the surface water network and alleviate historic capacity issues.

It is proposed to achieve this through a series of drainage system enhancement measures and infrastructure proposals. The implementation of a new Contamination Detection and Response (CD&R) System and the provision of additional pollution control facilities are designed to provide robust protection to receiving waters. The network enhancements also intend to intercept greenfield inflows, at points upstream of the airport campus, and convey them directly to the receiving waters. These proposals will operate as part of an integrated airfield-wide surface water management system designed to protect water quality in the receiving waters.

It is also proposed to provide hydraulic upgrades to the existing network. This will provide the network connectivity needed to facilitate the proposed flow segregation system, increase the hydraulic capacity of the network and alleviate historic capacity issues. Some local upgrades and reconfigurations of existing drainage networks at West Apron and South Apron Hub will be necessary to integrate these networks into the airfield-wide surface water management system.

The proposed ADP includes an airfield-wide SCADA system which will provide operational control for all existing and proposed drainage infrastructure.

The design of the ADP also includes safeguarding measures to facilitate future developments at Dublin Airport. The inclusion of safeguarding measures is designed to uphold the principles of sustainable and coordinated development, avoiding the need for repeat work or abortive work, which can sometimes arise if an individual project is not adequately coordinated with future developments.

4.2 Key Contacts

Role	Organisation	Name	Contact Number	Contact Email
Client Rep	daa	Sean McBride	01 944 2075	sean.mcbride.cw@dublinairport.com
Project Supervisor Design Phase (PSDP)	Nicholas O'Dwyer Ltd	Martin Hickey	01 296 9000	mhickey@nodwyer.com
Design Team	Nicholas O'Dwyer Ltd TOBIN Consulting Engineers	Martin Hickey Paul Cloonan	01 296 9000 091 565 211	mhickey@nodwyer.com paul.cloonan@tobin.ie
Programme	Nicholas O'Dwyer Ltd	Martin Hickey	01-296 9000	mhickey@nodwyer.com
PM	daa	Sean McBride	01 944 2075	sean.mcbride.cw@dublinairport.com

Table 4-1: List of key contacts to the ADP

4.3 Current Scope of Works

4.3.1 General

Figure 4-1 shows the site boundary and location of the proposed ADP within the airport complex.

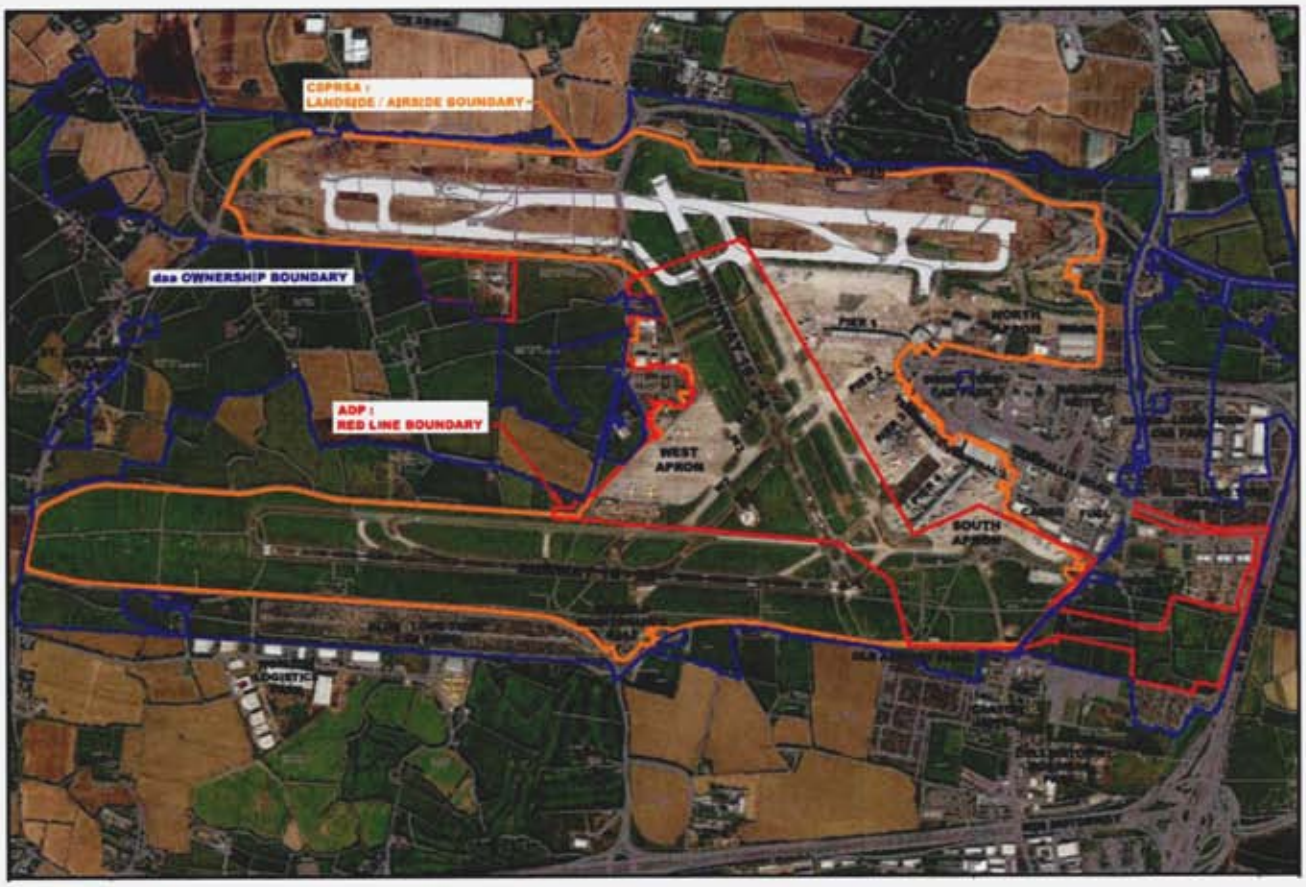

Figure 4-1: Site Location of the ADP Boundary

The scope of the overall ADP considered in this report includes the delivery of the following:

- Establishment of site compounds (east compound (Eastlands) and west compound);
- Site clearance and excavation of topsoil from the proposed pipeline corridors, works in the vicinity of West Apron, and the site of the proposed Central Pollution Control Facility (CPCF) at Eastlands;
- Construction of the Clean Water Supply Pipelines through the airport complex to a discharge point at the Cuckoo Channel Diversion immediately to the south of the South Apron. The Clean Water Supply Pipelines consists of pipelines within four corridors, denoted CW1, CW2, CW3 and CW4;

- Diversion of the upstream section of the Cuckoo Channel where CW4 ties in;
- Construction of an overflow weir and overflow channel at the existing Flow Diversion Structure (FDS) and raising existing banks around the FDS;
- Reconfiguration of existing South Apron network;
- Repurposing of the existing Airfield Trunk Culvert;
- Installation of Contamination Detection and Response system, incorporating decision point chambers, actuated vales, pipework, ducting and monitoring kiosks;
- Construction of the West Apron Drainage Upgrade incorporating pipelines, decision points, clean flow attenuation, storage of contaminated flow, pumping station and control kiosks;
- Construction of the Airfield Contaminated Pipeline from a point on the existing Airfield Trunk Culvert (ACP2). Construction of the Airfield Contaminated Pipeline (ACP1) from West Apron to the ACP2;
- Bulk excavation for a Central Pollution Control Facility (CPCF) at Eastlands;
- Construction of the CPCF at Eastlands. The CPCF will consist of a large underground concrete tank for storage of contaminated runoff from the airfield. There will be an associated access road for the construction stage;
- Construction of CPCF Pipeline from the vicinity of the Cuckoo Channel in South Apron to the CPCF in the Eastlands;
- Construction of a rising main (with potential section of gravity sewer) from the CPCF outlet to the existing North Fringe Sewer (NFS) on the R132 or alternatively to the west of the R132;
- Provision of works to enable a future connection to be made from the outlet from the CPCF to the planned Greater Dublin Drainage (GDD) sewer;
- Construction of an electrical substation in the Eastlands;
- Construction of power and communications ducting, kiosks for control panels;
- Enhancement of the flood control berm in the Eastlands.

4.3.2 Permanent Works Planning Corridor

The Permanent Works Planning Corridor (design envelope) defines the maximum extent of area within which permanent works could be sited. The extent of this corridor/envelope has been detailed on the Planning Drawings.

The identified corridors for the pipelines and the works areas in the airport complex, in the Eastlands and on public roads (R108 and R132) are shown in Figure 4-2.

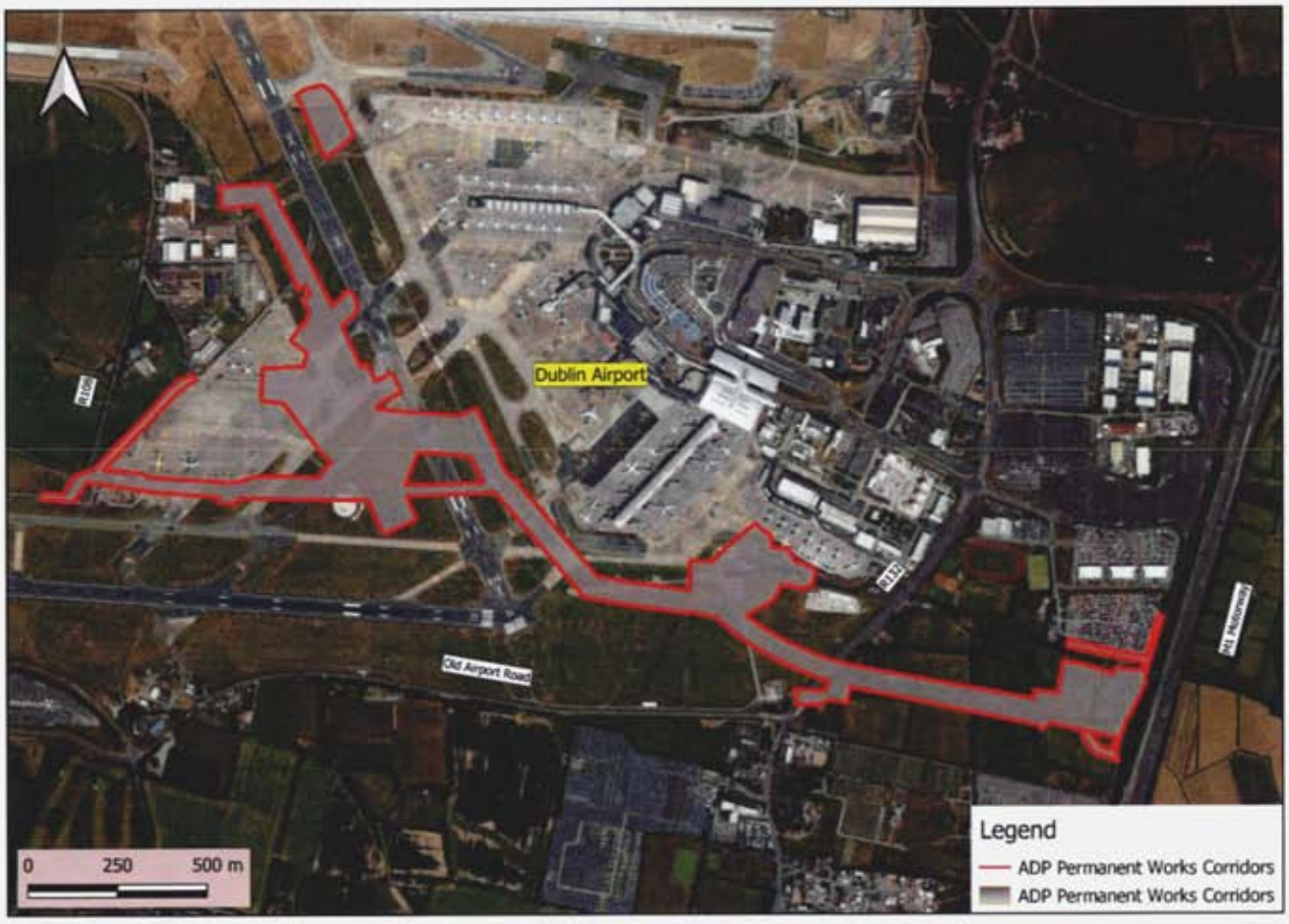

Figure 4-2: Indicative Layout of Proposed Permanent Works Planning Corridors

4.3.3 Construction Methodology for Pipelines

4.3.3.1 Introduction

The proposed pipelines will vary in diameter and the Planning Drawings show a range of pipe diameters for each pipeline within the Permanent Works Planning Corridor. A range of pipe

diameters and depths is proposed for each Permanent Works Planning Corridor that will allow some flexibility in the design of the horizontal and vertical alignments at detailed design stage.

The envisaged construction methods for the pipelines on the ADP include:

- Open cut methodologies;
- Tunnelling methodologies.

Generally, through open grassed areas in the airport it would be envisaged that the open cut methodologies would be employed by the appointed contractor. Pipeline construction in West Apron would also be envisaged to be constructed using open cut methods either in conjunction with an open cut construction methodology for the proposed Underpass or independent to the Underpass.

Tunnelling methodologies would be envisaged in the construction of pipeline crossing of taxiways, runways and the R132 crossing with the CPCF Contaminated Pipeline.

It is anticipated that the ADP would be delivered via a Design Build (DB) contract, this approach would provide the flexibility to address ground conditions and obstructions that cannot be completely understood at consent stage. In this DB approach the construction method for the pipelines would be selected by the appointed contractor.

The worst case of the alternative pipeline construction methods has been accounted for in the environmental assessments in the CEMP. Worst case pipeline construction method would be the open cut methodology.

4.3.3.2 Open Cut Method

The open cut construction works will require a larger site area compared to the tunnelling works within the Permanent Works Planning Corridor. The Permanent Works Planning Corridor provides flexibility in the selection of the horizontal and vertical alignment of the proposed pipelines in consideration of existing constraints.

Figure 4-3 shows a typical cross section of an open cut construction methodology that would be applicable to the construction of the proposed pipelines within the Permanent Works Planning Corridor.

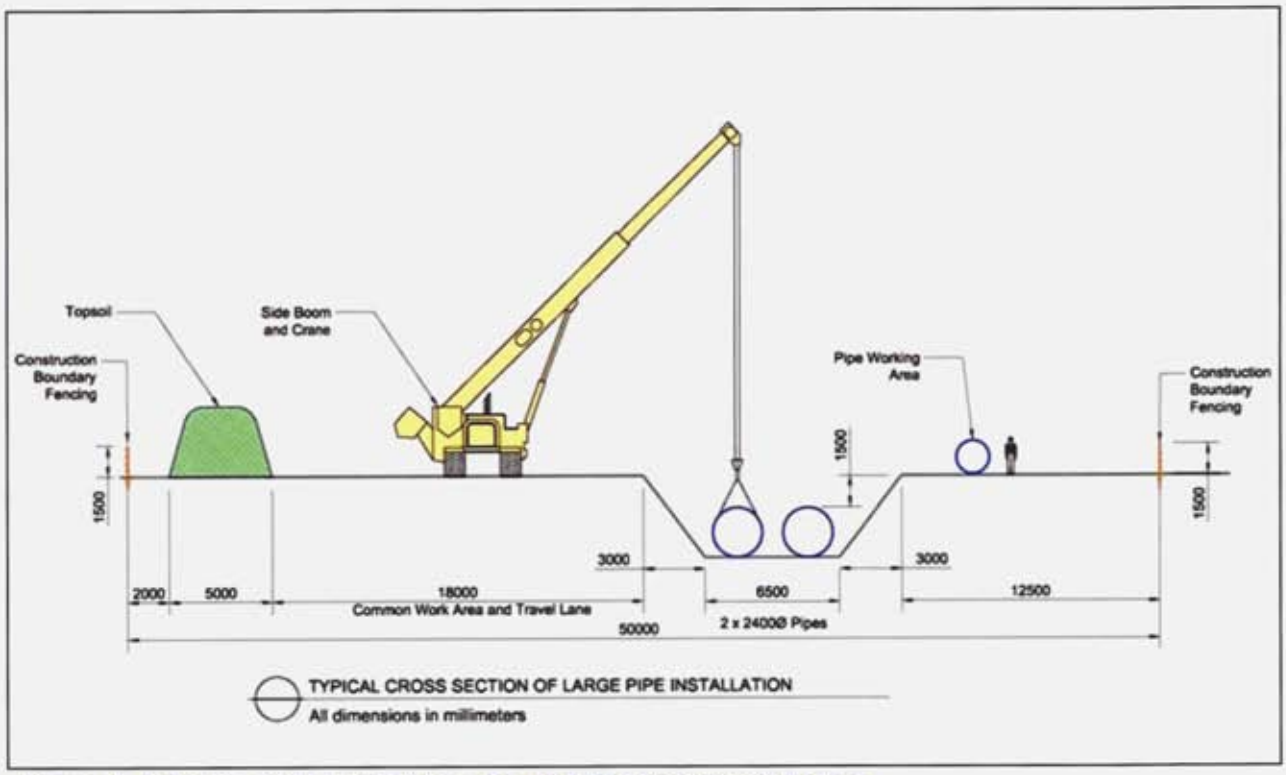

Figure 4-3: Typical Cross Section of Large Pipeline Construction

The photo in *Figure 4-4* (for illustrative purposes only) shows a typical example of a cleared corridor with topsoil stripped and stockpiled and some pipeline and pipe surround materials stored along the corridor boundary. The photo in *Figure 4-4* shows the use of excavators for pipeline construction which are likely to be used in the airfield as opposed to cranes for pipeline handling and installation.

Figure 4-4: Typical Pipeline Corridor

For open cut pipelaying in grassed areas, the pipeline working corridor will be stripped of topsoil. This topsoil will be stockpiled along the pipeline corridor for use in reinstating the grassed surface prior to completion. Surplus excavated material (subsoil) will be removed and disposed as the excavation progresses. Suitable excavated material (subsoil) will be used for backfilling the trench to the underside of the topsoil layer. There will be no stockpiling of subsoil along the pipeline corridor other than that required to backfill the trench on a daily basis. Section 10 of the D-O Wildlife and Habitat Management document contains requirements for construction works centred around the exposure of bare earth and the mitigation of risks of attracting birds. This is further discussed in Section 9.2.1.

For open cut pipelines in hardstand areas such as taxiways and aprons, the excavated material will be removed and disposed as the excavation progresses. Backfill material for the trenches will be imported stone fill to the appropriate specification. Surface reinstatement will match that of the existing hardstand areas.

4.3.3.3 Tunnelling Methodology

The tunnelling works will require a smaller overall site area compared to the open cut methodology. The Permanent Works Planning Corridor provides flexibility in the selection of the

horizontal and vertical alignment of the pipelines, which are proposed to be constructed by tunnelling methods by the appointed contractor, in consideration of existing constraints and ground conditions.

Drive and reception shafts will be required at each end of the tunnelled section of pipeline. The proposed shafts would be located within the Permanent Works Planning Corridor and the locations would be selected in consideration of tunnel pipe diameters, feasible drive lengths, ground conditions and other applicable parameters.

Figure 4-5 shows a typical pipeline installation through a tunnelling method from within a drive shaft.

Figure 4-5: Typical Pipeline Tunnel Installation via Shafts

A tunnelling compound will be required at each end, with a typical drive shaft compound arrangement as shown in *Figure 4-6* (tunnel drive shaft shown as orange circle).

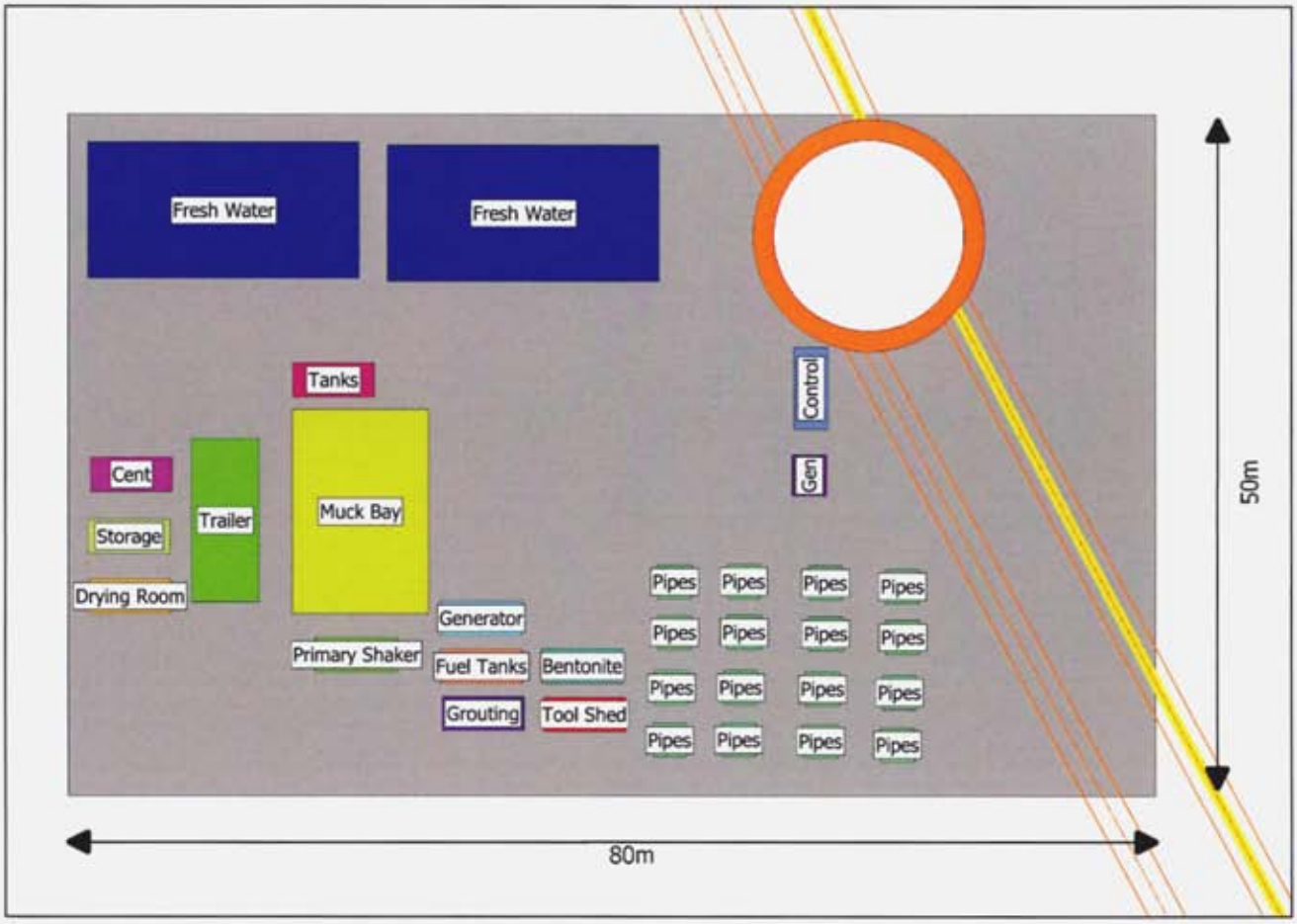

Figure 4-6: Typical Local Tunnelling Compound Layout (Drive Shaft)

The local tunnelling compound layout shown in *Figure 4-6* is specific to the tunnelling methodology and the main compounds would be used for storage of the tunnel pipes and other materials until required at the various local tunnelling compounds.

During pipeline tunnelling operations, there will be a requirement to use cranes to hoist sections of the tunnelling shafts for both the drive shaft and the reception shaft. Craning will also be required to hoist sections of the pipeline to be installed and to hoist the tunnel boring machine into the drive shaft and out of the reception shaft.

For tunnelling operations, it is envisaged that spoil will be removed from the works area on a regular basis during each shift as the trailer fills. An area of the East Compound has been reserved

for use as a spoil stockpile (for 48 hours' worth of tunnelling spoil), in order that the tunnelling will not be held up by any temporary interruptions to the waste removal process.

4.3.4 Construction Methodology for the Central Pollution Control Facility

At the proposed Central Pollution Control Facility (CPCF), a large open excavation with battered sides (refer *Figure 4-7*) will be required, with an excavated volume estimated to be 190,000m^3. The open excavation with battered sides is deemed the worst-case approach for environmental assessment. Construction methods could be implemented by the appointed contractor that could result in a reduced excavation volume; such methods could involve sheet piling the sides of the excavation. It is envisaged that a significant proportion (approx. 75%) of the excavated material will be removed from the works area for off-site disposal as it is excavated. Options for re-use off site could be explored by the appointed Contractor at the time of the construction works. The remainder of the excavated material required for backfilling, topsoiling and construction of a temporary berm and permanent flood embankment will be stockpiled on site. The maximum volume of excavated material to be stockpiled is estimated to be 47,000m^3. Stripping and stockpiling of topsoil will be one of the first activities in the construction of the CPCF with the topsoil stockpiled for a length period. Stockpiling of suitable material for backfilling will be commenced near the completion of the excavation for the CPCF, and a stockpile will be maintained until the completion of the tank construction (though with reducing volumes as the tank is backfilled but depending on the contractor's selected sequence of construction and testing for watertightness).

Figure 4-7: Typical Battered Excavation

During construction of the CPCF in-situ concrete tank, there will be a requirement to use cranes to hoist sections of formwork into place, and to remove formwork following construction. There will also be a requirement for concrete pumping equipment with long booms.

Depending on the ground conditions encountered, there may be a requirement for piling to stabilise the excavation, especially in the vicinity of the Cuckoo Stream to the north and potentially along the eastern boundary in close proximity to the car park access road. Various piling options are available using either a temporary system, such as metal sheet piles, or a permanent system, such as secant piles.

Alternative construction methods such as caissons may also be considered depending on the final detailed design configuration of the CPCF storage tank and assessment of the ground conditions. Caisson construction is where the outer structure is constructed in vertical sections and lowered into the ground by excavating the material from within. The vertical sections are then progressively constructed as the structure is lowered into the ground. When the structure reaches

the required invert level, the base of the structure, as well as internal walls and roof can be constructed.

4.3.4.1 Temporary Berm

The proposed CPCF site overlaps an area of potential flooding from the Cuckoo Stream to the north (see *Figure 4-8*). In order to protect the excavation for the CPCF from ingress of water, a temporary berm will be constructed along the southern bank of the Cuckoo Stream in this area. using some of the excavated material from the CPCF. Appropriate measures will be applied to reduce the risk of sedimentation to the watercourse as detailed in Section 13.2.

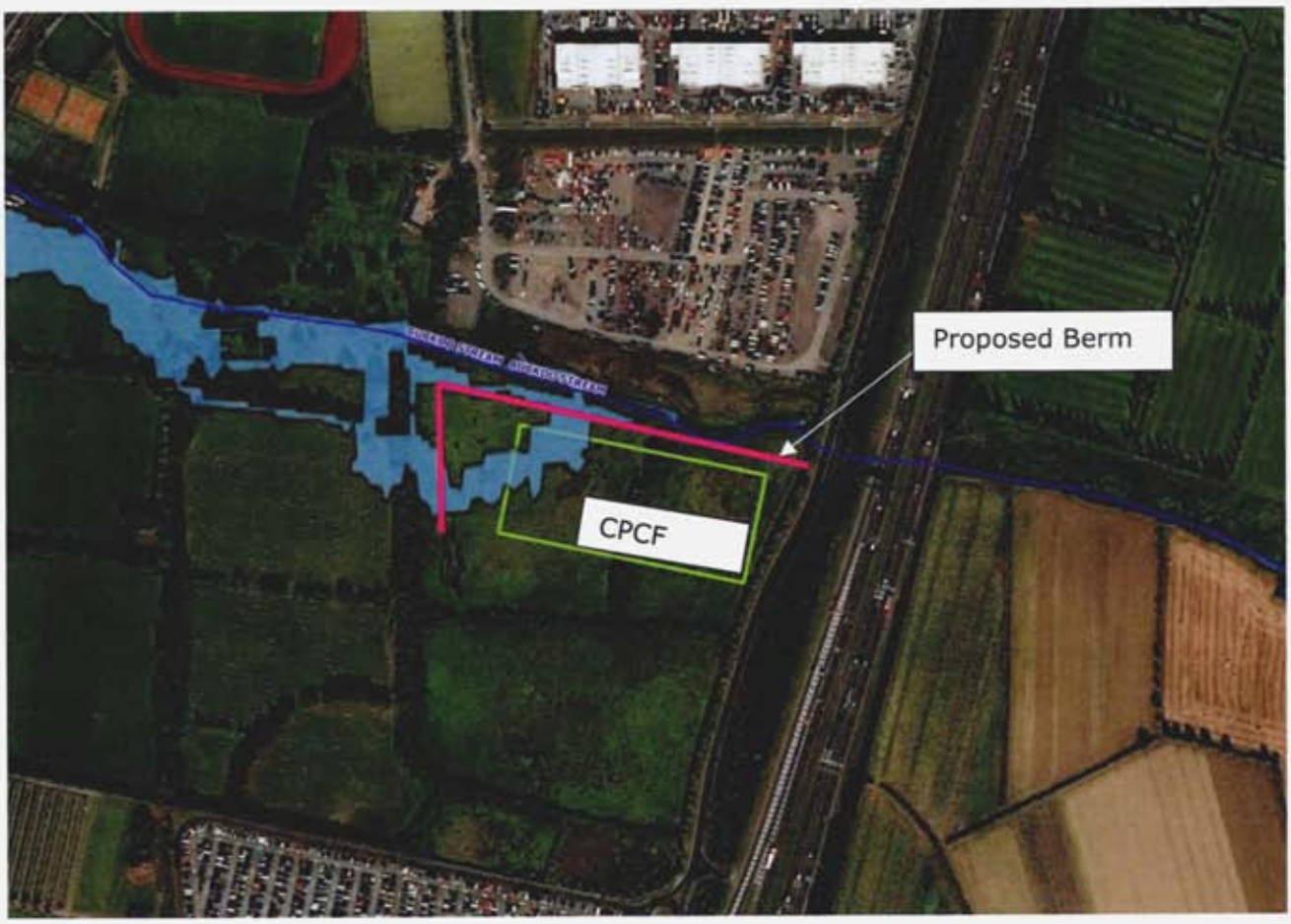

Figure 4-8: Flood Mapping at Proposed CPCF - 1% AEP (source Fingal East Meath Flood Risk Assessment and Management Study)

4.3.4.2 Flood Control Berm

Eastlands is an area which is susceptible to flooding and has been the subject of a number of flood control schemes and studies. For example, the FEM-FRAMS future scenario map predicted flooding in the vicinity of the Eastlands.

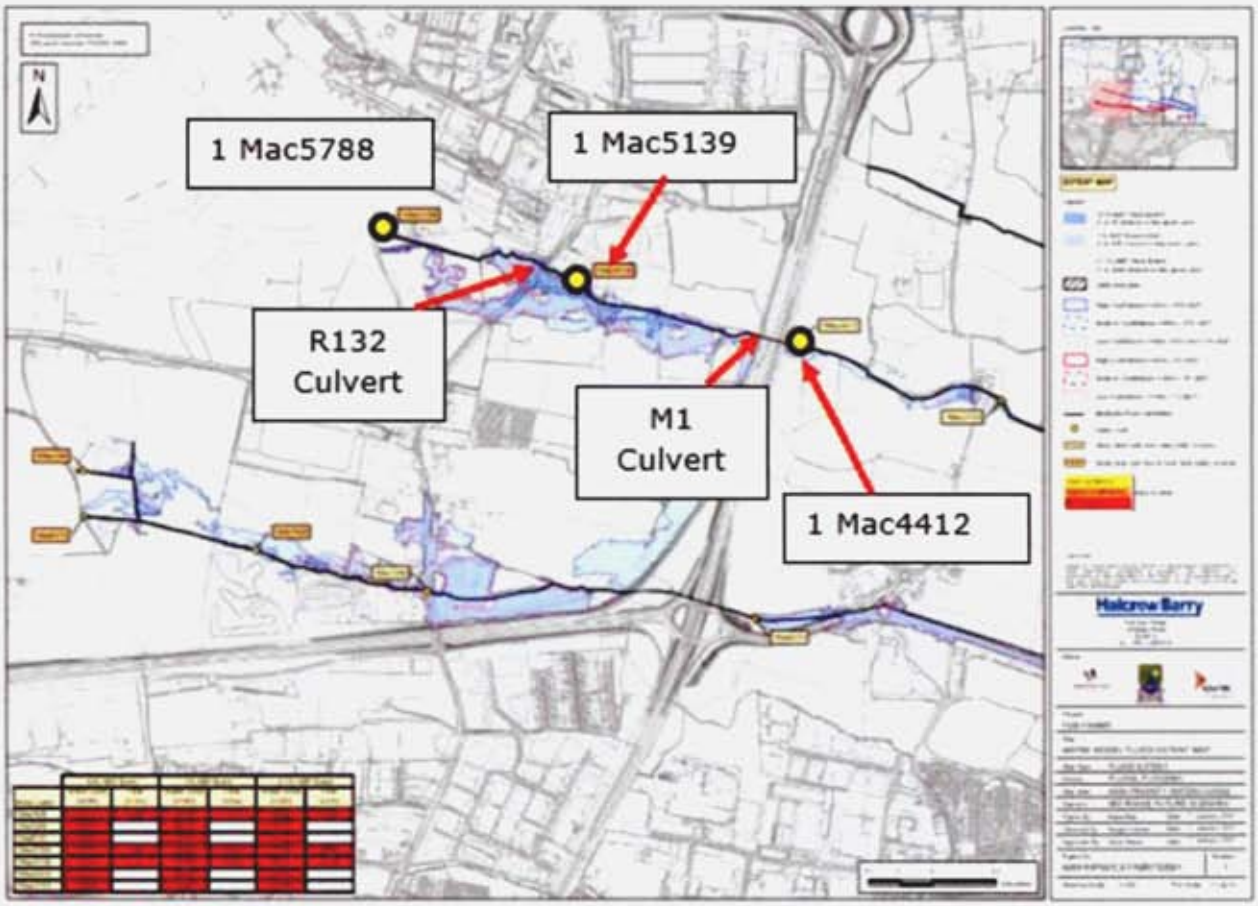

Figure 4-9: FEM FRAMS Future Fluvial Flood Extent Map of the Cuckoo Stream and Mayne Stream

In the mid 2010's daa constructed a flood alleviate scheme which included the provision of additional culverts under the R132 to prevent flooding of the road and an earth embankment on the eastern edge of the Eastlands. Based on the detailed hydraulic analysis of the airport drainage network using the ICM Model, overtopping of the existing earth embankment was observed for the Q100 event with 30% uplift applied for climate change, which would result in flooding of the Y+Z access road. For this reason, it is proposed to enhance he flood control berm at this location when completing the reinstatement and landscaping works in the vicinity of the CPCF.

The system is designed to ensure there is no uplift in the allowable discharge rates to the downstream Cuckoo Catchment.

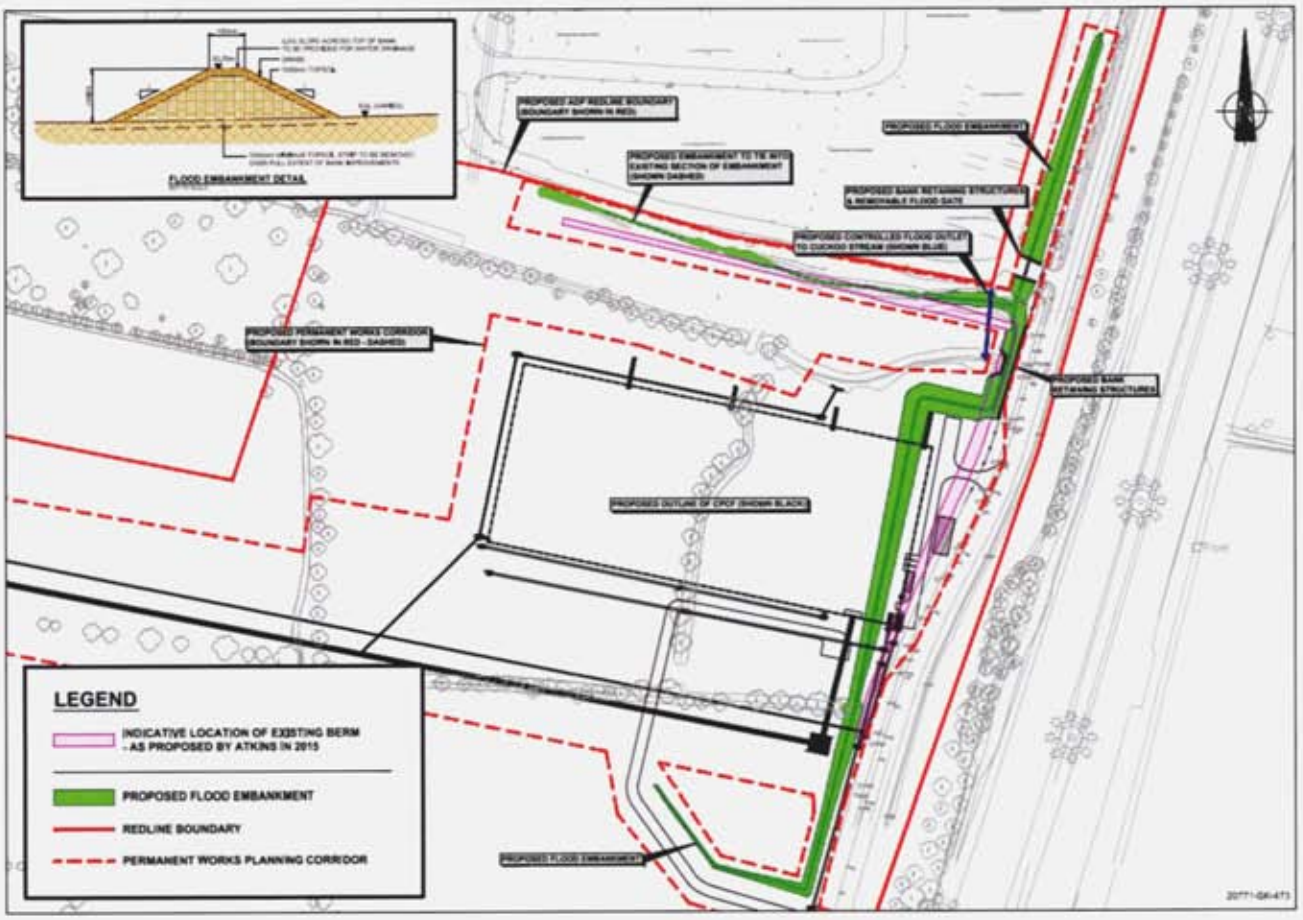

Figure 4-10: Layout and cross-sectional view of proposed flood embankment (shown Green)

The proposed flood embankment would be constructed with suitable material, typically a fine-grained cohesive soil with between 20% and 40% clay particles and a moisture content of less than 20%, to achieve the necessary compaction to achieve a homogeneous structure capable of restraining the design flood depth. It would be an objective to obtain this material from excavated material associated with the CPCF tank or elsewhere with the ADP works, subject to testing and analysis of the soils for suitability. The material for the embankment would be placed by excavator in layers typically not exceeding 150mm and then thoroughly compacted using a sheepfoot (tamping) roller with a typical 4,000kg mass per meter width and a minimum of typically 12 passes. The filling of the embankment would be built up and compacted evenly, maintain at all times a sufficient camber or cross fall and a surface sufficiently even to enable surface water to drain freely from it. Topsoil and a good holding grass would be placed over the entire embankment. The topsoil would be available from surplus excavation associated with the CPCF

tank and the stripping of the footprint of the flood embankment where located outside the extent of the excavation for the CPCF tank. The flood embankment to the north of the Cuckoo Stream could be constructed as material arise for necessary excavations in the ADP works zone, where deemed suitable, whereas the majority of the embankment to the south would be constructed post completion of the CPCF, using a stockpile of suitable material.

It is acknowledged that, during the critical-duration design rainfall event, the ground overlaying the CPCF would be inundated with flood water. The proposed CPCF will be an underground water-retaining structure and watertight, sealed access covers will be provided for the tank and ancillary structures (e.g. pipelines and chambers) to prevent ingress into the tank. Furthermore, overflow pipelines from the CPCF to the Cuckoo Stream to the Cuckoo Stream would be fitted with non-return flow control devices. This would prevent a situation where water in the stream surcharges back along these pipelines and enters the CPCF storage tanks.

4.3.5 Construction Methodology for West Apron Pollution Tank

The proposed West Apron Pollution Tank (WA-PT), with a storage capacity of 3,800m³, is planned to be constructed as a reinforced concrete (cast in situ or pre-cast) below ground structure to the east of Taxiway W1 and to the south of the proposed Underpass. It is assumed that both infrastructure elements would be constructed under separate works programmes. The envisaged construction method for the proposed WA-PT is an open dig method. The construction of the WA-PT using a caisson construction method may also be selected by the appointed contractor. The open dig method is deemed the worst-case approach for environmental assessment as the volume of excavation is greatest as is the overall footprint of the excavation.

To protect the taxiway infrastructure (refer to *Figure 4-11*) to the west and south of the proposed WA-PT, it is envisaged that the works area would be piled, with either a temporary system such as metal sheet piles (refer to *Figure 4-12*) or a permanent system such as secant piles (refer to *Figure 4-13*), on at least two sides (west and south).

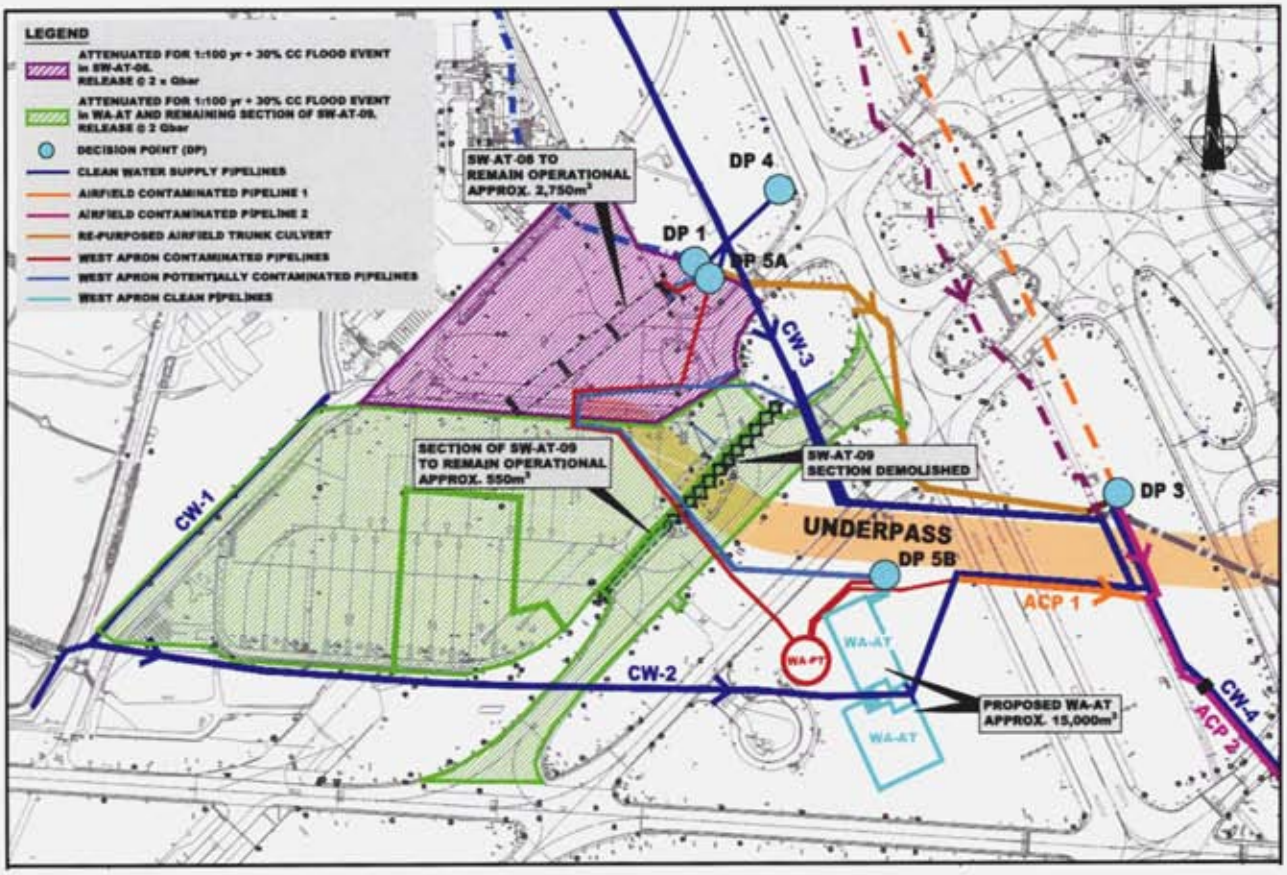

Figure 4-11: Location of the West Apron Pollution Tank Relative to the Taxiways

The excavated volume for the construction of the WA-PT will vary depending on the construction method proposed by the contractor to protect the taxiway. As a worst-case scenario with temporary sheet piles on two sides and a battered excavation on the sides adjoining the proposed WA-AT, the excavated volume is estimated to be 38,000m³. It is envisaged that approximately 20% of the excavated material will be immediately removed from the works area and disposed off-site as it is excavated. The remainder (80%) of the excavated material required for backfilling will be stockpiled on site, potentially to the east of the proposed WA-PT. An alternative would be that all the excavated material would be removed and disposed off-site with the excavated material from the proposed West Apron Attenuation Tank (WA-AT) (refer Section 4.3.6) used for backfilling. The estimated volume of the surplus excavated material from the WA-AT (30,000m³) is similar to the estimated volume required to backfill the WA-PT (29,000m³). Stockpiles will be managed to reduce the risk of bird hazards as described in Section 9.2.1.

During construction of the in-situ concrete tank, there will be a requirement to use crane(s) to hoist sections of formwork into place, and to remove formwork following construction. There will also be a requirement for concrete pumping equipment with long booms.

Pipework, valves, vents, covers and any other mechanical equipment associated with the WA-PT would be brought to the works area when required for installation and these would be generally installed using a mobile crane.

Alternative construction methods such as caissons may also be considered for the WA-PT depending on the final detailed design configuration of the storage tank and assessment of the ground conditions.

As part of the WA-PT it is proposed to construct a pumping station adjacent to Decision Point DP5B and this is described in Section 4.3.8. A gravity pipeline will connect the WA-PT to the pumping station. The control kiosk for the WA-PT pumping station is proposed as a below ground structure associated with DP5B, with excavation using an open cut method or a caisson method and this is further outlined in Section 4.3.8.

Figure 4-12: Construction Using Sheet Piles

Figure 4-13: Construction Using Secant Piles

4.3.6 Construction Methodology for West Apron Attenuation Tank

The proposed West Apron Attenuation Tank (WA-AT), with a storage capacity of 15,000m³, is planned to be constructed as a below ground structure, incorporating a series of large diameter pipes (refer to *Figure 4-14*), to the east of Taxiways W1 and to the south of the proposed Underpass.

The WA-AT is proposed to be located entirely to the south of the proposed Underpass (refer *Figure 4-11*). Depending on the proposed extent of the excavation for the Underpass some of the proposed pipes could be constructed during the backfill of the excavation around the proposed Underpass.

The WA-AT is proposed to be located to the east of Taxiway W1. Some of this Taxiway will be demolished in order to facilitate the construction of the proposed Underpass. Where it is envisaged that the existing Taxiway W1 will not be impacted by the construction of other proposed infrastructure the location of the proposed WA-AT is such that the associated construction works is not envisaged to impact on the Taxiway when using open cut excavation methods with battered / stepped sides.

The excavated volume for the construction of the WA-AT will vary depending on the extent of overlap if any with the excavation for the proposed Underpass. As a worst-case scenario the excavated volume is estimated to be 60,000m³. It is envisaged that approximately 50% of the excavated material will be immediately removed from the works area and disposed off-site as it is excavated or alternatively used to backfill around the proposed WA-PT, depending upon the sequencing of the works associated with the WA-PT and the Underpass. The remainder (50%) of the excavated material required for backfilling will be stockpiled on site, potentially to the east of the proposed WA-AT and to the south of the Underpass. Section 10 of the D-O Wildlife and Habitat Management document contains requirements for construction works centred around the exposure of bare earth and the mitigation of risks of attracting birds. This is further discussed in Section 9.2.1.

During construction of the WA-AT, there will be a requirement to use crane(s) to hoist sections of large diameter pipework into place and off load from transport vehicles.

Figure 4-14: Typical Attenuation Tank Under Construction

4.3.7 West Apron Pollution Tank Pumping Station

The contents of the WA-PT are proposed to be released to the proposed Airfield Contaminated Pipeline 2 (ACP2) via the Airfield Contaminated Pipeline 1 (ACP1) at a controlled rate. Due to the proposed depth of the tank relative to the level of the proposed Airfield Contaminated Pipeline, it will be necessary to install a pumping system as part of the WA-PT. The proposed pumping station is configured as a completely below ground structure with a wet well arrangement of submersible pumps and with valves in a dry valve chamber. The submersible pumping station would contain a series of pumps operating in a duty-assist (if required) and standby arrangement.

The proposed pumping station is planned to be constructed adjacent to Decision Point DP5B. The control panel associated with the pumping station would be incorporated with that associated with DP5B and contained completely below ground.

The pumping station would be constructed using an open dig methodology but due to the depth and footprint the excavation would be formed with temporary works in the form of sheet piles or

similar. The construction of the pumping station using a caisson construction method may also be selected by the appointed contractor. The open dig method is deemed the worst-case approach for environmental assessment.

The pumping station and valve chamber would be constructed in reinforced concrete either by cast in situ or using pre-cast elements or a combination of both.

Surplus excavated material associated with the open dig method would be removed and disposed off-site during the excavation process. Excavated material necessary for backfilling would be stockpiled adjacent to the excavation. The overall volume of excavation for the pumping station is estimated at 1,200m³ with approximately 45% of the volume disposed off-site and 55% retained and stockpiled for backfilling and reinstatement.

During construction of the in-situ concrete structure, there will be a requirement to use a mobile crane to hoist sections of formwork into place, and to remove formwork following construction. There will also be a requirement for concrete pumping equipment.

Pipework, valves, pumps, penstocks, covers and other mechanical equipment would be brought to the locations of pumping station when required for installation and these would be generally installed using mobile cranes.

4.3.8 Construction Methodology for Decision Point Chambers and Kiosks

The decision point chambers are to be constructed as reinforced concrete below ground structures at various locations within the airport complex. The envisaged construction method for the decision point chambers is an open dig method with stepped / battered sides.

Associated with the decision point chambers are monitoring kiosks and some are proposed as below ground structures due to location within the airport and others are proposed as above ground kiosks to be constructed on concrete plinths at ground level. The below ground structures would be constructed using an open dig method with stepped / battered sides.

Surplus excavated material associated with the open dig method would be removed and disposed off-site during the excavation process. Excavated material necessary for backfilling would be stockpiled adjacent to the excavation. The overall volume of excavation for the various decision point chambers and associated kiosk is estimated at 4,200m³ with approximately 90% of the volume disposed off-site and 10% retained and stockpiled for backfilling and reinstatement.

During construction of the in-situ concrete structures, there will be a requirement to use a mobile crane to hoist sections of formwork into place, and to remove formwork following construction. There will also be a requirement for concrete pumping equipment.

Pipework, valves, penstocks, covers and other mechanical equipment would be brought to the locations of each decision point chamber when required for installation and these would be generally installed using mobile cranes.

Above ground kiosks would be transported to the works areas ready for installation onto constructed concrete plinths via a mobile crane or similar.

4.3.9 Construction Methodology Re-Configuration of Downstream Network

4.3.9.1 Cuckoo Supply Channel Diversion

The proposed Cuckoo Supply Channel Diversion will be constructed through excavation and reprofiling of the soil levels in SA as shown in Figure 4-15. It is proposed to start the construction from the most upstream section where CW4 ties in and move downstream to the tie in with the existing Channel. This is to avoid any potential flooding / overflow from the existing Cuckoo Supply Channel into the Diversion before it is fully operational. Alternatively, the Diversion construction can commence from the downstream section and move upstream, on the condition that the tie in between the Diversion and the existing Cuckoo Supply Channel is completed as the last phase of construction.

The material excavated from the Diversion will be stockpiled for later use in the backfilling of the upstream sections of the existing Cuckoo Supply Channel. Once these sections are backfilled, the existing SA network can be reconfigured (construction of new pipes, relaying of existing pipes) through open cut. Appropriate measures will be applied to reduce the risk of sedimentation from the stockpiles to the watercourse as detailed in Section 13.2.

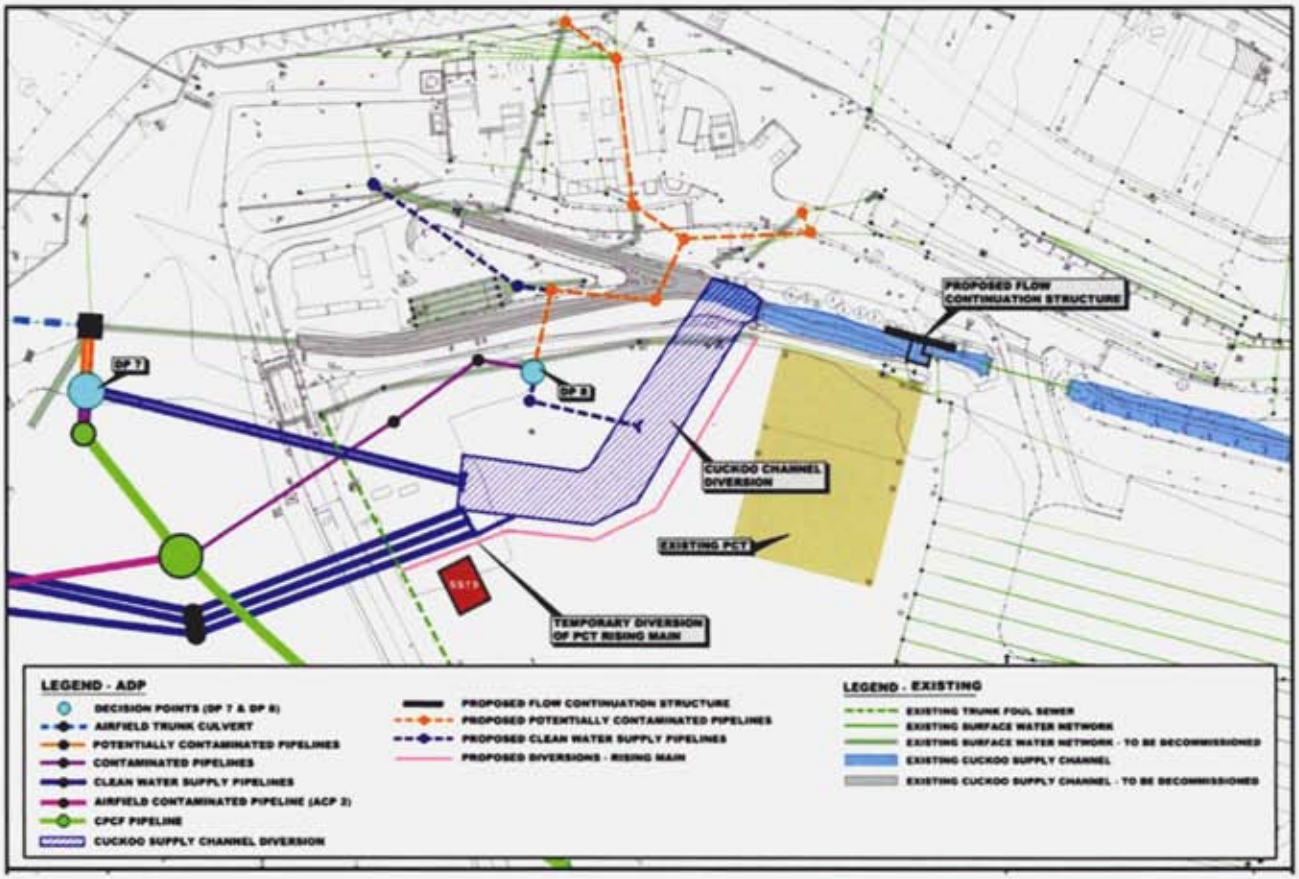

Figure 4-15 Proposed SAH Network Re-configuration

Gabion basket structures or rock armour will be used along parts of the Cuckoo Supply Channel Diversion banks both as retaining walls for the support of the steep banks and as scour protection. The relatively short length of the Diversion, the multiple sharp bends and inlet headwalls does not make it feasible to introduce significant naturalisation measures on this newly built stretch of the Cuckoo Supply Channel. The Diversion is also situated in a congested area in SA where the construction restrictions do not allow the provision of a riparian zone around the Diversion. Where a vegetated section of embankment can be provided it will consist of fast establishing native species. The top of the banks of the channel will be topsoiled and planted with grass seed to match the existing landscaping of surrounding grassed areas in the airfield. The vegetation within and adjacent to the Cuckoo Supply Channel will be regularly maintained and controlled, in accordance with the Dublin Airport Wildlife Management Plan.

The diverted Channel is designed to have a low-flow channel and a high-flow channel. This low flow channel will maintain minimum depths/velocities during low flow conditions, thereby mitigating the risk of sediment settling in the channel. The high flow channel has been designed

to contain the maximum design flow event within the channel. The top of bank elevation has been designed such that it can convey the peak design rainfall event over the continuation weir, without surcharging above the banks.

An indicative cross-section of the proposed channel diversion is provided in *Figure 4-16*.

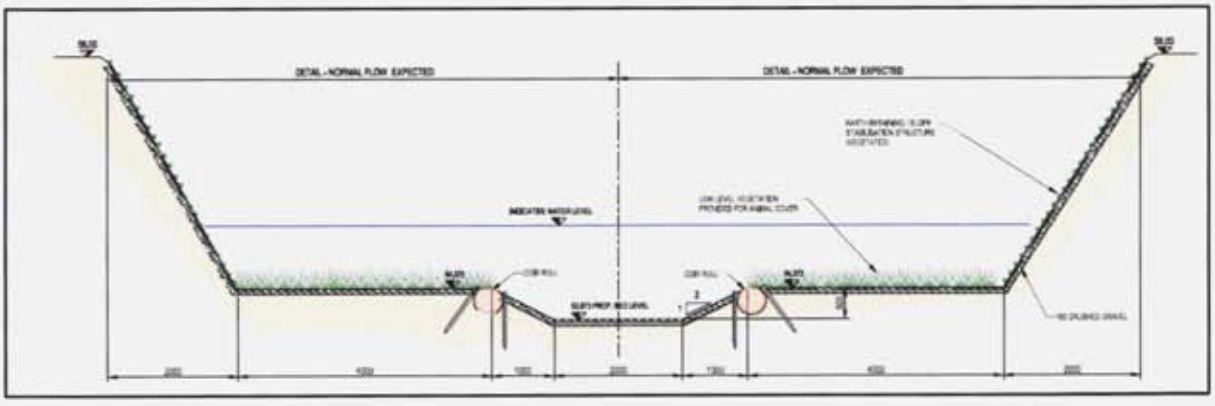

Figure 4-16- Cross-section of Proposed Cuckoo Supply Channel Diversion

Headwalls associated with the CW4 and DP7 connection to the Diverted Cuckoo Supply channel would be cast in-situ. Given the size of the structure it would not be feasible to install a pre-cast structure. The headwall construction would take place in the dry i.e. before connection to the existing channel is completed or flows are turned upstream. The reinforced earth embankments and / or gabion basket structures for the channel outer banks would be integrated into the profile and arrangement of the headwall.

4.3.9.2 Re-profiling

The reconfiguration of the pipeline network in SA (construction of new pipes, relaying of existing pipes) will require raising the existing ground levels to achieve the required cover above the pipelines. The extent of the area to be reprofiled is shown on Figure 4-17 below. Backfill material excavated from SA and other areas (e.g., CPCF tank) can be used in reprofiling.

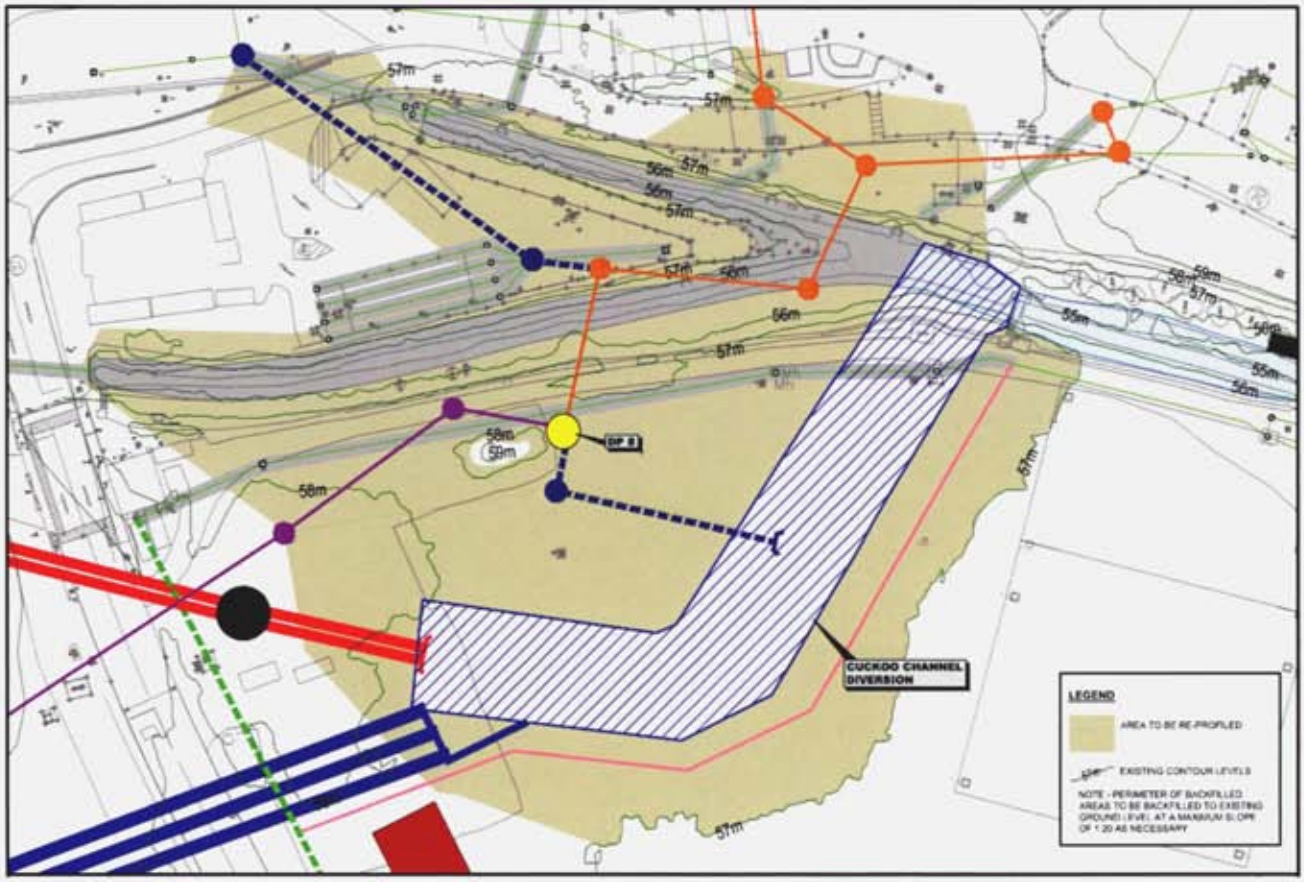

Figure 4-17 Extent of Re-profiling Required in SA

4.3.9.3 Flow Continuation Structure

There is an existing FDS along the Cuckoo Supply Channel which currently serves two functions; to divert contaminated flow to the existing PCT and to attenuate clean outflows to the Cuckoo Stream.

Under the proposed arrangement, the FDS will no longer serve the contaminated diversion function, as clean and contaminated flows will already have been segregated in the upstream network. It has been noted that some flood events have occurred in the vicinity of the FDS. It is therefore proposed to upgrade the existing FDS to alleviate these existing capacity issues.

Flow Continuation Structure (FCS): an FCS is proposed to be installed adjacent to the existing FDS, along the northern bank of the Cuckoo Supply Channel. The FCS will allow overflows to the downstream Cuckoo Supply Channel during extremely high-flow events, when water surcharges upstream of the FDS. The FCS upgrade will consist of:

- **Flow Continuation Weir:** A weir is proposed to be installed upstream of the FDS, parallel to the existing Cuckoo Supply Channel, along its northern bank. The weir is designed such that surcharged flows overtop the weir and flow to the Flow Continuation Channel rather than breaching the banks of the channel.
- **Flow Continuation Channel:** A concrete, rectangular channel is proposed to capture flows which overtop the proposed overflow weir. Flows in the channel will bypass the existing FDS and continue to the downstream section of the Cuckoo Supply Channel, during extremely high-flow conditions.
- **Reprofile Existing Banks:** The level of the existing Cuckoo Supply Channel banks upstream of the FDS will be raised to ensure that flows do not breach the banks, even during high-flow conditions when the flow continuation weir will be in use.

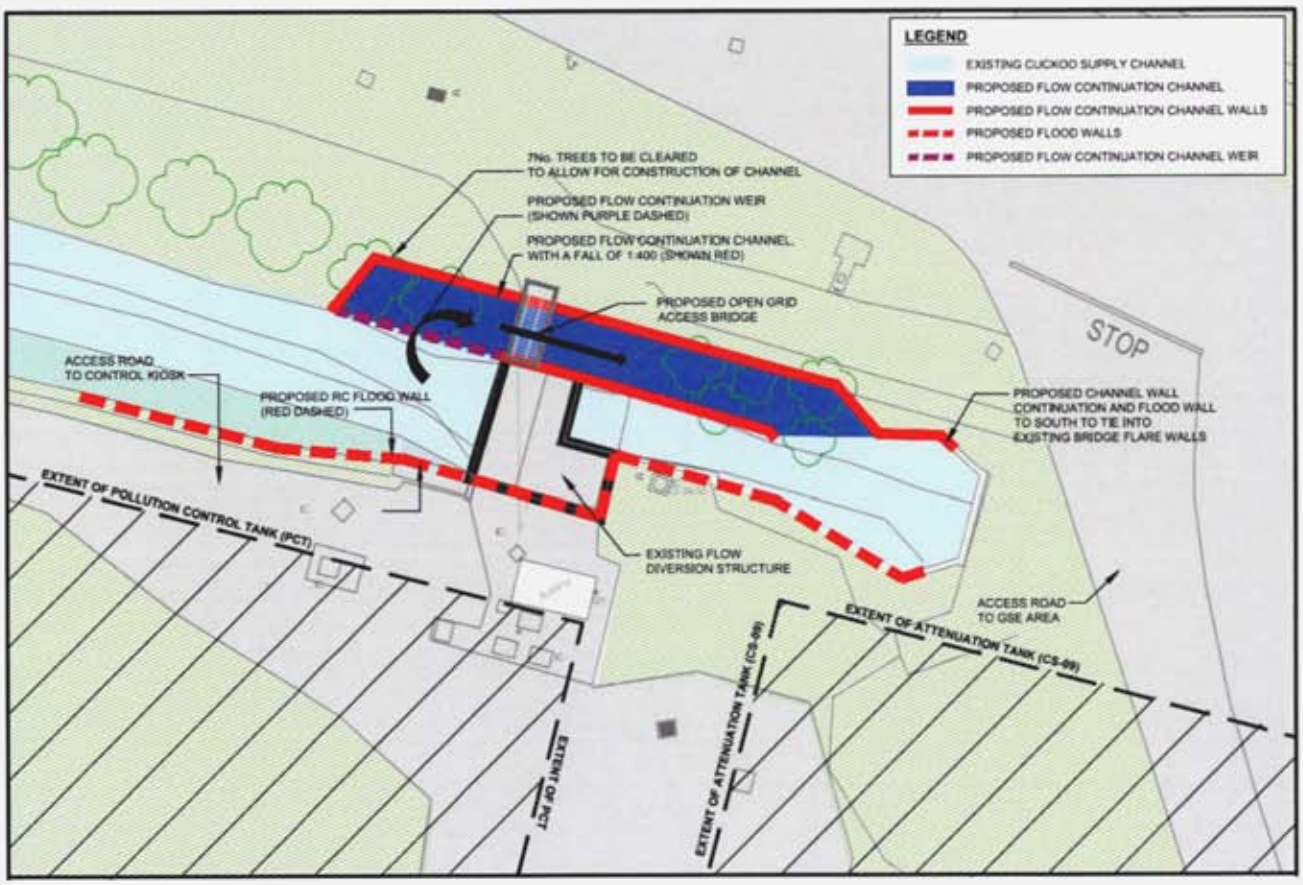

Figure 4-18 Flow Continuation Structure Layout

Where new sections of channel are required for the FCS, they will be constructed using pre-cast channel units to reduce the requirement to pour concrete in close proximity to the Cuckoo channel.

4.3.10 Construction Materials

All construction materials must be responsibly sourced. In procuring responsibly, daa seeks assurance that goods and services are legitimately secured from legal and well-managed sources, and from suppliers and contractors who can demonstrate responsible sourcing of their materials.

- The source of fill material will be carefully selected and vetted in order to ensure that it is of a reputable origin and that it is 'clean' (*i.e.*, will not introduce contamination to the environment). Suitable fill material will be sourced from excavations where feasible. Pipe bed, surround and backfill must be to a specified standard to ensure protection of the pipe from imposed loads and must be imported for bedding and surround as well as backfill in trafficked areas. Green areas present the opportunity to re-use excavated material (sub-soil and topsoil) for backfilling but not for bedding and surround;
- The ADP contract and procurement procedures will be developed to ensure that aggregates are sourced from reputable sources;
- All potential suppliers will be vetted for their environmental management status and regulatory and legal compliance;
- 'Clean' fill material will only be sourced from suppliers which comply with the above requirements;
- If recycled aggregate is used as imported fill, rigorous chemical testing will be undertaken to confirm that it is 'clean' (*i.e.*, will not introduce contamination to the environment).

Significant groundworks are required at the proposed pipelines and storage tanks (CPCF and West Apron). Large scale open excavations will be required along the routes of the proposed pipelines.

At the proposed CPCF tank, a large deep excavation will be required. The estimated volume of excavation for this tank will be 190,000m^3. The volumes for disposal and reuse of excavated materials are included in Section 4.3.4. This large-scale excavation may require temporary piling in order to stabilise the sides of the excavation, especially on the side of the Cuckoo Stream.

The West Apron Pollution Tank and the West Apron Attenuation Tank also involve large deep excavations with a combined estimated excavation volume of 98,000m^3 of which 36,000m^3 would be disposed off-site and the remainder required for backfilling.

In total it is estimated that circa 291,000m^3 (+25%, -15%) of excavated materials would be disposed off-site for the construction of the infrastructure associated with the ADP, including

pipelines and the various structures. Table 15-2 provides further details on estimates of construction waste disposal.

Table 4-2 sets out an estimate of the materials required for the construction of the infrastructure associated with the ADP.

Description	Units of Measurement	Estimated Quantity
Pipelines up to 1200mm dia	m	3,100
Pipelines from 1200mm to 1600mm dia (or equivalent capacity box culvert)	m	5,550
Pipelines from 1600mm to 3000mm dia (or equivalent capacity box culvert)	m	3,600
Pipe Surround material / Granular Fill	m^3	28,550
Manholes	No	105
Bituminous Materials	m^3	260
Concrete (Pollution Tanks, Cast in Situ Chambers and Taxiway / Apron reinstatement)	m^3	50,000
Reinforcement Steel for Tanks (CPCF, WA-PT, Decision Points, Secant Piles)	Tonnes	7,500
West Apron Attenuation Tank – 2.0m to 2.4m Diameter Pipes	m	3,900
Power and communication ducts – various diameters	m	3,500
Watercourse headwalls and associated scour protection of various sizes	No	6

Description	Units of Measurement	Estimated Quantity
MEICA equipment for decision point chambers – including pipework, valves, penstocks, covers, control panels.	No	10
Above Ground Control / Monitoring Kiosks	No	6
Electrical Substation – various materials including concrete, steel reinforcement, blockwork, pre-cast slabs, windows, doors, etc.	m^2	60
Flood Protection Embankment	m^3	15,000

Table 4-2: Construction Materials Estimates

4.3.11 Other Resources

Apart from the materials described above, there will be other resources which will be required during construction, as follows:

- Fuel (for construction plant and equipment)
- Electrical power (for light, heat and electrical appliances)
- Water (for welfare facilities, tunnelling, tank testing, pipeline testing, etc)
- For the largest proposed tunnelling installation, at the CPCF Pipeline, a storage volume of approximately 1,000m^3 of water will be required at the outset. The water will be used to transport material from the tunnel boring machine to the surface during tunnel boring, and to lubricate the pipeline during installation. This water will be recycled through an on-site separation system and will be reused throughout the process.

Regarding electrical power, there will be a requirement for a connection to the electricity network at both proposed compounds. This will be required for lighting, heating and communications purposes (refer Section 8.9). For the works areas, it is anticipated that mobile generators will be utilised to provide electrical power.

Regarding water usage, the operation with the largest requirement for water will be the tunnelling of pipelines. This requires water for the removal of material from the tunnel boring machine and for the lubrication of pipelines during installation. For instance, for the tunnelling of the CPCF Contamination Line, 1,000m^3 of water will be required for a tunnel bore length of 3 to 4m as part of this installation. For other smaller bore pipeline tunnels, a lesser quantity is anticipated. Water will also be required for pipeline testing and tank testing purposes. Considering the large pipe diameters and large tank volumes involved, this will need to be carefully planned, while considering the potential for water being reused for multiple pipeline sections and tank compartments as appropriate. In the first instance water from the public mains would be considered for use following liaison with Uisce Éireann, water from the Cuckoo Stream would be considered provided this did not impact on downstream flow conditions and groundwater would be considered where encountered in deep excavations. In the West Compound, there is an existing well that has been used for the previous construction works in this area.

In addition to above, water will be required for various other uses, some of which are listed below:

- Wheel washing (estimated daily usage of 450m^3 of water based on wheel washing at two compounds and three construction access gates to the works zones and peak daily construction traffic movements of 450 from the works zones). Water can be conserved by the potential use of water reuse wheelwash systems;
- Welfare facilities (estimated daily usage of 6m^3 of potable water at peak construction);
- Canteen facilities (estimated daily usage of 15m^3 of potable water at peak construction);
- Dust suppression (refer to Section 14).

It is anticipated that lower volumes of water will be required for the tunnelling installation at CW2, CW3, CW4 and the Airfield Contaminated Pipelines, in comparison to the CPCF Pipeline. This is due to these tunnelled sections being of smaller diameter and shorter length.

For the water testing of the CPCF storage tank it would be anticipated that the tank would be tested in stages based on the number of compartments in the final design. On completion of testing of a compartment the water would be transferred to the next compartment to continue the testing procedure.

4.3.12Plant, Machinery and Equipment

At each phase of the ADP, plant, machinery and equipment on site shall be recorded. The noise levels of this plant, machinery and equipment shall be covered within risk assessments and

method statements to ensure they do not exceed noise restrictions and the requirements of Section 13.

Where available, alternatives to diesel, such as low-carbon fuels, should be used to reduce fuel consumption, fuel handling risk, carbon emissions and noise levels. These could include hybrid generators and excavators. Hybrid excavators can yield a 20% reduction in diesel use and associated carbon savings. Fewer vehicles on the road to bring fuel to the site and reduced chance of spillage of fuel due to decreased refuelling.

Where possible a 20m buffer zone shall be established between machinery and watercourses. The refuelling of machinery shall be off site. These specific measures will provide protection to the receiving soil and water environments during the construction phase.

Mobile cranes will be used during the ADP, particularly during tunnelling works and tank construction (CPCF storage tank, West Apron Pollution Tank). Use of mobile cranes must comply with all Dublin Airport Directions for works in and around the Aerodrome and Guidance Documents for construction works at Dublin Airport.

Mobile concrete pumps will be used for in-situ tank construction.

The following Table 4-3 is an indicative list outlining the main plant/machinery and equipment envisaged to be used on each phase of the proposed works. In the description of the phase of works the duration of the works is outlined which is linked to the high-level construction programme provided in Section 5. The numbers in parenthesis in Table 4-3 beside each plant item represents the typical maximum sound level (L_{max}). The percentage (%) use outlines the envisaged usage of each plant item during the works programme for each phase.

Phase of Works	Plant/Machinery (typical Lmax @ 10m dB(A))	% use	Plant/Machinery (typical Lmax @ 10m dB(A))	% use
Topsoil stripping, Open Cut Pipelines, West Apron tanks and CPCF Month 2 to Month 16	Excavators (85)	100	Dump Trucks (84)	100
	Backhoe (80)	50	Tipper Trucks	100
	Bulldozers (85)	100	Trailers	50
	Wheel Tractor (84)	100	Tankers	50

Phase of Works	Plant/Machinery (typical Lmax @ 10m dB(A))	% use	Plant/Machinery (typical Lmax @ 10m dB(A))	% use
	Scraper (85)	100	Tractors (84)	50
	Dumpers (84)	100		
	Loaders (80)	100		
Pipeline Construction Works (Open Cut)- CW1, CW2, CW3, CW4, West Apron pipes, Airfield Contaminated Pipelines ACP1 & ACP2, South Apron Area Month 3 to Month 23	Excavators (85)	100	Tipper Trucks (84)	100
	Backhoe (80)	50	Trailers	50
	Trenchers	50	Tankers	50
	Dumpers (84)	100	Tractors (84)	50
	Loaders (80)	100	Readymix Trucks (85)	10
	Dewatering pumps (77)	25	Concrete Pumps (82)	10
	Dump Trucks (84)	100	Generators (82)	25
Pipeline Construction Works (Tunnelling)- CW2, CW3, CW4, **Airfield Contaminated Pipeline, CPCF** Pipeline, South Apron pipelines Month 3 to Month 23	Control container	100	3x D60 CAT generators (82)	100
	1500kW FG Wilson generator (82)	100	3x air compressors (80)	100
	3x 20m^3 slurry tanks	100	Jacking frame	100
	2x freshwater tanks	100	Push block	100
	2x dump-tanks	100	6x telescopic rams	100
	1x bentonite holding tank	100	Launch seal	100
	1x 'clay baller'	100	Triple Pump Gertec – lubrication system	
	2x primary decks	100	HANY Grout mixer & Pump	100

Phase of Works	Plant/Machinery (typical Lmax @ 10m dB(A))	% use	Plant/Machinery (typical Lmax @ 10m dB(A))	% use
	2x de-sanders	100	Bentonite container	100
	2x de-'silters'	100	Cables & Spares containers x2	100
	1x venturi	100	Tool container	100
	2x centrifuges (potential need for a 3rd centrifuge to manage clays)	100	Multiple slurry and clamp stillages	100
			Multiple 8-inch slurry pumps	100
			160t Crawler Crane (85)	100
			335 CAT 360' Excavator (85)	100
			50T Hyster forklift	100
Reinstatement Works	Excavators (85)	100	Loaders (80)	50
	Backhoe (80)	50	Trailers	50
	Graders (85)	100	Tankers	10
	Rollers (85)	100	Tractors (84)	50
Tank Construction Works - CPCF and West Apron (including excavation)	Excavators (85)	100	Tipper Trucks (84)	100
	Backhoe (80)	50	Trailers	100
	Rollers (85)	50	Tankers	100
Including Flow Continuation Structure	Dumpers (84)	100	Tractors (84)	100

Phase of Works	Plant/Machinery (typical Lmax @ 10m dB(A))	% use	Plant/Machinery (typical Lmax @ 10m dB(A))	% use
and Cuckoo Supply Channel Diversion Month 2 to Month 25	Loaders (80) Mobile/crawler cranes (85) Forklifts Dump Trucks (84)	100 100 10 100	Readymix Trucks (85) Concrete Pumps (82) Generators (82)	100 100 100

Table 4-3: List of Plant and Machinery

4.4 The Surrounding Environment

The proposed development is located at Dublin Airport, County Dublin, as shown in *Figure 4-19*. Primary strategic road access to Dublin Airport is from the M1 motorway. Road access to the airport is via the M1 Spur route and the existing R132 roundabout.

Figure 4-19: Site Location

4.4.1 Sensitive receptors

Sensitive receptors have been identified within and in proximity to the proposed works (within 150m of the ADP boundary and the West Compound), through examination of the supporting studies and documents listed in Section 3 of this document. The sensitive receptors within and proximal to the ADP boundary are summarised in Table 4-4. This table will be updated as new information becomes available from further studies and surveys undertaken for the EIAR, including the schedule of mitigation measures, and the appropriate assessment and mitigation measures (as may be applicable) to the proposed ADP.

The general location of selected sensitive receptors in relation to the ADP boundary and 150m buffer is shown in *Figure 4-20*. Further detail on the location of sensitive receptors is provided in the table below with reference to the relevant technical information contained in the EIAR Baseline Report. Separate figures show the location of dwellings/other noise sensitive receptors, and the details of bird species elsewhere is this document as detailed in the table below.

Figure 4-20: ADP Boundary, 150m buffer and selected sensitive receptors.

Receptor	Location
Protected Structures & sites	HA7: Toberbunny Well (DU014-023) is a recorded monument. It is a well located 140m east of the Airport, adjacent to Cuckoo Stream, and is within the ADP boundary. Even though this Monument is proximal to the project boundary, it is not anticipated that construction works for the ADP will impact this Monument. HA9: The Boot Inn (DU014-090) is a Recorded Monument of local significance located adjacent to the west boundary of Dublin Airport at Pickardstown. It is a two-storey, four-bay building of post-1700 date located to the east of the R108. The ADP boundary is circa 20m from the site of this building. It is anticipated that there will be no impacts to this Monument arising from construction of the proposed ADP, including access to the works areas. The general location of these monuments is indicated in Figure 4-17. Further information is provided in the *Environmental Baseline Report Technical Appendix 10A Cultural Heritage.*
Watercourses	Cuckoo Stream is a main watercourse which interfaces with the proposed ADP development. The Cuckoo Stream flows eastwards through the northern section of the Eastlands works area within the ADP boundary. This watercourse will be impacted by works adjacent to it and in-stream. These works are described in Section 13 of this document. Cuckoo Stream flows to the Mayne River approximately 4.5km downstream of the airport. The proposed works do not interface with this waterbody. It is the receiving water for the surface water discharges from the proposed ADP. The proposed works will interface with drainage ditches in airside locations and in the Eastlands works areas (see Section 9.1.1.2). There are proposals for the rehabilitation of drainage ditches and construction of a headwall adjacent to West Apron. There are several wet drainage ditches and streams (e.g., Cuckoo Stream) within 150m of the ADP boundary that are considered suitable for common frog and smooth newt (*AECOM Ecology Interim Technical*

Receptor	Location
	Note). Any works such as rehabilitating drainage ditches will require a pre-works survey to be carried out by a suitably qualified ecologist. Mitigation is needed in the form of control of silt and petrochemical and dust during construction. Local drainage connections, gullies and watercourses will be protected from dust, silt and surface water throughout the works. All onsite drainage network connections will be blanked off and sealed at the first phase of the construction works. There will be no entry of solids or petrochemicals to the drainage network during the works. Ditches and streams shall be clearly identified on site and shown on method statements and site plans. Temporary stockpiles will be located away from drains and watercourses. Stockpiles will not be located within 10m of any ditches, dry or wet, or watercourses.
Groundwaters	Most of the aquifers underlying the ADP boundary are classified as 'low vulnerability' with smaller localised areas to the north west of the airfield (in the vicinity of the CW-3 pipeline corridor) classed as 'moderate vulnerability' and 'high vulnerability'. None of the groundwaters underlying proposed works areas are classified as 'extreme vulnerability'. Given the nature of the underlying aquifers, the fact there are no public water supply wells within the airport campus, and that there are no discharges to groundwaters proposed, there will be no impact on existing groundwater sources and aquifers arising from the proposed ADP. Section 16 of this document details the control and emergency response measures to be implemented during construction which will prevent potential contamination of groundwaters by accidental spills and leakages.
Natura 2000 Sites	Baldoyle Bay SAC/SPA lies approximately 5.5km downstream of the airport. It is anticipated that the works proposed in the ADP Natura 2000 sites will be hydrologically linked to the downstream European sites via the Mayne River.

Receptor	Location
	Mitigation is needed to limit the potential negative effect from contaminated surface water during construction.
Public road network	R132 (Swords Road), immediately to the southeast of the existing South Apron. The proposed Central Pollution Control Facility (CPCF) is located to the east of this road. Two proposed drainage pipeline routes (CPCF Pipeline and the pumped discharge from the CPCF Storage Tank to the North Fringe Sewer) cross this road. Access to the airfield for the proposed works will be via Gate 1B off Old Airport Road. R108 to the west of the of the airport. This route will also be used by construction traffic moving between the Western Compound and works areas through Gate 9. The proposed Clean Water Supply Pipeline CW1 is to be partially located on the R108 for the interception of greenfield flows outside the airport complex that naturally flow through the complex. The locations of the above roads in relation to the ADP boundary are shown in Figure 10-2.
Dwellings and other noise sensitive receptors	Noise sensitive receptors within 150m of the ADP boundary include houses, commercial premises, the Boot Inn, farmyards and an industrial estate and ALSAA recreational grounds. Other noise sensitive receptors include Dardistown Cemetery is located adjacent to the Eastlands work area, approximately 50m from the ADP boundary at its closest point, and Silloge Golf Course, located approximately 750m south of the ADP project boundary. Refer to Figure 12-1, Figure 12-2 and Figure 12-3 for detail on locations of noise sensitive receptors surrounding the airport.

Receptor	Location
Airport Operations	Navaids equipment ATC tower OLS for RWYs Radars
Contaminated land	There is no known contaminated land within the ADP boundary. A decommissioned petrol station to the east of R132 is situated approximately 50m north of the ADP boundary. A Decommissioning Report was prepared in March 2018 for this petrol station. The report details the decommissioning process, provides drawings of the area and also confirmed that the site, in its current post-decommissioned state, does not pose a risk to human health, to the environment, or to future commercial development on the site.
Noise & Vibration	Noise Monitoring Terminal 21, north of the north apron. Refer to Figure 13-1, Figure 13-2 and Figure 13-3 for locations of noise sensitive receptors surrounding the airport. The main items of plant that are expected to cause noise and vibration are listed in Section 12.3. Existing buildings and utilities that could be impacted by construction vibrations are listed in Section 12.5.
Habitats	The main areas of proposed development are primarily a series of agricultural/wet grassland surrounded by hedgerows. The Cuckoo Stream, drainage ditches and hedgerows on site would be seen as the most important habitats on site, not because of the species noted but, by the linear nature of the elements providing biodiversity corridors and bat foraging routes to the surrounding areas. No habitats of conservation significance were noted within the site outline. There is a known area of invasive species to the south west of the West Apron within 150m of the ADP boundary. Mitigation is required to offset the hedgerow loss on site and to comply with legislation in relation to the control/removal of invasives on site.

Receptor	Location
Amphibians	The common frog (Rana temporaria) was not observed on site. However, frogspawn was noted beside the drainage ditch. There are features within the site boundary that could be important to frogs including the grassland and drainage ditches. The common lizard (Zootoca vivipara) or smooth newt (Lissotriton vulgaris) were not recorded on site. There are several wet drainage ditches and streams (*e.g.,* Cuckoo Stream) within 150m of the ADP boundary that are considered suitable for common frog and smooth newt (*AECOM Ecology Interim Technical Note).* Any works such as rehabilitating drainage ditches will require a pre-works survey to be carried out by a suitably qualified ecologist.
Mammals	Badgers have been noted [redacted] however, no badgers or badger activity was noted on site. Otters (Lutra lutra) activity or holts were not noted on site. No evidence of deer was noted on site. Hedgehogs (Erinaceus erinaceus) have been recorded by NPWS within the 10km square. No hedgehogs were seen during the site visits (15th & 20th January 2023) but may be present on site. Irish hares (Lepus timidus hibernicus) were noted within the grasslands within the airfield. Evidence of rabbit (Oryctolagus cuniculus) and fox (Vulpes vulpes) activity was noted on site, particularly to the east of the R132. However, hedgehogs (Erinaceus erinaceus), Irish hares (Lepus timidus hibernicus), rabbit (Oryctolagus cuniculus) and fox (Vulpes vulpes) were all recorded by Ball et al. (2023) using camera traps in 2022 within the airport. No protected terrestrial mammals were noted east of the R132. General locations of the badger setts identified in the baseline surveys are shown in Figure 4-17. Mitigation is required in the form of pre-construction inspections for mammals and ensuring that mammals have the ability to exit excavations.

Receptor	Location
Bats	Bat assessments were carried out, including emergence surveys from trees and hedgerows. There were no seasonal or climatic constraints as surveys were undertaken within the active bat season in good weather conditions with temperatures of greater than 10OC after dark. Winds were very light and there was no rainfall. Foraging activity of soprano pipistrelle, common pipistrelle and Leisler's bats were noted along the hedgerows on site. No trees of moderate or high bat roosting potential are noted within the proposed development site. No bats were noted roosting on site. No bats were noted emerging from trees on site. Foraging of three bat species was noted on site. During construction several areas of hedgerow will be lost which may result in a minor temporary loss of foraging areas. Mitigation is needed in the form of the control of light spill during construction.
Birds	'Thirty-two Bird species were recorded at the Dublin Airport site over three breeding bird surveys in May and June 2022. Of these species recorded eleven species were proven breeding on-site these being – Blackbird, Robin, Wren, Song Thrush, Blue Tit, Coal Tit, Long-tailed Tit, Goldcrest, Chaffinch, Willow Warbler and Hooded Crow. Breeding species recorded on-site that are amber-listed on Birdwatch Ireland's Bird of conservation concern in Ireland 2020-2026 were Willow Warbler and Goldcrest.' A wintering bird assessment is ongoing, and the data collected have thus far recorded a similar profile of passerines to those recorded in the 2022 breeding bird surveys, exceptions being Redwing and Fieldfare (foraging on-site in small numbers). Of the wintering species recorded on-site (non-passerines) and of conservation concern, Snipe are foraging on-site in small numbers (single figures), attracted to forage at wet locations on-site (some areas in fields at east side and near the stream). Woodcock was recorded once (Single bird). Other species recorded were Oystercatcher and Curlew (one visit only) in the

Receptor	Location
	playing fields area, again in single figures. No other species were recorded. Mitigation is needed whereby light spill is controlled and the removal of woody vegetation happens outside of bird nesting season. In addition, compensatory areas for willow warbler and goldcrest to be planted on the eastern portion of the site in the vicinity of the Cuckoo Stream. Given the location of the site beneath the flight path mitigation is not proposed for the larger bird species on site due to the potential for collision risk with incoming aircraft.
Mean Absolute Difference (MAD) (Pluvial flooding)	Pluvial flooding occurs in the West Apron area of the airport complex. It is proposed to address the pluvial flooding as part of the ADP.
Fluvial Flooding	The Cuckoo Stream causes fluvial flooding in the Eastlands upstream of the M1 motorway culvert.

Table 4-4: Sensitive Receptors at Dublin Airport

5 PROGRAMME

A high-level construction programme has been prepared to reflect the construction works as described above. The programme has been broken down into each area of construction (*i.e.*, various pipelines, West Apron and the CPCF pollution tank).

5.1 Indicative Construction Programme

Figure 5-1 is an indicative programme for the drainage pipelines, West Apron drainage works and the CPCF Tank.

Ref	Description	Months 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
A	***Clean Water Supply Pipelines and Contaminated Pipelines***																											
A1	Mobilisation																											
A2	Pipeline Delivery																											
A3	CW4 Pipeline including river channel works																											
A4	DP6, DP7 & DP8 Pipework and Chambers																											
A5	MEICA Works for CW4																											
A6	CW3 Pipeline																											
A7	DP1A Pipework and Chambers																											
A8	DP4 Pipework and Chambers																											
A9	DP5A & DP5B Pipework and Chambers																											
A10	DP3 Pipework																											
A11	MEICA Works for CW3																											
A12	CW1 and CW2 Pipeline																											
A13	MEICA Works for CW2																											
A14	Contaminated Pipelines																											
A15	South Apron Network Re-configuration																											
A16	Testing and Commissioning																											
A17	Demobilisation																											
B	***CPCF Contamination Lines***																											
B1	Mobilisation																											
B2	CPCF Contamination Lines																											
B3	Testing and Commissioning																											
B4	Demobilisation																											
C	***CPCF Tank***																											
C1	Mobilisation																											
C2	CPCF Tank / PS / Substation / Berm																											
C3	MEICA Works																											
C4	Rising Main & Gravity Sewer to NFS																											
C5	Futureproofing pipework to orbital sewer																											
C6	Testing and Commissioning																											
C7	Demobilisation																											
D	***West Apron Works***																											
D1	Mobilisation																											
D2	West Apron Pipework and Tanks																											
D3	MEICA, Testing and Commissioning																											
D4	Demobilisation																											

Figure 5-1: Indicative Construction Programme in Months

6 ROLES, RESPONSIBILITIES & COMMUNICATIONS

All ADP stakeholders have a responsibility to protect the environment. Assigned environmental roles and responsibilities are described in the *Airport Direction D-O Environment and Pollution*.

The following section describes the main responsibilities of relevant ADP stakeholders with regards to the development of this CEMP and subsequent detailed CEMP. Responsibilities are not limited to the below and each stakeholder is responsible for all their Environmental duties according to the law.

6.1 Client

daa shall be responsible for keeping Environmental Policies, general procedures and other organisational process assets, such as templates, up to date and in conformance with the current environmental legislation. It shall also be responsible for communicating effectively any updates and changes proposed to the process of environmental compliance for other projects carried out in the Airport Campus.

6.2 Project Manager

The Project Manager (PM) shall be responsible for managing and overseeing the development of this CEMP making sure it accounts for all of daa information and required inputs from relevant ADP stakeholders. The PM shall also be responsible for keeping this document up to date with changes to the ADP and monitor the development of this live document as it advances through the project life cycle.

6.3 Designers

Designers shall be responsible for demonstrating environmental due diligence in their designs, assessing any environmental risks insofar as reasonably practicable with the information available. Design information shall be done to a level of detail that supports the development of this CEMP.

6.4 Contractor

Contractors and sub-contractors are responsible for developing a detailed CEMP of their Works in accordance with this document, the relevant general policies created by the daa, daa's standard contract documentation (specifications, appendices and airport directions) and any planning conditions relevant to the ADP. They shall be responsible for

implementing all documented procedures on their CEMPs and provide resources to monitor and control the implementation.

The Contractor's Site Manager will be responsible for the pollution prevention programme and will ensure that at least daily checks are carried out to ensure compliance. A record of these checks will be maintained.

6.5 Audits and Inspections

Periodic inspections of the construction Works shall be conducted to address issues including dust, litter, noise, traffic, surface water, waste management and general housekeeping. These inspections shall be conducted by the appointed contractor (by a project dedicated Environmental Manager if needed) and shall be documented and reported to the daa Project Manager on a monthly basis.

The daa or its appointed consultants shall also reserve the right to carry out audits, inspections, monitoring and/or spot checks of the Works and any systems being implemented both on-site and off-site in connection with the Works to ascertain whether they comply with the requirements of this document – the CEMP, and the contractor's detailed CEMP.

Findings raised as a result of these audits shall be recorded in Corrective Action Requests (CARs). These shall be issued to ensure prompt action is agreed and committed to with a view to the effective resolution of any deviations from the CEMP requirements or any environmental issues. Key Performance Indicators (KPI's) shall be established within the contract documentation to support this.

6.6 Communications, Liaison and Complaints

daa will appoint a dedicated liaison (Project Manager or Stakeholder Manager) for the ADP who shall act as coordinator with the contractor and all internal and external stakeholders unless agreed otherwise. This includes liaising with passengers, members of the public and the local community and statutory authorities where relevant.

All communications are to be cleared with daa in advance. The contractor shall provide all necessary information, details and records to facilitate the role of the daa liaison including briefing packs where required.

The contractor shall detail their procedures and timescales for recording, acknowledging, investigating and responding to complaints and who is responsible for same.

The dedicated daa liaison shall review the above procedure and agree protocols for its implementation for these Works.

The daa Communications team shall inform the public of Project Element progress and any environmental incidents.

6.7 Non-conformances and Non-Compliances

Environmental Observations, Non-Conformances and/or Non-Compliances are identified through audits and inspections by the contractor, daa or their agents or reports of non-compliance received from enforcement agencies (EPA, Local Authority).

All environmental observations, incidents and near-misses must be recorded within 48 hours via the contractor's reporting system and the necessary internal and external stakeholders notified accordingly. The timeframe for close-out must be agreed at the outset of the ADP between daa and the contractor and full details should be recorded, and any issues suitably addressed within the agreed timeframe. Good practices should also be recorded.

In the event of an emergency incident occurring, the Environmental Manager shall be required to investigate and provide an incident report to daa including a description of the incident, contributory causes, negative impacts, notification to relevant parties, mitigation measures implemented and recommendations to prevent re-occurrence. daa's dedicated liaison and the contractor's Project Manager must be notified immediately in the event of such an incident occurring.

Refer to d*aa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual* and the *Airport Direction D-O Environment and Pollution* for further guidance on this matter.

Further detail on penalty clauses for environmental non-conformances & non-compliances shall be included in the construction contract once a contractor is appointed to carry out the works.

6.8 Permits and Licensing

All Project Elements must have the required permits and licenses identified and planned before the start of the construction works and shall follow standard procedures as per daa planning, design and construction processes. Specific permits and licences to this Project Element include (but is not limited to) the following:

- IAA approval;
- Permission to Work (P2W);
- Airside Driving Permit;
- Breaking Ground Risk Assessment and Permit;
- Plant Isolation Handover Permit;
- Electrical/ Hazardous Energy Permit;
- Hot Works Permit;
- Life Safety Systems (LSS) Permit;
- Ladder Permit;
- Waste Collection Permit;
- Disposal Facility Permit;
- Crane Lift Plan Approval;
- Permission from Utility Owners for work to, and in vicinity of, existing services (*e.g.*, ESB, Uisce Éireann, Gas Networks Ireland, various telecoms utilities);
- Road Opening Licences;
- Waste Haulage Permit;
- Waste Disposal Facility Permit;
- Tree Felling Licence;
- Hoarding Licence; and
- Licence for Protected Species under the Wildlife Act (subject to EIAR findings).

Refer to *daa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual* for guidance on some of the work permits required.

6.9 Utilities

Ongoing consultation with Irish Water, Bord Gáis, EirGrid, ESB Networks and other relevant service providers within the locality, and compliance with any requirements or guidelines they may have, will ensure a smooth construction schedule without disruption to the local residential and business community. The works contractor will be obliged to put best practice mitigation measures (including consultation with utility providers; assessment of utilities at detailed design stage to determine risk of damage due to vibrations) in place to ensure there are no interruptions to these utilities, unless this has been agreed in advance. Coordination and consultation will be had between the project team and ESB and Irish Water, and other relevant service providers within the locality, as the design of the proposed development progresses.

6.10 Health and Safety

Health and Safety are at the forefront of daa priorities. Contractors, designers and other construction stakeholders for the ADP must comply with all the rules and take on board all recommendations outlined in the *daa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual*.

daa shall ensure that the appointed Project Supervisor Design Process (PSDP) has prepared a Preliminary Health and Safety Plan as required by Regulation 12 of the Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013) to identify exceptional features of design and construction affecting Safety and Health on daa projects based on information provided by designers, the daa and by reference to the contract documentation. The information presented in the Preliminary Health and Safety Plan will assist the Project Supervisor Construction Stage (PSCS) in the further development of the Safety & Health Plan as required by Regulation 16 of the Safety, Health & Welfare at Work (Construction) Regulations 2013, prior to commencement of works on site.

7 WORKING HOURS AND CONSTRUCTION NUMBERS

7.1 Working Hours

Construction working hours on the Dublin Airport campus would normally be between 08:00 and 19:00 Monday to Friday and 08:00 to 14:00 Saturday, with no activities taking place on Sundays or Bank Holidays. However, the proposed works subject of this CEMP shall require working hours that are outside those stated above. In particular, there is a necessity for tunnelling operations to be undertaken on a 24-hour basis. Night working may also be required due to height restrictions in certain parts of the airport campus and when working on the R132. Other works, such as large concrete pours for the CPCF, may require out-of-hours working including extended weekend working.

The contractor shall be encouraged to adjust shift and delivery times to minimise operational impacts on the landside road network or terminal areas. This shall also assist in the mobility of workers in relation to car parking and access from the construction staff parking to the works site. The table below shows the standard day shift, rush hour, peak passenger times and optimum delivery times which is to be applied to the contractor's delivery schedule.

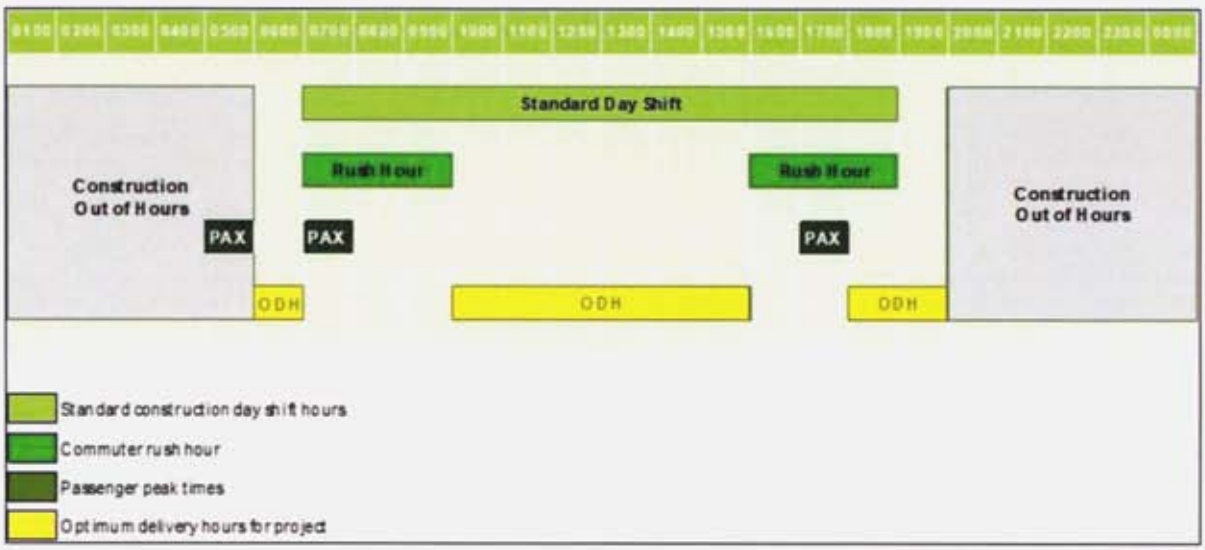

Figure 7-1: Current peak hours at Dublin Airport

Contractors must also abide by the Organisation of Working Time Act, 1997 in relation to working hours.

As detailed above, for certain works it may be necessary to work outside the above hours in order to facilitate the efficient operation of Dublin Airport. The contractor shall obtain the written permission of daa at least 48 hours in advance of working outside the specified hours and shall take all practical efforts to minimise these works.

Much of the proposed works in the airfield, including runway and taxiway crossings, may have to be completed outside specified hours (*i.e.*, night works). It is envisaged that the installation of pipeline CW2 and CW3 across runway 16/34 shall be carried out during the backfilling of the Underpass in this area. It is also envisaged that the installation of pipeline CW2 across taxiways W1 and W2 may proceed by either tunnelling or open cut. These works shall meet all daa requirements for the completion of such works.

For pipeline tunnelling works, it shall be necessary to carry out works during both daytime and night-time hours. This is because the nature of this work requires that there be no delays during tunnel boring and installation works. The tunnelling works shall also be subject to height restrictions, which would require some operations (*e.g.*, craning) to be carried out during night-time hours. The tunnelling works will be limited to operations at a drive shaft and a tunnel shaft when carrying out night time works. Management of the tunnelling operation should ensure that all equipment and material are available at the designed tunnelling compounds for the night-time works and no significant traffic movement, involving heavy haulage of plant or materials, should occur between the tunnelling compounds and the main compounds. The tunnelling compounds would have mobile lighting for night-time works and this would be focused on the compound areas without significant spread to the surrounding environment. Noise monitoring of the tunnelling works would be monitored to ensure that nigh time noise does not impact on sensitive receptors in proximity to the tunnelling compounds.

There shall be requirements for large scale concrete pours to be carried out during the construction of the CPCF and pollution tank in West Apron. These shall necessitate continuous work including continuous concrete deliveries until the pour is completed and shall require works to take place throughout daytime and night-time hours.

The construction of pipelines on and or crossing the R108 is envisaged to be carried out under a road closure and with the works being carried out during day-time hours. The construction of the pipeline connection from the CPCF to the NFS on the R132 is envisaged to be carried out using temporary traffic management and due to the high traffic volumes

on the R132 it is envisaged that this works will be carried out in stages with night working. Further details are contained in the CTMP.

7.2 Construction Numbers

The total number of construction operatives on-site will vary considerably throughout the duration of the ADP.

Based on the outline construction programme, the estimated average number of people employed during construction is expected to be 93 site operatives, with the peak estimated at approximately 160 site operatives. In general, this estimate is based on a single pipelaying crew for each of the pipelines (*i.e.,* CW1, CW2, CW3, CW4, ACP1, ACP2, CPCF Pipeline, CPCF Outlet Line). It also assumes two concrete shuttering crews and two concrete placing gangs for the CPCF and West Apron tank construction works.

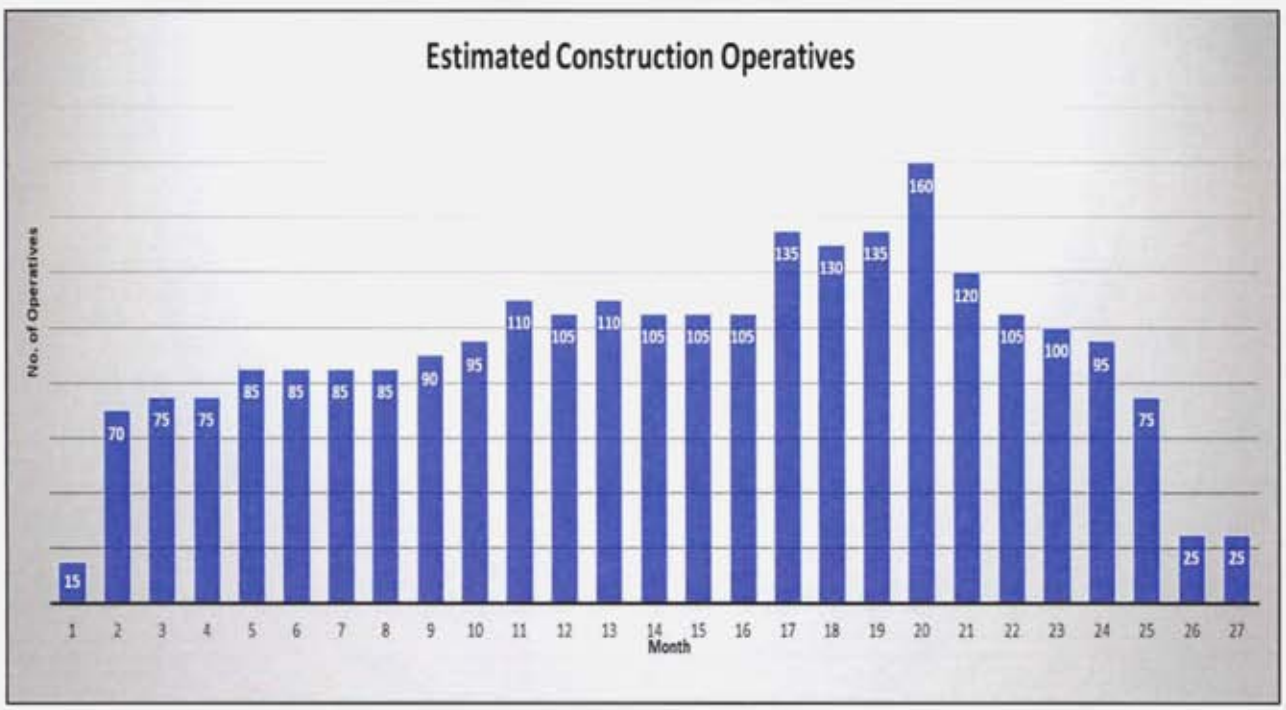

Figure 7-2: Estimated Construction Operatives on site

8 COMPOUNDS AND MATERIAL STORAGE LOCATIONS

8.1 Main Construction Compounds

Two areas have been identified as construction compounds, namely the West Compound and the East (Eastlands) Compound, as shown in Figure 8-1. These compounds shall be utilised by the ADP.

The EPA Guidance Note *'Storage and Transfer of Materials for Scheduled Activities'* shall be taken into account when designing material storage and containment on site.

Construction compounds shall have a signed Compound Agreement in place with the contractor.

Temporary accommodation units and cabins shall be sustainably designed to be as efficient as possible in terms of energy use and water consumption. Rainwater harvesting and renewable energy options shall be reviewed as potential options to minimise carbon emissions.

A pre-condition survey shall be required to analyse the current state of the proposed sites and ensure its use as a compound is feasible and to define the exact scope to facilitate the compound.

Site compound and welfare facilities establishment for the ADP would take place at the start of the construction programme.

Site compound and welfare facilities establishment is critical, but consideration must also be given for removal on completion, and reinstatement of surface finishes where required.

All deliveries shall be planned and coordinated and shall take into account the presence of other programme contractors located in both main compounds.

Works in the South Apron area of the ADP could potentially use the area of the tunnelling compound associated with CPCF Pipeline (refer *Figure 8-4*) pre or post tunnelling works, as an efficient means of storing and containment of materials on site.

Figure 8-1: Construction/Material Storage Compounds

8.2 Indicative Layout of Main Compounds

Figure 8-2 and Figure 8-3 show the proposed indicative layouts of the East and West compounds for the purpose of the ADP works. Each compound typically contains offices, canteen, welfare facilities, pipe storage, plant storage and storage for miscellaneous construction materials. Car parking for site operatives will be located in the vicinity of the offices / canteen / welfare facilities. Internal roads will be provided within the compound layout linked to the proposed access point.

Access to the compounds is detailed in Section 10.

The compound areas will be initially fenced off and then topsoil will be stripped from the area and stockpiled for reinstatement at the end of the works. Trees and hedgerows will be removed as part of the compound area clearance. The cleared compound area will then be filled with hardcore to create a trafficable surface for vehicles. During the filling of the area service ducts / pipes would be installed for water, electrical and telecom services to the facilities. When the hardcored areas are complete portable buildings would be installed

for the offices, canteen and welfare facilities. Areas within the compounded would be delineated for the various storage requirements.

The East Compound is proposed to have an area allocated for temporary storage of spoil from the tunnelling operations in the East Work Zone (refer to details on Potential Tunnelling Compounds in Section 8.3). This area will be enclosed on three sides in order to prevent excessive spread of the stockpiled material and contamination of areas used for storage of materials, and to prevent creation of dust from the stored material.

Large diameter pipes for the construction of the CPCF Pipeline in the East Work Zone would be delivered by articulated lorry, typically one to two pipes per load, and stored in the East Compound until required at the work zone. Similarly, pipes for the various pipelines in the West Work Zone will be delivered by articulated lorry, with variable numbers of pipes per load, and stored in the West Compound until required at the work zone. It is envisaged that sufficient pipework for the construction of a 1km length of pipeline would be stored at any one-time. Deliveries of pipes to the compounds would be expected to be continuous initially to create the stockpiles, and then periodically to keep the stock replenished. This could be variable depending on the capacity of the pipe manufacturer to produce the pipes, and also if different manufacturers are required to source the pipes to achieve the contractor's programme.

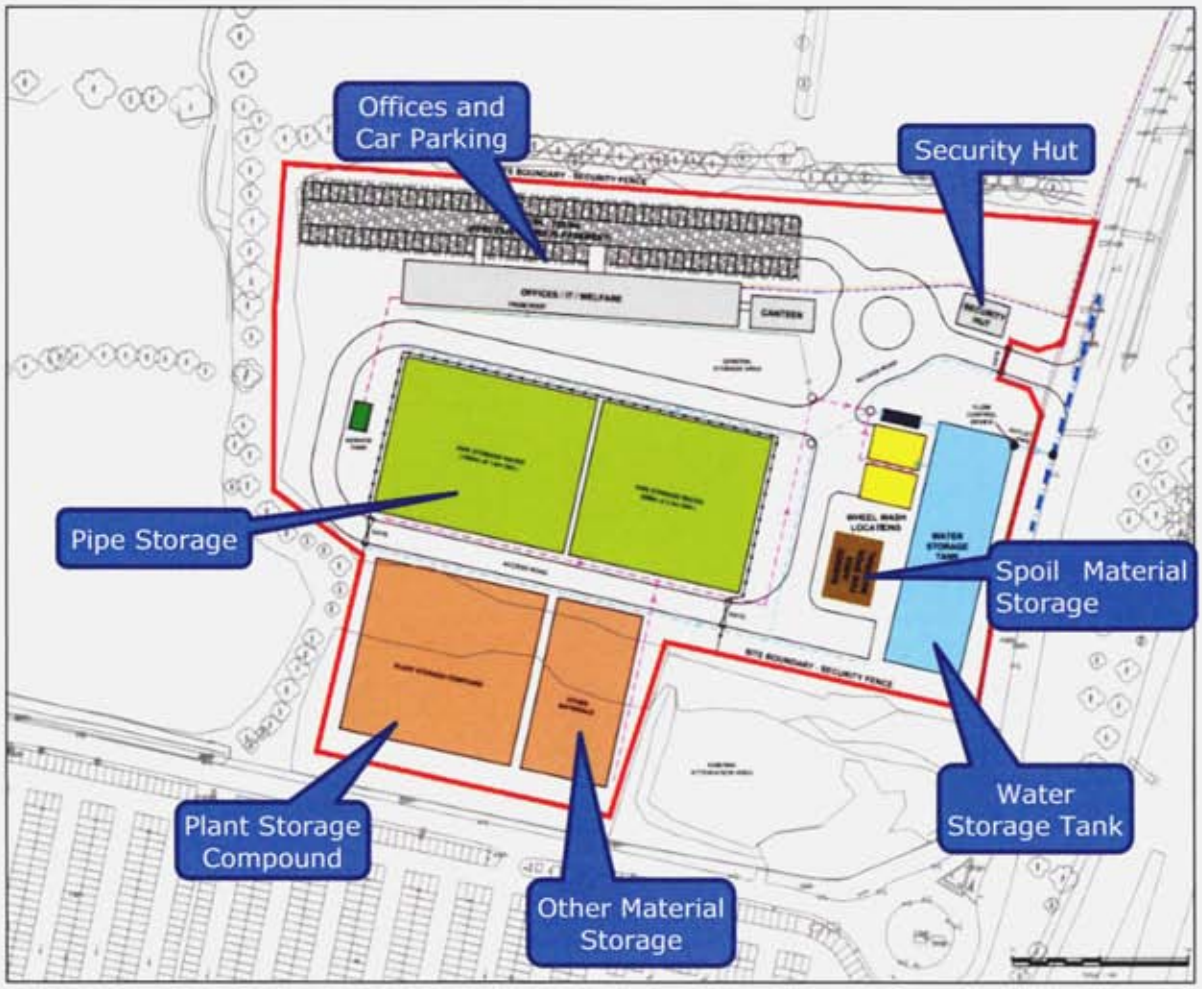

Figure 8-2: Proposed Indicative Layout of East Compound

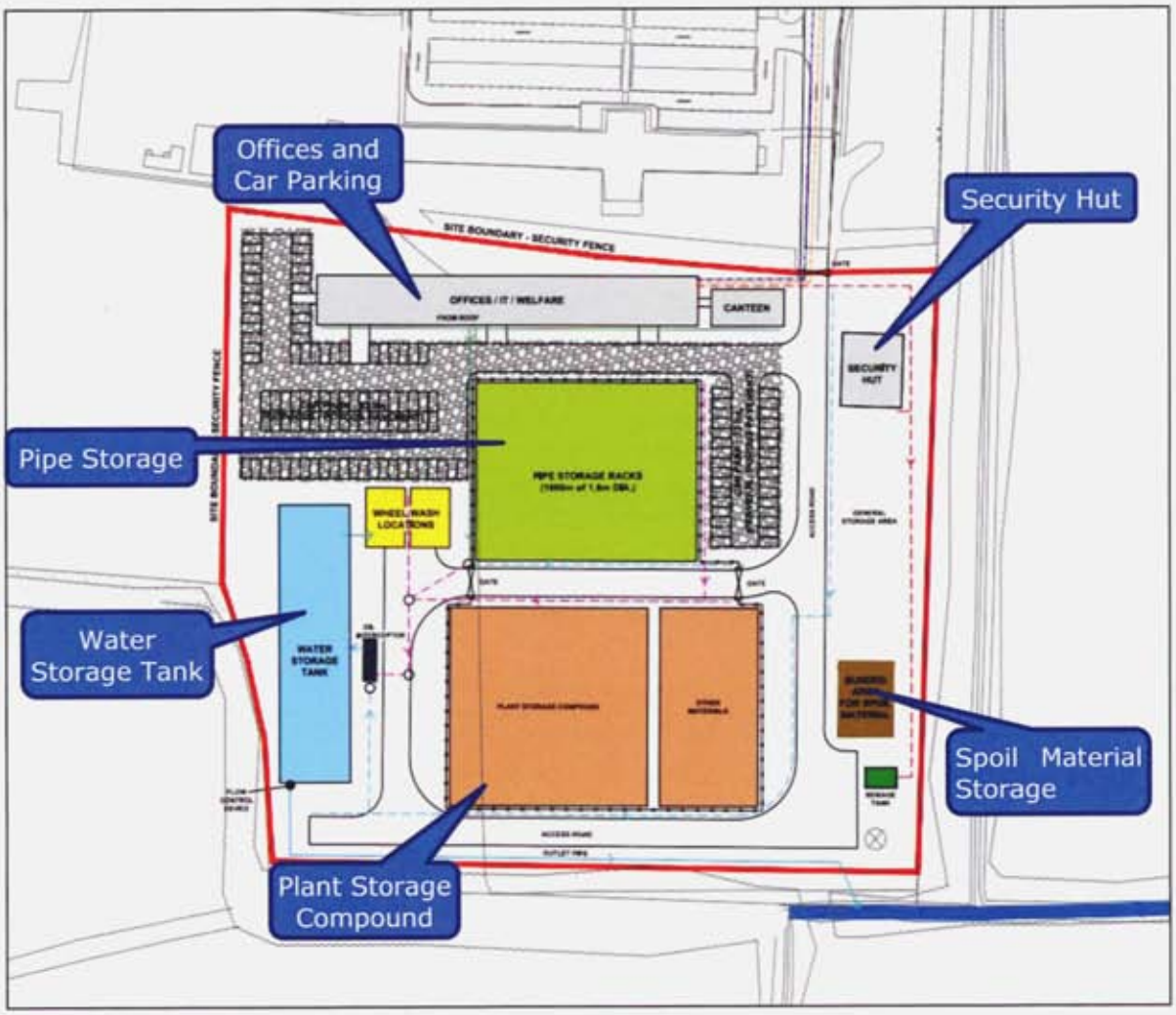

Figure 8-3: Proposed Indicative Layout of West Compound

8.2.1 Site Services to Compounds

The Contractor will require water, welfare, sanitary, power and communications facilities during the course of the construction period to facilitate construction, to enable welfare facilities to be provided for the workforce, and to allow the safe and efficient management of the project.

Water Supply:

A water supply will be required for the contractor's welfare facilities as well as other activities on site such as equipment and material wash down, dust suppression, tunnel pipe construction, etc. Direct connections will be provided to each of the compounds from

the public water supply. Applications will be made to Uisce Éireann Connections and Developer Services Team.

Where possible dust suppression and wash down will use recycled water however it may be necessary to supplement this water during dry periods.

Welfare and Sanitary:

The compounds will require welfare facilities; this will necessitate a method of collecting the wastewater generated. Wherever possible, compounds will have a direct connection to local sewers; otherwise, they will be serviced by means of a wastewater storage tank, which will be emptied by means of a suction tanker. The wastewater shall be disposed of to a licensed WwTP.

Telecoms:

For the duration of the construction period, the Contractor will provide communications facilities (telephone, broadband) at each of the compounds. This will be provided via fixed line, global system for mobile communication (GSM) network or satellite networks.

8.3 Potential Tunnelling Compounds

In some locations, there is the potential for tunnelling of pipelines to be carried out. In addition to the proposed West and East compounds described above, there shall also be compounds set up at the drive and reception shafts for the potential tunnelling of pipelines in some locations. The proposed locations of these potential compounds are shown in Figure 8-4. A typical layout of a tunnelling compound is shown in Figure 4-9. These compounds shall be predominantly on the airside of the airport boundary.

Each tunnelling compound would be self-contained and include sufficient stockpiled materials within the compound boundary to allow tunnelling to proceed as a continuous operation once commenced. Tunnel pipes would be stockpiled in advance within the West and East compounds. The tunnel pipes would be transported from the West or East compound, as applicable, to the tunnelling compounds during the set-up of the tunnelling compounds. On long tunnel drive lengths and on large diameter tunnels, the tunnel pipes would likely be transported from the main compounds to the tunnelling compound on a phased basis as the tunnel drive progresses so as to avoid excessively sized tunnelling compounds.

The tunnelling compounds will have sufficient space for a mobile crawler crane. Power supply shall be via mobile generators.

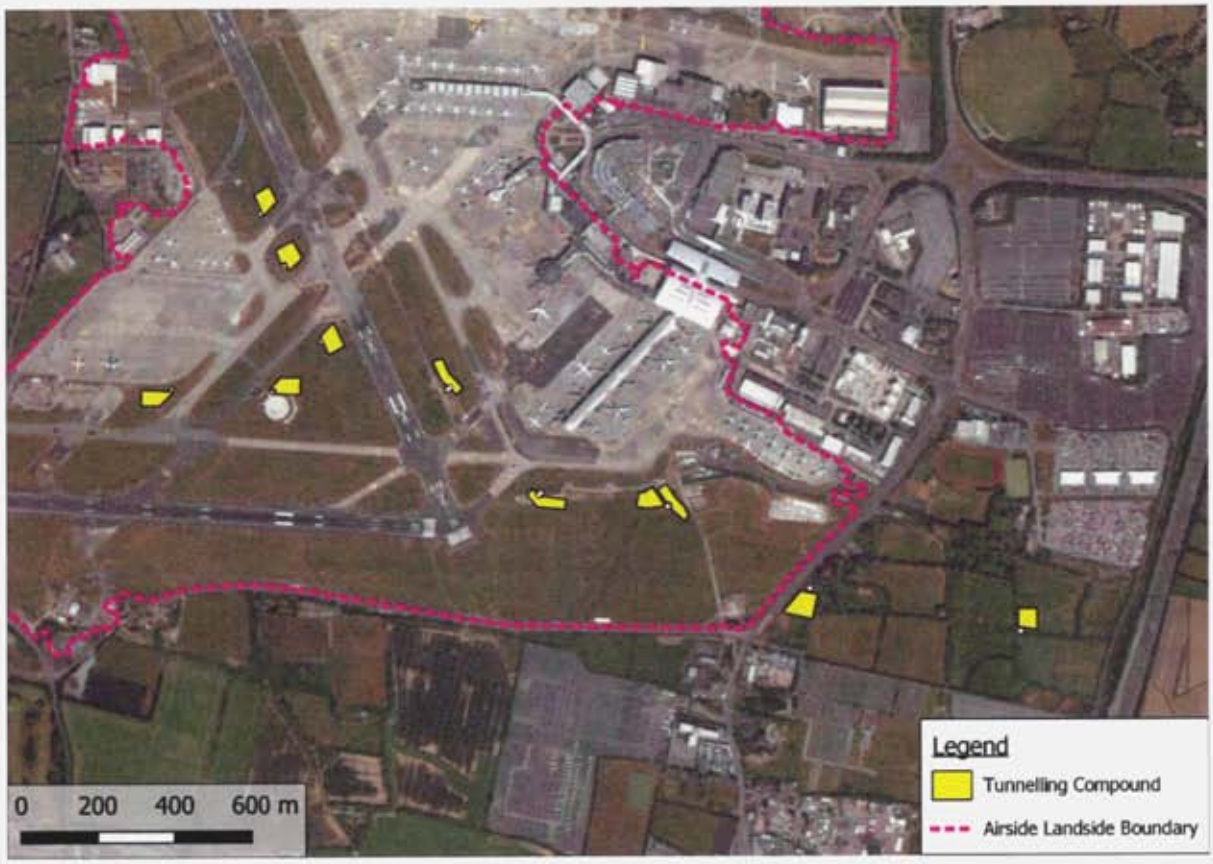

Figure 8-4: Proposed Location of Potential Tunnelling Compounds

8.4 Open Cut Areas

For open cut areas, the works area is expected to be a corridor along the proposed pipeline section. Materials shall be transported from the main construction compounds to the open cut areas for use as required. The main materials would be pipes, pipe fittings and pre-cast manholes. Within the corridor, there will be a requirement for plant and equipment associated with excavation and pipelaying.

When the contractor ceases works (end of shift/ end of day/ end of week), large mobile machinery shall be removed from the works area and returned to the main construction compound. The machinery to be removed to the compounds would typically include items such as dumpers, dump trucks, tipper trucks and tractors. Machinery such as tracked excavators and dewatering pumps would remain within the works areas.

Excavated material will be removed or backfilled at the end of each shift/day/week. Topsoil shall be stockpiled alongside the excavation, for placement at the completion of the pipeline section. Bird hazards associated with stockpiled materials is outlined in Section 9.2.1.

8.5 CPCF Storage Tank Area

The proposed CPCF storage tank is located immediately to the north of the East Compound and it is not anticipated that there would be any additional compound associated with this works area.

Topsoil excavated from the works area would be stockpiled on site for re-use on site as it proposed to reinstate the area of the CPCF storage tank to a grassed area. The topsoil would also be used for reinstatement around the pumping station, sub-station and associated access road. Mitigation measures related to dust associated with stockpiles of topsoil are outlined in Section 14. Locating stockpiles relative to watercourses is addressed in Section 13.2.2. Bird hazards associated with stockpiled materials is outlined in Section 9.2.1.

Surplus sub-soils would be removed from the works area and disposed off-site. Rock, if encountered in the excavation of the storage tank, would be removed from the works area and disposed off-site with the exception of quantities required for re-use as backfill material around the perimeter of the tank. Rock to be re-used for backfilling would be crushed on-site and stored on-site with the East Works Zone. Suitable sub-soils would be retained on site for the construction of the proposed flood protection berm. Mitigation measures related to dust associated with stockpiles of sub-soil are outlined in Section 14. Locating stockpiles relative to watercourses is addressed in Section 13.2.2. Bird hazards associated with stockpiled materials is outlined in Section 9.2.1.

The bulk of the materials required for construction of the storage tank include reinforcement steel and concrete. Reinforcement steel could either be transported to the compound for storage or delivered direct to the works area for placement or temporary storage. Concrete from external manufacturing plants would be transported direct to the works area for placement as required.

The East Compound will have space available for the storage of the construction plant. Plant would be transported as required from the compound to the works area. Plant associated with the erection of reinforcement steel, shuttering and concrete, such as tower cranes, would be fixed in position within the works area. Machinery to be removed to the

compounds would typically include items such as dumpers, dump trucks, tipper trucks and tractors. Machinery such as tracked excavators and dewatering pumps would remain within the works areas.

8.6 West Apron Pollution Tank

The proposed West Apron Pollution Tank (WA-PT) is located in the West Works Zone and it is not anticipated that there would be any additional compound associated with this works area.

Topsoil excavated from this works area would be stockpiled close to the works area for re-use in reinstating the grassed area. Mitigation measures related to dust associated with stockpiles of topsoil are outlined in Section 14. Locating stockpiles relative to watercourses is addressed in Section 13.2.2.

Surplus sub-soils would be removed from the works area and disposed off-site. Rock, if encountered in the excavation of the WA-PT, would be removed from the works area and disposed off-site with the exception of quantities required for re-use as backfill material around the perimeter of the tank. Rock to be re-used for backfilling would be crushed on-site and stored on-site with the West Works Zone.

The bulk of the materials required for construction of the WA-PT include reinforcement steel and concrete. Reinforcement steel could either be transported to the West Compound for storage or delivered direct to the works area for placement or temporary storage. Concrete from external manufacturing plants would be transported direct to the works area for placement.

The West Compound would have space available for the storage of the construction plant. Plant would then be transported as required to the works area. Plant associated with the erection of reinforcement steel, shuttering and concrete, such as tower cranes, would be fixed in position within the works area. Machinery to be removed to the compounds would typically include items such as dumpers, dump trucks, tipper trucks and tractors. Machinery such as tracked excavators and dewatering pumps would remain within the works areas.

8.7 West Apron Attenuation Tank

The proposed West Apron Attenuation Tank (WA-AT) is located in the West Works Zone and it is not anticipated that there would be any additional compound associated with this work area.

Topsoil excavated from the works area would be stockpiled close to the works area for re-use in reinstating the grassed area. Mitigation measures related to dust associated with stockpiles of topsoil are outlined in Section 14. Locating stockpiles relative to watercourses is addressed in Section 13.2.2.

Surplus sub-soils would be removed from the works area and disposed off-site or as outlined in Section 4.3.6. Sub-soils required for backfilling over the WA-AT would be stockpiled close to the works area.

The bulk of the materials required for construction of the WA-AT include large diameter pipes. These pipes would be initially transported to the West Compound for storage and then delivered to the works area as required for installation.

The West Compound would have space available for the storage of construction plant. Plant would be transported as required from the compound to the works area. This machinery to be removed to the compounds would typically include items such as dumpers, dump trucks, tipper trucks, mobile cranes and tractors. Machinery such as tracked excavators and dewatering pumps would remain within the works areas.

8.8 Excavated Material

Correct classification and segregation of the excavated material being removed off site is required to ensure that any potentially contaminated materials are identified and handled in a way that will not impact negatively on workers as well as on water and soil environments, both on and off-site. Options for re-use off site could be explored by the appointed Contractor at the time of the construction works. The remainder of the excavated material required for backfilling, topsoiling and construction of a temporary berm and permanent flood embankment will be stockpiled on site.

Soil sampling and laboratory analysis will be carried out in order to identify any potential contamination during excavation works. If contaminated soil is encountered, it will be required to be removed by a licensed waste contractor and disposed of at a licensed facility.

The mitigation measures outlined in the Resource & Waste Management Plan (RWMP) (Refer to Chapter 13 Waste Management and Resource & Waste Management Plan (RWMP)) will be implemented in full and will form part of a mitigation strategy for the site. The mitigation measures presented in this RWMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the excavation and construction phases of the proposed development.

- Prior to commencement, the appointed Contractor(s) will be required to refine / update the RWMP in agreement with FCC and in compliance with any planning conditions, or submit an addendum to the RWMP to FCC, detailing specific measures to minimise waste generation and resource consumption, and provide details of the proposed waste contractors and destinations of each waste stream.

- The Contractor will implement the RWMP throughout the duration of the proposed excavation and construction phases.

8.9 Hazardous Materials

There are no hazardous materials required for the works that would require special storage facilities or any other special features at the compounds.

All materials to be stored in compounds shall be stored in a manner that is safe and that is in line with best industry practice, instances of such are fuels and chemicals, which should be stored in an appropriately bunded area/within double skinned tanks. The bund capacity will be sufficient to accommodate 110% of the largest tank's maximum capacity or 25% of the total maximum capacities of all tanks, whichever is the greater. The exception to this being double walled tanks equipped with leak detection, which do not require additional retention. All potentially harmful substances will be stored in accordance with the manufacturers' guidelines. The contractor will ensure that adequate means to absorb or contain any spillages of these chemicals are available at all times.

8.10 Energy Consumption

There will be energy consumption associated with the temporary offices, canteen, welfare facilities and lighting of the storage areas. It is assumed that the energy supply will be available from existing sub-stations within the airport complex.

The estimate of monthly energy consumption is set out as follows:

Compound Facility	Estimated Monthly Energy Consumption
Offices – lighting and heating / cooling	32,000 kWh / month
Canteen – lighting and heating / cooling	
Welfare facilities – lighting and heating / cooling	

Compound Facility	Estimated Monthly Energy Consumption
Storage Areas – lighting (envisaged use under poor visibility conditions in mornings, evenings and poor weather conditions)	1,500 kWh / month

Table 8-1: Monthly estimate of energy consumption

9 ECOLOGY AND WILDLIFE MANAGEMENT

The EiAR shall be referenced in respect of the Ecology and wildlife management requirements of the project.

A project ecologist will be appointed prior to works commencing on site and the ecologist shall be consulted in relation to:

- All onsite drainage during works.
- All site clearance works methodologies shall have prior approval of the appointed project ecologist. This shall include not removing woody vegetation within bird nesting season.
- Staging of the project construction shall be carried out to reduce risks of onsite drainage to the Cuckoo Stream and subject to the approval of the project ecologist.
- Silt fencing shall be in place in the vicinity of the Cuckoo Stream, and other areas deemed appropriate and as directed by the project ecologist.
- Measures shall be in place to allow mammals to exit from excavations. This shall be discussed and agreed with the project ecologist and shall include sloped sides and ramps where relevant.
- Landscaping elements include compensatory areas for Willow Warbler and Goldcrest to be planted on the eastern portion of the site in the vicinity of the Cuckoo Stream in consultation with the project ecologist.
- A post construction landscape inspection will be carried out by the project ecologist.
- The project ecologist will oversee the management/treatment or removal of the Japanese knotweed on site in line with Irish legislation.

10 PROTECTED STRUCTURES & SITES MANAGEMENT

Archaeological monitoring of the proposed works will take place at the Cuckoo Stream in the Eastlands area, to identify whether any archaeological features or deposits are present (as outlined in Section 16.5.2.3).

Archaeological monitoring will be carried out under licence to the Department of Housing, Local Government and Heritage (DHLGH) and the NMI, and will ensure the full recognition of, and the proper excavation and recording of, all archaeological soils, features, finds and deposits which may be disturbed below the ground surface. All archaeological issues will be resolved to the satisfaction of the DHLGH and the NMI. The archaeologist will have provision to inspect all excavation to the formation level for the proposed works and to temporarily halt the excavation work, if and as necessary. They will be given provision to ensure the temporary protection of any features of archaeological interest identified. The archaeologist will be afforded sufficient time and resources to record and remove any such features identified. Archaeological excavation ensures that the removal of any archaeological soils, features, finds and deposits is systematically and accurately recorded, drawn and photographed, providing a paper and digital archive and adding to the archaeological knowledge of a specified area (i.e., preservation by record).

Geophysical survey will be undertaken as a mitigation measure within the Eastlands area, where not already undertaken, well in advance of construction. This will seek to identify any other archaeological sites or features that may be present subsurface.

Further archaeological investigation will include archaeological testing of the potential archaeological sites / features already identified in Toberbunny and Pickardstown townlands (as detailed in Section 16.5.2.2), and any additional features identified by geophysical survey. Any confirmed archaeological features will be resolved through one or more of the following, in consultation with the National Monuments Service (DHLGH):

- Preservation by record (archaeological excavation);
- Preservation in situ;
- Preservation by design; and
- Archaeological monitoring.

11 CONSTRUCTION TRAFFIC

Construction Traffic on daa sites shall be managed following the rules and recommendations of the daa *Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual.*

Appendix A includes a Construction Traffic Management Plan (CTMP). This is a "live document" and shall be required to be updated following the planning process and updated further by the contractor prior to and during the construction phase. The CTMP has been developed to assess the construction traffic impacts associated with the development of the proposed ADP. The objective of this CTMP is to ensure that the residual impacts to the public road network during the construction phase of the project which have been identified in the application documentation are minimised and that transport related activities are carried out as safely as possible and with the minimum disruption to other road users. The CTMP has also been prepared for the purpose of identifying appropriate and safe methods of access for construction traffic to the proposed development.

In updating the CTMP, the contractor shall also be required to prepare traffic management plans for:

- Large/High Volume deliveries;
- Construction works requiring traffic management to facilitate utility/drainage connections;
- Construction phases which re-configure existing traffic flows to facilitate the Works; and
- Where necessary to facilitate crane lifts and swings.

11.1 Receiving Environment

The relevant public roads adjacent and within the area of proposed works are as follows:

- R132 (Swords Road), immediately to the southeast of the existing South Apron. The proposed Central Pollution Control Facility (CPCF) shall be located to the east of this road. Two proposed drainage pipeline routes (CPCF Pipeline and the pumped discharge from the CPCF Storage Tank to the North Fringe Sewer) shall cross this road.

- Old Airport Road, to the south of the airport campus. There is no proposed works anticipated which would directly impact this road.
- Naul Road, to the north of the airport campus. There is no proposed works anticipated which would directly impact this road.
- R108 to the west of the of the airport. The proposed Clean Water Supply Pipeline CW1 is to be partially located on the R108 for the interception of greenfield flows outside the airport complex that naturally flow through the complex.

The M50, M1 and N2 motorways are likely to be utilised by the appointed contractor for removal of surplus materials associated with the construction of open cut pipelines, tunnelled pipelines and structures such as the CPCF storage tank, West Apron Attenuation Tank and West Apron Pollution Tank. Manufacturers and suppliers of materials such as pipes, concrete and steel are also likely to utilise the M50, M1 and N2 for deliveries.

Figure 11-1: Public Roads Around Airport

11.2 Works Zones

The ADP has two principal works zones and ancillary work zones associated with these two locations (see Figure 10-2). The principal work zones are:

- West Works Zones comprising:
  - Clean Water Supply Pipelines: CW1, CW2, CW3 and part of CW4;
  - Decision points DP1, DP2A/2B, DP3, DP4, DP5A and DP5B; Part of the Airfield Contaminated Pipelines (ACP1 and ACP2);
  - West Apron drainage upgrade works including WA-PT and WA-AT.
- East Works Zones comprising:
  - Clean Water Supply Pipelines: part of CW4;
  - Part of the Airfield Contaminated Pipelines (ACP1 and ACP2)
  - Decision points DP6, DP7 and DP8;
  - Cuckoo Supply Channel Diversion;
  - CPCF Pipeline;
  - Central Pollution Control Facility (CPCF), rising main and ancillary works.

Figure 11-2: Proposed Works Zones for the ADP

11.3 Site Access Routes

Access to and from the compounds and works zones is via the existing road network in the airport campus (R108, R132, R122 and Naul Road) as indicated in Figure 11-3, Figure 11-4, Figure 11-5 and Figure 11-6. Given the importance of these roads to Dublin Airport, the contractor shall coordinate all deliveries with the appointed daa liaison so as not to delay the passenger journey.

The contractor shall note that Dublin Airport operates 24 hours/day, 365 days/year. Therefore, airport operations will be continuous around the works at all times. No interruption or disruption to Dublin Airport's operation or impact on passenger travel journeys shall be permitted unless expressly agreed with daa in advance.

The two main construction compounds (West Compound and the East (Eastlands) Compound) will be used for deliveries for stockpiling in advance of construction. Deliveries to site will be managed to prevent queuing traffic on the public road network. This may involve a delivery booking system with timed delivery slots to be controlled by the

contractor logistics manager. The option for delivery time slots to be scheduled for 'out of peak' hours would further assist the operational efficiency of the construction site and surrounding areas. Delivery vehicles must not block access or escape routes or cause inconvenience to neighbouring businesses or residents and should not be unloaded outside the site perimeter fencing or into public roads or footpaths.

Figure 11-3: Site Access Routes (Western Works) via Gate 9

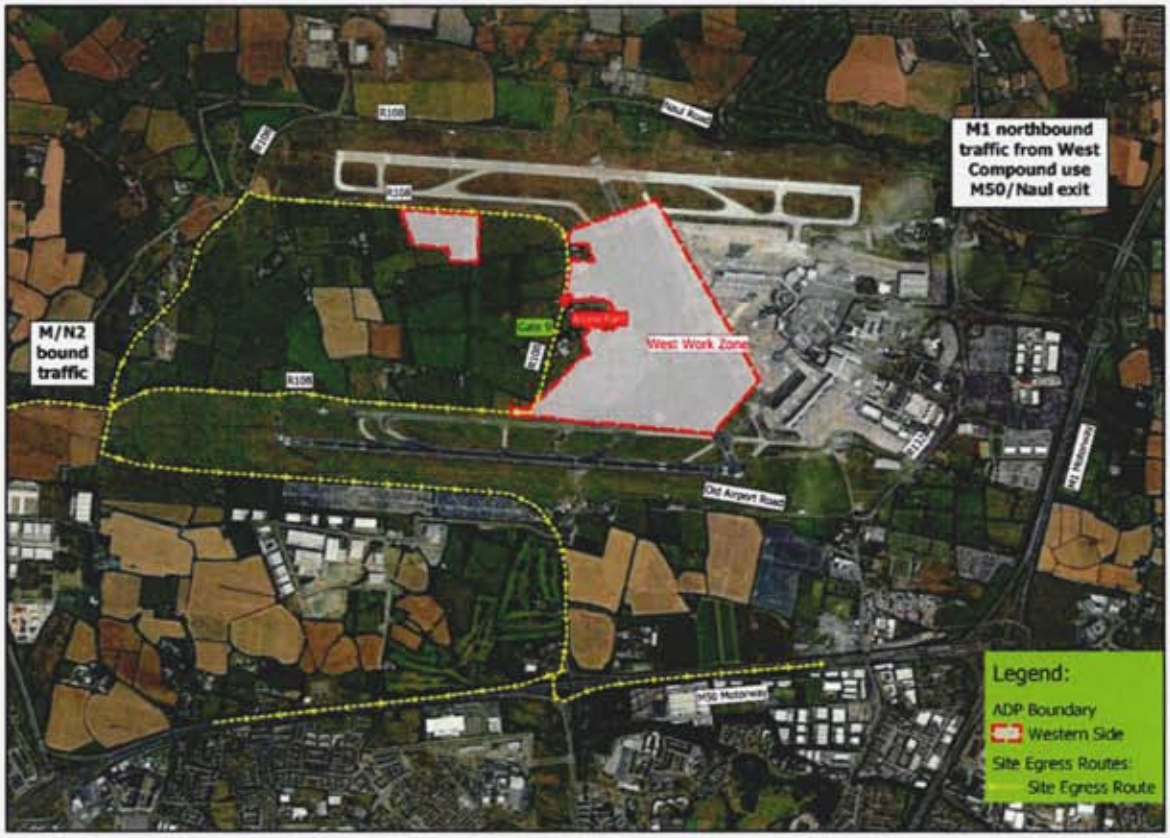

Figure 11-4: Site Egress Routes (West Works) – Gate 9

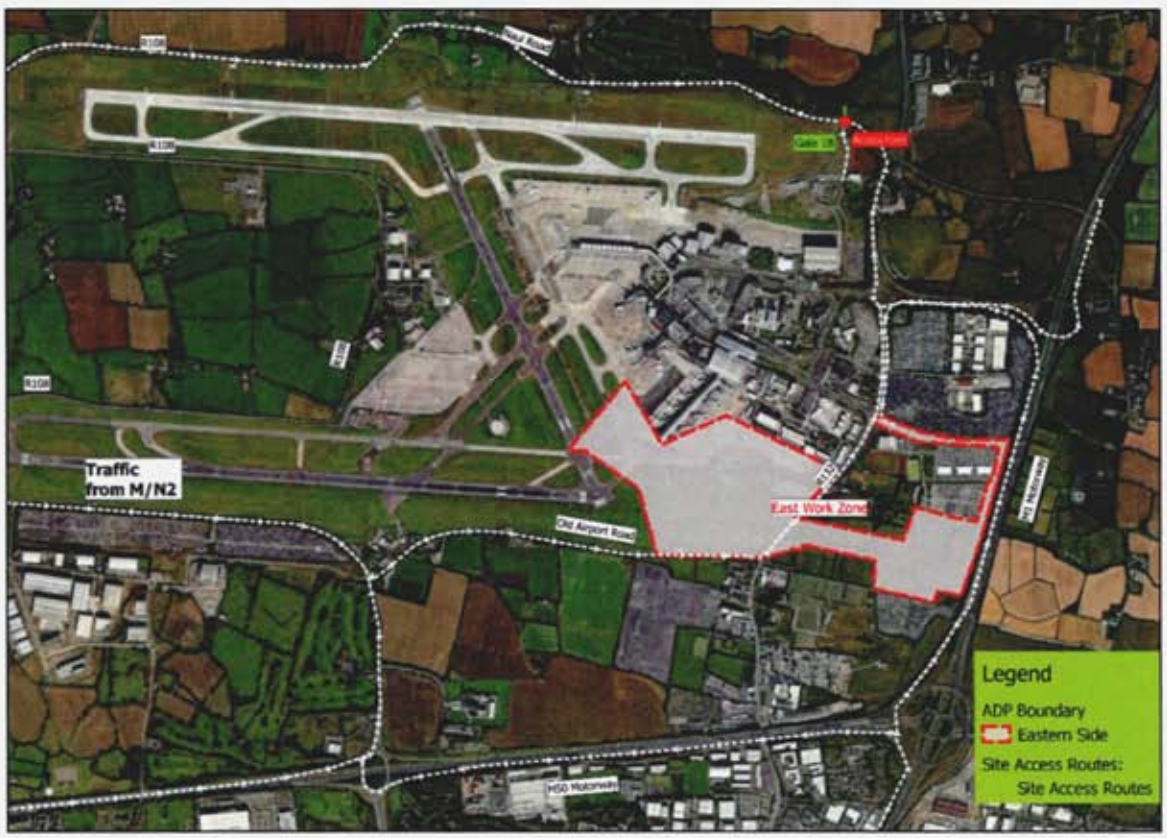

Figure 11-5: Site Access Routes (Eastern Works)

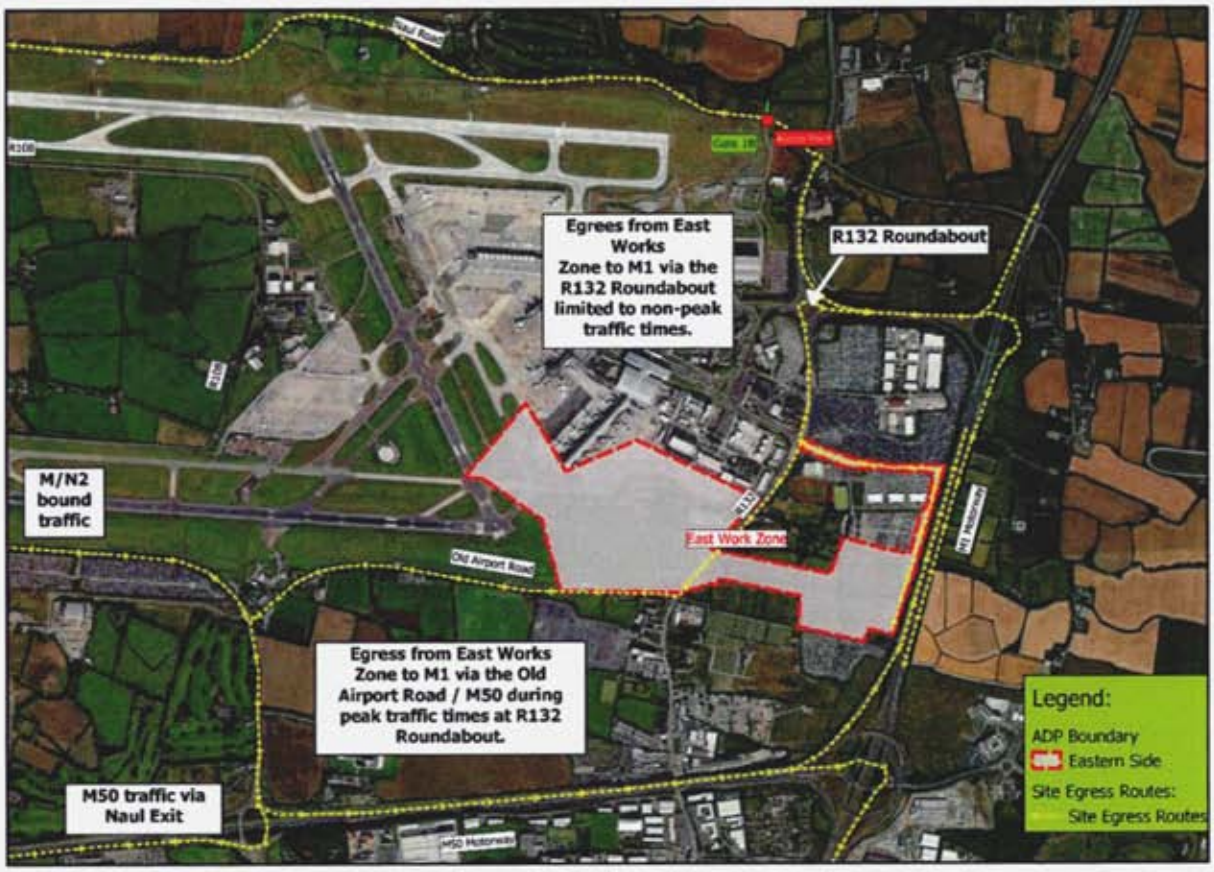

Figure 11-6: Site Egress Routes (Eastern Works) – Gate 1B & Access Point to East Compound

It is proposed to access different parts of the ADP site using different access points as follows:

- For the pipelaying works to the western side of the site and works at West Apron (West Works Zone), it is proposed to access the airfield via Gate 9, off the R108 road as shown in Figure 10-3. Dunbro Lane shall not be used as a haul road between the West Compound and the West Works Zone or shall not be used as a delivery route to the West Compound.

- For the pipelaying works to the eastern side of the site (CW4, Airfield Contaminated Pipelines, part of the CPCF pipeline and the Cuckoo Supply Channel Diversion), it is proposed to access the airfield via Gate 1B, off the Naul Road as shown in Figure 11-5. Gate 1B was previously used for the construction of the northern runway.

- For the tank and pipeline construction works in Eastlands, and access to the east compound, it is proposed to access the site via the road to the car hire facility (*i.e.*, via the access point shown in Figure 11-5).

The access points have been assessed for use with the largest vehicle available in Ireland (large articulated truck). A swept path analysis (autotrack) has been carried out for entry and exit via the access points. The results of this analysis in graphical format are included in the CTMP (Appendix A) and shows that the largest vehicles can enter and exit at each of the proposed access points.

Access to the R108 for construction of part of the CW1 pipeline will be via the R108 from the West Compound. Dunbro Lane shall not be used for access to the construction area on the R108. A road closure would be required on the R108 for the construction of the CW1 pipeline on the public road. The proposed extent of the closure is shown in Figure 26 of the CTMP and the proposed diversion routes are shown in Figure 27 of the CTMP. Dunbro Lane would be utilised for local access only during the road closure as set out in Section 6.2.5 of the CTMP.

Temporary traffic management would be required on the R132 to facilitate pipeline construction for the connection to the NFS. The details of the traffic management requirements are set out in the CTMP. Access to the R132 for construction of the CPCF connection to the NFS will be via the R132 from the East Compound.

No road diversions are necessary for the delivery of this ADP.

11.4 Construction Traffic Generation

Construction traffic movements to and from the two works zones will take place for various construction related activities, including but not limited to:

- Disposal of surplus excavated materials from pipeline trenches, manholes, chambers, tunnel shafts, tunnelled pipelines, the West Apron tanks and the CPCF storage tank.

- Delivery of construction materials such as pipes, backfill material, concrete, steel, precast materials, mechanical equipment, etc either direct to the works zone or from the compounds.

The estimated construction traffic volumes are variable depending on phasing of the works and the work type. The peak construction traffic volume will be associated with the

excavation for the CPCF, the concrete pours for the CPCF, the excavation for the West Apron tanks (polluted and clean tanks) and the concrete pours for the West Apron Pollution Tank.

Average estimated traffic movements for HGVs, LGVs and operatives' vehicles during each phase of construction is provided in Table 10-1 below. A movement is classed as a one-way trip. A round trip is classed as two movements. The percentages in brackets in Table 10-1 represents the approximate variation of the estimated average daily traffic movements.

Works Description	Type of traffic	Daily Traffic Movements (One-Way Trip)
Construction of Pipelines CW1 and CW2	HGV	10 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Pipeline CW3	HGV	8 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Pipeline CW4	HGV	18 traffic movements (+25%, -25%)
	LGV	4 traffic movements (+25%, -25%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Decision Point DP1A	HGV	4 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Decision Point DP3	HGV	16 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)

Works Description	Type of traffic	Daily Traffic Movements (One-Way Trip)
	Cars	40 traffic movements (+25%, -25%)
Construction of Decision Point DP4	HGV	4 traffic movements (+25%, -25%)
	LGV	6 traffic movements (+50%, -50%)
	Cars	60 traffic movements (+25%, -25%)
Construction of Decision Point DP5A, DP5B	HGV	20 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	20 traffic movements (+25%, -25%)
Construction of Pipelines & Structures at Decision Point DP6, DP7 & DP8 at South Apron	HGV	10 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	20 traffic movements (+25%, -25%)
Construction of Airfield Contaminated Pipelines (ACP 1 and ACP2) including Cuckoo Diversion Channel, etc at Cuckoo Channel	HGV	16 traffic movements (+25%, -25%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of CPCF Pipeline	HGV	17 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	36 traffic movements (+25%, -25%)
Construction of Outlet to North Fringe Sewer	HGV	10 traffic movements (+100%, -100%)
	LGV	4 traffic movements (+50%, -50%)

Works Description	Type of traffic	Daily Traffic Movements (One-Way Trip)
including Futureproofing Gravity Outlet Section	Cars	40 traffic movements (+25%, -25%)
Excavation for CPCF	HGV	236 traffic movements (+25%, -25%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	50 traffic movements (+25%, -25%)
Construction of CPCF Tank & Electrical Sub-Station	HGV	28 traffic movements (+25%, -25%)
	LGV	11 traffic movements (+50%, -50%)
	Cars	101 traffic movements (+25%, -25%)
West Apron Tank - excavations	HGV	143 traffic movements (+25%, -25%)
	LGV	6 traffic movements (+50%, -50%)
	Cars	20 traffic movements (+25%, -25%)
West Apron Tank – constructions	HGV	16 traffic movements (+50%, -50%)
	LGV	8 traffic movements (+50%, -50%)
	Cars	80 traffic movements (+25%, -25%)
Pipe and backfill material deliveries	HGV	84 traffic movements (+25%, -25%)
	LGV	0 traffic movements (+50%, -50%)
	Cars	10 traffic movements (+25%, -25%)

Table 10-1: Construction Traffic estimates

Figure 11-7 shows the monthly variation in traffic movements over the duration of the works.

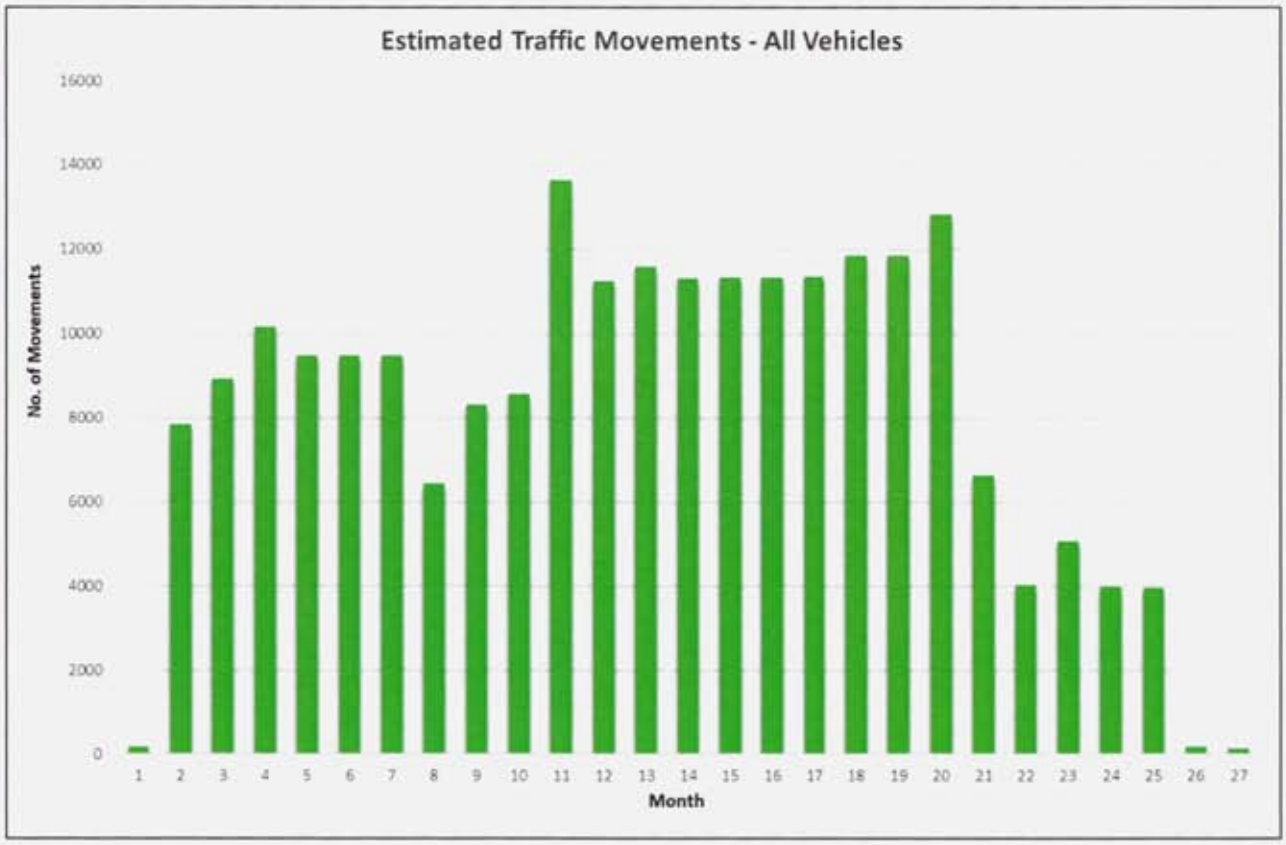

Figure 11-7: Estimated traffic movements

The maximum estimated monthly traffic volume is 13,650 traffic movements.

In the case of high volume, abnormal or large load deliveries, the contractor shall submit full details to daa 14 days in advance of such deliveries.

Details to be submitted include but are not limited to;

- Dates,
- Times,
- Durations,
- Number and types of trucks,
- Abnormal loads,
- Holding Areas and Locations,
- Marshalling,

- Traffic management.

The contractor shall agree all such deliveries with daa and implement any timing restrictions or measures imposed by them to ensure no impact on the operations of Dublin Airport.

11.5 Construction Traffic Movements and Congestion Points

Construction traffic movements to and from the works zones will be via the routes shown in Figure 11-3, Figure 11-4, Figure 11-5 and Figure 11-6 and will be subject to site access control and security as described in Section 11.

Construction traffic movements associated with the removal of surplus excavated materials from the works zones to suitable disposal sites may not be able to avoid impacting known congestion points at the M1 spur route and the R132 roundabout, but this will depend on the location of the disposal site(s) to be determined by the appointed contractor(s). This may be particularly true for egress from the Gate 1B.

Construction traffic associated with the disposal of surplus material from the west works zone can access the main routes via the R108 as follows:

- The M50 can be accessed via the Naul exit;
- The N2 to the west can be accessed via the R108;
- The M1 can be accessed via the Naul exit onto the M50.

Traffic associated with deliveries to the west compound would be via the R108 from the M50, N2 and M1.

Figure 11-3 and Figure 11-4 sho these routes that are proposed to avoid the congestion points on the M1 spur route and the R132 roundabout associated with traffic movements to and from the west works zone and west compound.

Construction traffic, associated with the disposal of surplus material, from the east works zone via Gate 1B and from the Eastlands can access the main routes as follows:

- The M50 can be accessed via the R132 and the Naul exit outside peak traffic times from Gate 1B;
- The M50 can be accessed via the R132 and the Naul exit from the Eastlands;

- The M50 can be accessed via the Naul Road in a westerly direction from Gate 1B in peak and outside peak traffic times;
- The N2 to the west can be accessed via the R132 outside peak traffic times and via the Naul Road during peak traffic times from Gate 1B;
- The N2 to the west can be accessed via the R132 from the Eastlands;
- The M1 can be accessed from the Eastlands via the R132 and Naul exit onto the M50 at peak traffic times on the M1 spur route and R132 roundabout;
- The M1 can be accessed from Gate 1B via the Naul Road in a westerly direction onto the M50 at peak traffic times on the M1 spur route and R132 roundabout;
- The M1 can be accessed from Gate 1B and the Eastlands via the R132 and the M1 spur road / R132 roundabout outside peak traffic times.

Figure 11-5 and Figure 11-6 show these routes that are proposed to avoid the congestion points on the M1 spur route and the R132 roundabout associated with traffic movements to and from the east works zone.

11.6 Construction Access Design

During construction, access to the works zones shall be via the access points noted in Section 10.3. Refer to the CTMP (Appendix A) for auto-track analysis for each access point.

11.7 Traffic Management

All Traffic Management at Dublin Airport must comply with the following general procedures:

- DAA Temporary Traffic Management Requirements Specification Covering High Risk Works
- DAA Standard Traffic Management Plans Covering Low and Medium Risk Works requiring traffic management.

All traffic management plans shall be designed by a competent person and installed in accordance with the latest edition of Chapter 8 of the Traffic Signs Manual as published by the Department of Transport.

Prior to implementation of any traffic management within Dublin Airport, the traffic management plan is to be submitted in accordance with the Permit to Work system to daa for approval.

The traffic management system, when approved is to be implemented and supervised by a competent person holding a Construction Skills Certification Scheme (CSCS) card for Signing, Lighting and Guarding (SLG) at Roadworks and when this person is not on site there must be at least one person who has completed the Health and Safety at Roadworks CSCS.

Regular audits of the installed traffic management are to be carried out by the designer and the SLG operative.

From the beginning of construction works, the contractor shall be responsible for the provision of competent traffic marshals for the safe management of sub-contractor deliveries and to limit disruption to the general public and surrounding properties. They shall wear full distinctive high-vis suits and have attended an appropriate training course for this activity.

The contractor shall undertake consideration of the six primary issues that affect traffic and road movements, these being:

- Maintaining a good neighbour policy;
- Maintaining site security;
- Vehicle- pedestrian segregation and manoeuvring of vehicles;
- Delivery co-ordination;
- Loading and storage;
- Delivery times;
- Dilapidation surveys shall be undertaken on all construction access routes.

Robust signage shall be placed at strategic locations to ensure pedestrian and site personnel are made aware of high-risk areas including live construction areas, lifting operations, no parking zones and emergency exits.

Regulation 15 of the Construction (Health Safety and Welfare) Regulations requires that every construction site shall be organised in such a way that, so far as reasonably

practicable, pedestrians and vehicles can move safely and without risk or injury to all parties. This Regulation requires the provision of safe, effective and functional pedestrian and vehicle segregation. Wherever vehicles and pedestrians are required to utilise adjacent access during construction around the ADP, suitable physical segregation with signage shall be installed to demarcate safe pedestrian routes. The vehicle entry gate points shall be isolated from site pedestrians by use of designated pedestrian routes and physical barriers.

Delivery scheduling via a web-based delivery management system shall assist in controlling the volume of deliveries to site. Sub-contractors and hauliers must be booked a minimum of 48 hours in advance to allow the delivery request to be reviewed and approved or declined. Delivery time slots shall be controlled by the contractor logistics manager to prevent queuing traffic on the public road network adjacent to the site due to deliveries. Timing for out of peak hours deliveries shall help the operational efficiency of the construction site and neighbouring areas.

Each sub-contractor shall ensure that:

- Deliveries shall not be unloaded outside the site perimeter fencing or onto public roads or footpaths;
- Site vehicles and deliveries shall not block access or escape routes or cause inconvenience to neighbouring business or residents; and
- At all times the sub-contractor is to maintain a professional manner and respect the neighbouring residents, businesses and co-workers.

12 SITE ACCESS CONTROL AND SECURITY

Site access control and security shall be managed as specified in the daa *Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual*.

The contractor shall be required to provide the following site access and control measures;

- All construction traffic requiring access to airside work zones will have to be pre-screened prior to accessing site, the pre-screening will take place at each Compound (East and West) prior to continuation onto the site access. The pre-screening will ensure construction traffic does not queue on the public road network adjacent to the site entrances;

- All construction traffic requiring access to the landside construction zones will need to be processed through the East compound. The intention will be to consolidate construction materials which will reduce traffic frequency to the construction site and control construction traffic to avoid queuing on the public road network adjacent to site entry gates;

- Due to the congested location of the project i.e., the airport, services to the immediate area will need to be prioritised, therefore, the workforce will travel to site by public road network and park adjacent to the site compounds within designated areas near the offices. Transport services will be provided from the car park within the compound to the work zones;

- Rules regarding cars parked in the car park will state that all cars are to be positioned by "reverse parking". By requiring reverse parking, the risk of backing out blindly into oncoming traffic is removed. Contractors reserve the right to place a warning sticker on cars not compliant with site parking rules. Re-offending cars will be removed from site and access badge revoked;

- Site work vans and mobile workshops vans will have temporary parking facilities on site at the works face. (To limit and police the number of vehicles entering the work zones the Contractor will issue a limited number of permits to the workforce);

- Advanced notice for delivery vehicles arriving at the compounds is required to avoid an ad-hoc system of delivery. The preferred system will sequence and schedule delivery and construction vehicle arrivals / departures to avoid traffic congestion and safety risk to the neighbours and local businesses;

- Delivery bookings need to be submitted at least 48 hours in advance to allow sufficient time to co- ordinate delivery vehicle movements and the associated use of on-site materials handling equipment. Regular delivery meetings will be held between all parties and the Logistics Manager to make any adjustments and ensure that the delivery schedules are pre-agreed with all;

- The existing services and operations will be ongoing at Dublin Airport and are to be uninterrupted by the proposed works. The proposed delivery routes shall be restricted to ensure that strategic roads to Dublin Airport are not compromised by significant increases in construction traffic volumes;

- The contractor will be responsible for the provision of Temporary Traffic Management (TTM) by competent and trained personnel. Where works require TTM, the PSCS must ensure that the hazards associated with working on the road are addressed. They must ensure that a TTMP is in place and that it is implemented correctly. Only appropriately trained and competent operatives, supervisors, managers or other competent persons should be engaged in the assessment, design, installation, maintenance and removal of TTM;

- Employees to receive induction for working at the airport;

- Security/Gatemen on all access points to the works and associated compounds to prevent unauthorized entry;

- All employees to have a unique identification badge with photograph and register to be maintained of all employees actively working on this site;

- A record of all deliveries to and removals from the site to be maintained and made available to daa on request;

- Access to the site shall be managed by the deployment of Security Officers at key access points situated around the perimeter of the site with the assistance of an access control system utilising turnstiles and barriers/bollards;

- The construction site fencing will be kept secure at all times; the perimeter will be secured using fencing circa 2.4m to 3m high for the duration of the construction works. The contractor will be responsible for installing the temporary boundary fencing required.

- A traffic marshal shall be located at the delivery vehicle entrance to control the movement of vehicles coming in from the site access points.

Note the contractor shall be responsible for cleaning and where necessary remediation arising from any deliveries to or plant/trucks leaving the works which occur on airport or public roads. The contractor shall be required to issue a detailed Surface Water Management Plan (SWMP) in line with the ADP and shall cover the protocol for all spills and environmental incidents.

13 NOISE AND VIBRATION MANAGEMENT PLAN

Contractors shall comply with the contents and recommendations outlined in the *daa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual* in relation to noise and vibration.

The contractor shall comply with the contents and recommendations of BS 5228 – 1:2009 + A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise & Part 2: Vibration.

In general, BS5228 recommendations shall be adopted in relation to use and siting of equipment.

Annex B of BS5228 (Figures B1, B2 and B3) provides typical details for temporary and mobile acoustic screens, sheds and enclosures that can be constructed on site from standard materials.

The contractor shall develop the CEMP that demonstrates how they comply with the above and how to minimise the risk that people and wildlife are negatively affected by noise and/or vibration during the construction of these works. This section should be read in conjunction with relevant chapter of the EIAR when applicable.

13.1 Noise

The Contractor will prepare a Noise and Vibration Management Plan (NVMP) which will deal specifically with onsite activities in a strategic manner to remove or reduce significant noise and vibration impacts associated with the construction works. The NVMP will specify the noise and vibration monitoring and reporting that will be carried out ensuring that all potential noise sensitive receptors are covered in the monitoring programme.

The contractor shall ensure that each item of Equipment complies with the noise limits quoted in the European Commission Directive 2000/14/EC. All plant used on the works shall be the quietest of its type practical for carrying out the work required and shall be maintained in good condition with regard to minimising noise output. All Plant shall be operated and maintained in accordance with the manufacturer's recommendations including the use and maintenance of any specific noise reduction measures.

Careful consideration will be given to the noise emission levels of plant items when they are being considered for use on the site. This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units

be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

13.2 Control of Noise Sources

If the use of low noise plant or replacing a noisy item of plant are not viable or practicable options, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods, often in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS5228 states that "as far as reasonably practicable sources of significant noise should be enclosed". In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators. Demountable enclosures that could be moved around site as necessary may also be used to screen operatives using hand tools such as angle grinders.

In practice, a balance may need to be struck between the use of all available techniques and the resulting costs of doing so. It is therefore proposed to adopt the concept of "Best Available Techniques" (BAT).

BAT is defined as follows in Directive 2010/75/EU:

"...the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole."

In this context "best" means "the most effective in achieving a high general level of protection of the environment as a whole".

The expression "available techniques" means "those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable

conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator".

The term "techniques" includes "both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned".

In specifying or otherwise determining BAT, consideration should be given to a specified list of considerations and also to "the likely costs and advantages of measures" as well as "the principles of precaution and prevention".

Thus, the concept of BAT requires a degree of balance between the attainment of environmental benefits and the likely cost implications. In the identification of BAT, regard should be had to a wide range of factors, however, emphasis should be given to "practical suitability" and the need "to reduce an emission and its impact on the environment as a whole".

Proposed techniques should also be evaluated in light of their potential effect on occupational health and safety.

BS5228 makes a number of recommendations in relation to "use and siting of equipment". These are relevant and hence are reproduced below. These recommendations should be implemented on the site.

"Plant should always be used in accordance with manufacturers' instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas.

Circumstances can arise when night-time working is unavoidable. Bearing in mind the special constraints under which such work has to be carried out, steps should be taken to minimise disturbance to occupants of nearby premises.

Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.

Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.

Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.

Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material."

The following outline guidance in relation to specific plant will also be applied:

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant should be switched off when not in use and not left idling.
- For percussive tools such as pneumatic concrete breakers, rock drills and tools a number of noise control measures include fitting muffler or sound reducing equipment to the breaker 'tool' and ensuring any leaks in the air lines are sealed. Erect localised screens around breaker or drill bit when in operation in close proximity to noise sensitive boundaries.
- For all materials handling ensure that materials are not dropped from excessive heights and drop chutes/dump trucks are lined with resilient materials.
- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Demountable enclosures can also be used to screen operatives using hand tools and may be moved around site as necessary.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.
- Where practicable, metal on metal or rock on metal impacts should be avoided during night works. This can be achieved through the use of rubber mallets or impact linings etc. on site.
- White noise reverse alarms should be utilised on vehicles where practicable to reduce potential annoyance of tonal noise emissions from site, particularly during the more sensitive evening and night periods.

13.3 Construction Site Environment

The construction site is within the campus of Dublin Airport and extends from the R108 on the west to the M1 motorway on the east. To the west of Dublin Airport (west of R108) the area consists of agricultural lands that is sparsely populated. To the east of the Eastlands the busy M1 motorway runs north / south. To the north the works zones are bounded by the airport terminal buildings and the red zone carpark. To the south the works area is bounded by the existing runway, the Old Airport Road, some commercial premises, the crematorium and the part of the red zone car park.

There a number of sensitive noise receptors identified in the figures below.

Figure 13-1: Noise Receptors to the West of the Proposed Works

Figure 13-2: Noise Receptors to the Northwest of the Proposed Works

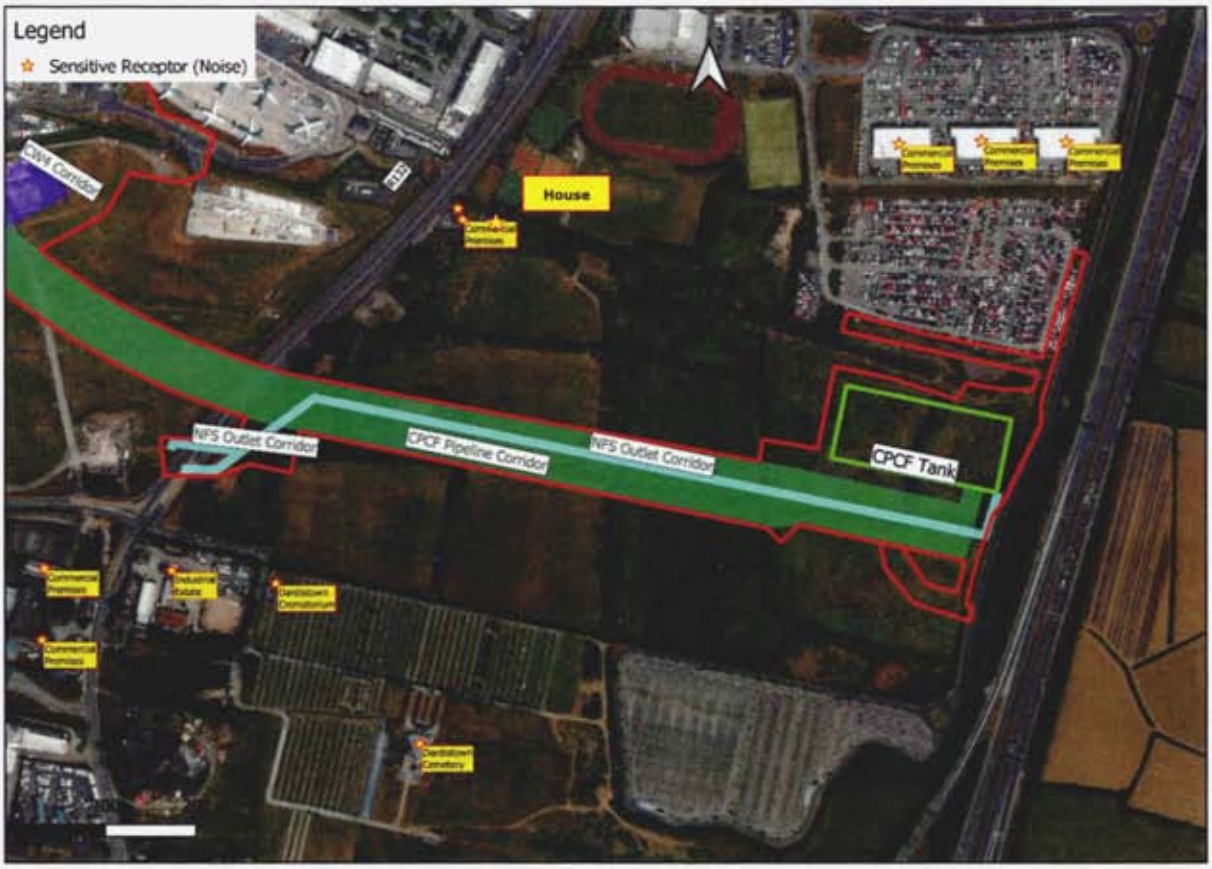

Figure 13-3: Noise Receptors to the Southeast of the Proposed Works

In the Eastlands area, there are also a number of amenity facilities including footpath/cycle path along the R132 (Swords Road); and playing pitches, a running track and tennis courts.

13.4 Noise Generating Construction Plant and Activities

The envisaged heavy construction plant for the ADP is outlined in Section 4.3.10 and Table 4-3. The construction plant would typically have a noise level (L_{max}) of 80 to 85dB.

If rock breaking is required in the excavation of trenches for pipelines and in the excavation for the tanks, then typical noise level (Lmax) would be 90 to 92dB.

Piling activities, if required, associated with anchoring deep tanks would typically have noise level (Lmax) between 80 and 89dB, depending on the piling methodology employed.

Tunnelling activities can generate typical noise level (Lmax) between 60 and 70dB, which is lower than that typically of excavation equipment used in open trench excavations (excavators typically generate 85dB). Data from previous similar works in the Dublin

region indicate that the noise generated during the tunnel boring and pipe installation operations involved in trenchless methods would not be expected to be greater than 10dB(A) above the background noise levels.

The main items of plant that are expected to cause noise and vibration are as follows:

- Crawler Cranes (85dB);
- Bulldozers (85dB);
- Excavation equipment (excavators (85dB), dumpers (84dB), dump trucks (84dB), backhoes (80dB), tractors (84dB));
- Rock breaking equipment (90 to 92dB);
- Rock crusher (90 to 96dB);
- Pneumatic equipment, (*e.g.,* compaction plates (78dB));
- Rollers (85dB);
- Dewatering Pumps (77dB);
- Tipper Trucks (84dB);
- Readymix Trucks (85dB);
- Concrete Pumps (82dB);
- Vibratory Piling Rig (70-90dB).

The contractor shall employ the best practicable means as outlined in the Safety, Health & Welfare at Work (Control of Noise at Work) Regulations, 2006 to minimise noise and vibration resulting from operations and shall have regard to the recommendations contained in BS 5228 2009 - Code of practice for noise and vibration control on construction and open sites.

The contractor shall employ all necessary measures to control noise (and vibration) including, but not limited to:

- Programming of particularly noisy activities to less sensitive times of the day such as late morning or early afternoon, with planned respite breaks;

- For mobile plant items such as cranes, dump trucks, excavators and loaders, the installation of an acoustic exhaust and/or maintaining enclosure panels closed during operation can reduce noise levels by up to 10dB. Mobile plant shall be switched off when not in use and not left idling.
- The use of mufflers / silencers on pneumatic tools;
- Demountable enclosures to screen operatives using hand tools that can be moved around site as necessary.
- The use of effective exhaust silencers on all items of plant, all diesel engine powered plant shall be fitted with effective air intake silences;
- The use of non-reciprocating plant;
- Machines, which are used intermittently, shall be shut down or throttled back to a minimum during those periods when they are not in use;
- Equipment liable to create noise and/or vibration whilst in operation shall be located away from sensitive receptors and use acoustic barriers to absorb and/or deflect noise away from noise sensitive areas;
- The contractor shall not operate any defective equipment or items fitted with noise control equipment until repaired;
- The contractor shall give preference to fixed items of construction equipment that are electrically powered rather than diesel or petrol driven;
- The contractor shall house static noise emitting equipment operating continuously within suitable acoustic enclosure;
- All items of plant shall be subject to regular maintenance to prevent unnecessary increases in plant noise and to prolong the effectiveness of noise control measures;
- Where practicable, metal on metal or rock on metal impacts shall be avoided during night works. This can be achieved through the use of rubber mallets or impact linings etc. on site;
- White noise reverse alarms shall be utilised on vehicles where practicable to reduce potential annoyance of tonal noise emissions from site, particularly during the more sensitive evening and night periods;

- Compressors shall be of the 'sound reduced' models fitted with properly lined and sealed acoustic covers which shall be kept closed whenever the machines are in use;

- Tunnelling compounds, located landside, shall include acoustic screens around the perimeter, to mitigate noise levels from equipment and machinery. This shall be 2.4m high.

Acoustic screens will be carefully positioned to be as effective as possible. In general, the barriers will be brought as close as possible to either the noise source or the receiving position with no gaps or openings in the joins of the barrier material. The barrier material will have a minimum mass per unit area of 7 kg/m^2. The minimum height of the barrier will be such that no part of the noise source will be visible from the receiving point. This will not always be possible and therefore the minimum prescribed height is 2.4m.

The contractor shall regularly inspect the works to ensure that all necessary measures are taken to mitigate and control construction noise and vibration. The contractor shall submit weekly inspection sheets to daa for review.

The contractor shall be responsible for the measurement and control of the noise levels on and adjacent to the works. The contractor shall supply, construct, maintain, move or remove such equipment or structures as may be necessary to enable the 24 hour measurement of noise levels on or adjacent to the site. Control stations shall be established as a minimum in the vicinity of noise sensitive buildings. The contractor shall liaise with daa for their requirements in this regard including the frequency of accessing and reporting this data, which may also be required as a planning condition. The location of the control stations shall generally be outside the works and within the airport boundary fence and the contractor shall obtain all necessary permissions from the daa liaison for such stations.

13.5 Ambient Noise

A baseline road traffic noise level survey has been carried out at five locations within the surrounding area of Dublin Airport (part of Environmental Baseline study). Table 12-1 lists the monitoring locations and Figure 12-4 shows the locations. Table 12-2 shows the road traffic monitoring results which were undertaken between the 18th and 20th September 2019. Aircraft movements of arrivals and departures have been excluded from the measurements to single out traffic from roads.

Location	Co-ordinates	Description
ST1	53.422038, -6.325235	Located on the junction of Kilshane Road and the R135 to measure noise emissions from road traffic on the R135.
ST2	53.424320, -6.315408	Located on the cycle path in the centre of Kilshane Road.
ST3	53.426058, -6.305038	Western edge of the R122, by the entrance of Newton Cottages to measure noise emissions from road traffic on the R122
ST4	53.418906, -6.261173	Located to the north of the properties along Old Airport Road directly south adjacent to the airport.
ST5	53.426576, -6.229775	Located to the north of the properties alongside the R132 to the east of the purple zone airport staff car park

Table 12-1: Baseline Noise Survey Monitoring Locations

Location	Distance to Road Edge, m	Arithmetic average L_{A10}, (3-hour), dB	L_{A10}, (18-hour), dB
ST1	5	76	75
ST2	7	79	78
ST3	7	77	76
ST4	5	81	80
ST5	9	73	72

Table 12-2: Road Traffic Monitoring Results

Figure 13-4: Baseline Noise Survey Monitoring Locations

The above baseline noise measurements have been undertaken to establish ambient noise levels. Potential sensitive receptor locations are identified in Figure 12-1, Figure 12-2 and Figure 12-3.

The Contractor shall be proactive in engaging with the occupants of neighbouring properties with potential for construction impacts and shall notify them of any works forecast to generate appreciable levels of noise, explaining the nature and duration of the works. Night-works in particular have the potential to generate the most significant noise impacts. All affected sensitive locations shall be notified of planned works in advance of the works progressing. The notification shall include a description of the works, the expected duration and details of how to contact the contractor to register any noise complaints.

Consideration shall be given to scheduling activities in a manner that reflects the location of the site and the nature of neighbouring properties. Each potentially noisy event/activity should be considered on its individual merits and scheduled according to its noise level, proximity to sensitive locations and possible options for noise control. Depending on the noise emission levels experienced and associated noise impact, the contractor shall be flexible and able to conduct certain works at hours which reflect periods when the neighbouring properties have lower sensitivities to noise. Furthermore, every effort will be made to schedule the noisiest works to take place during the less sensitive daytime hours.

The following ongoing noise monitoring programme is recommended for the site in relation to construction activities. Noise Monitoring Terminals (NMT), number and locations to be agreed between the contractor, daa and local authority, to be installed with the following specifications (or similar approved):

- Logging of two concurrent periods, e.g. 15-minute & hourly;
- E-mail alert on threshold exceedance;
- Remote access to measured data.

The contractor shall develop a noise monitoring programme taking the above into account, including monitoring locations, whether attended (and frequency for same) or unattended (continuous) monitoring; define how data shall be presented; how comparisons with thresholds shall be provided and timescales for the provision of reports. Reports are to be submitted within two (2) days of a request and with seven (7) days of the end of the related works. A reporting template shall be provided as an Appendix to the Noise

Monitoring Report. The contractor shall submit their monitoring programme to daa for acceptance as part of the CEMP. The Reports shall identify any exceedances above nominal limit values and attempts to clarify the causes, etc. Where remedial measures are required and identifiable these should also be clearly stated.

All measurements shall be carried out using current best practice and shall adhere to the relevant guidance on monitoring set out in the Annex G of BS 5228-1 [1].

The contractor shall:

- Retain all noise monitoring results (tabulated in electronic format) for at least 6 months after the contract end date; and provide data to daa within two (2) days of a request and within seven (7) days of the end of the related works,
- Maintain an inventory of all noise and vibration monitoring equipment.

Spot check noise measurements shall be conducted monthly. These spot checks can be organised to coincide with works that have potential to generate high levels of noise to confirm the potential extent of impact.

Noise control audits will be conducted at regular intervals throughout the construction programme. The purpose of the audits will be to ensure that all appropriate steps are being taken to control construction noise emissions. To this end, consideration should be given to issues such as the following (note that this list is not intended to be exhaustive):

- Hours of operation being correctly observed;
- Opportunities for noise control "at source";
- Optimum siting of plant items;
- Plant items being stopped when not in use;
- Correct use of proprietary noise control measures;
- Materials handling;
- Poor maintenance, and;

- Correct use of screening provided and opportunities for provision of additional screening.

Measurements of noise levels shall be undertaken with sound level measuring equipment conforming to BS EN 61672-1:2013 (IEC 61672-1), Class 1. Equipment should be periodically tested in accordance with BS EN 61672-3:2013. The sound level meter shall be capable of real time analysis giving statistical levels measurements and measure LAeq, LAmax and LA90 as a minimum. All monitoring Equipment shall be calibrated by a UKAS approved (or equivalent) test laboratory every twelve (12) months and have test certificates available.

A designated noise liaison shall be appointed by the contractor for the duration of the construction works. This person should log any issues and follow up promptly.

13.6 Vibration

Vibration standards apply to both human comfort and cosmetic or structural damage to buildings.

Humans are particularly sensitive to vibration stimuli. Rock breaking and piling, two of the primary sources of vibration during construction, are typically tolerated at vibration levels up to 12mm/s and 6mm/s respectively. This is applicable to the daytime only and night-time works involving rock breaking or piling would not be permitted.

Vibration generated by the contractor's activities shall not adversely affect the structural and serviceability of any building, wall or structure.

Construction works in the ADP that may cause vibrations include excavations (especially where rock breaking is necessary), piling (if required), tunnelling and vehicle movements.

Existing buildings in close proximity to the proposed works which could be impacted by construction generated vibrations include:

- CHC Building (to north of West Apron);
- Various hangars (to north of West Apron);
- Pier 4;
- Warehouse in the GSE area of South Apron;
- House to east of R132 (to north of East Compound);

- Abandoned house to east of R132 (to north of East Compound).

The structural condition of all buildings, in close proximity to the proposed works where vibrations are envisaged, would be assessed at detailed design stage and vibration limits set according to the recorded conditions.

The existing utilities within the ADP boundary and that could be impacted by construction generated vibrations include:

- Watermains;
- Storm drains;
- Foul sewers;
- Fuel Lines;
- Gas transmission main along R132 road;
- Electrical ducts.

The existing utilities are assumed to be functional and in good condition. The structural condition of utilities in close proximity to the proposed works where vibrations are envisaged will be assessed at detailed design stage to determine if there is any risk of damage due to vibrations and mitigation measures developed accordingly.

There are also various runways, taxiways and public roads that will be affected by construction works. Pre-condition surveys would be required for airport infrastructure and public road in advance of construction works associated with the ADP.

Typically, the maximum permitted peak particle velocity generated by the construction of the Works would be 8mm/s at low velocities (less than 10Hz) measured at the building, wall or structure closest to the operations being carried out. Allowable levels would increase to a maximum of 12.5mm/s at 50Hz and 20mm/s at 100Hz. Setting of limits would be subject to a detailed structural condition survey of buildings.

The gas transmission main on the R132 road will be crossed by the proposed CPCF Pipeline and would be crossed using a tunnelling methodology. Any vibration limitations set by Gas Networks Ireland (GNI) guidance documents would be complied with during the tunnelling operation. An assessment of the vibration levels at the gas transmission main would be completed and GNI advised with regard to peak particle velocity criteria and other

precautionary measures.

Ground borne vibrations would be limited to not exceeding 5mm/s at sites of freshly placed concrete (*i.e.,* concrete less than 48 hours old). This would require construction stage coordination of activities in close proximity of the CPCF storage tank and the West Apron Pollution Tank.

The contractor shall employ industry best practice methods to minimise vibration produced by construction activities, including plant selection and maintenance.

If requested by daa, the contractor shall monitor ground vibrations using a digital seismograph at selected locations during the course of the works.

If requested by daa, the contractor shall cease works giving rise to noise and vibration until directed by daa that it is acceptable to re-commence such activities.

The contractor shall employ the best practicable means as outlined in the Safety, Health & Welfare at Work (Control of Noise at Work) Regulations, 2006 to minimise noise and vibration resulting from operations and shall have regard for the recommendation contained in BS 5228 2009 - Code of Practice for Noise and Vibration Control on Construction And Open Sites. In particular:

- Where possible contentious vibration levels are identified from advance contact with residences and businesses. The contractor shall arrange advance vibration surveys to take place ahead of the programmed works commencement date in order to ascertain the ambient background levels. The contractor shall issue the advance survey results to a representative of the Employer two weeks in advance of the programmed works for comment and approval.

- As a minimum, the contractor shall employ vibration surveys a minimum of once a week at all site locations. The contractor shall issue the survey results to a representative of the Employer.

- Selection of construction plant with low inherent potential for generation of vibration as per the European Commission Directive 2000/14/EC;

- Contractors shall highlight in their method statement and/or risk assessment specific activities that will create significant vibration levels. In addition to this, contractors shall demonstrate how they will mitigate/manage these emissions.

Where significant vibration levels are expected, the appointed contractor shall inform the daa Liaison Officer.

14 SURFACE WATER MANAGEMENT

Contractors shall comply with the rules and take on board the recommendations outlined in the *daa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual* in relation to Surface Water Management.

14.1 Specific Works Areas for Surface Water Management

Specific works areas where surface water management measures will need to be implemented during construction of the drainage element are as follows:

- To the north of the proposed CPCF, the Cuckoo Stream runs in an easterly direction. The proposed CPCF shall require a deep excavation adjacent to the Cuckoo Stream. It should be noted that the flood maps indicate that this area is currently at risk of flooding (refer Figure 13-1). This would lead to a risk of the excavation becoming flooded and soil and silt being washed downstream. To mitigate this risk, special measures such as an earth berm shall be required to prevent the watercourse inundating the excavation.

- To the south of the South Apron, the proposed pipelines (CW4 and Airfield Contaminated Pipeline) cross a ditch (part of the Airfield Trunk Culvert), which discharges to the Airfield Trunk Culvert, requiring in-stream works.

- Diversion of the upstream part of the Cuckoo Channel.

- Backfilling of the upstream part of the existing Cuckoo Channel.

- Construction of an overflow weir and overflow channel as part of the existing FDS.

- The emergency overflow from the CPCF storage tank and the CPCF Pipeline is proposed to discharge via a headwall on the southern bank of the Cuckoo Stream upstream of the M1 motorway culvert (in-stream works).

- To the west of runway 16/34, the proposed pipeline (CW3) crosses underneath the existing Airfield Trunk Culvert.

- On and in the vicinity of the R108 where it is proposed to intercept greenfield flows (in-stream works for headwalls).

- Excavations for the pipeline trenches, manholes, tunnel shafts and decision point chambers could require de-watering depending on level of the ground water table.

- The CPCF storage tank, West Apron Attenuation Tank and West Apron Pollution Tanks are deep below ground structures and could require de-watering depending on level of the ground water table.

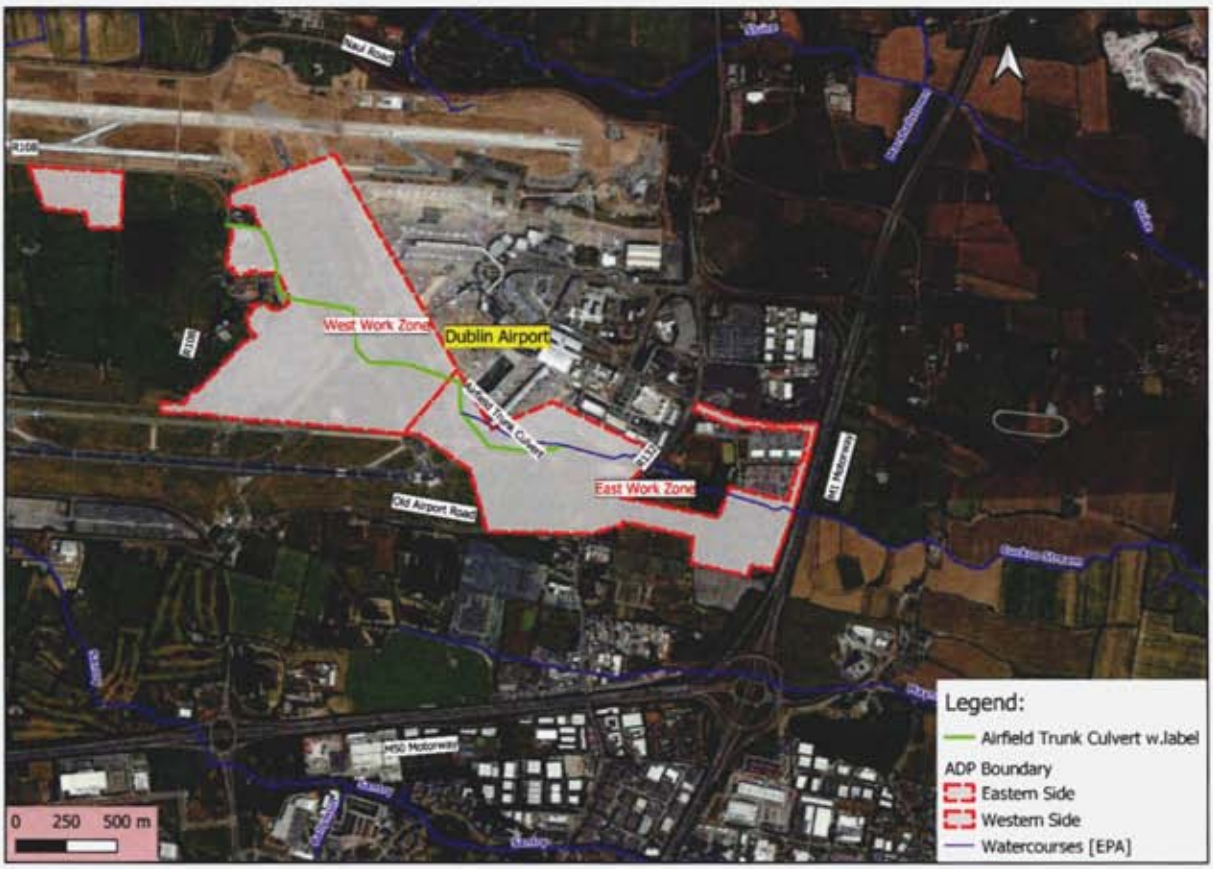

Figure 14-1: Existing Watercourses in Vicinity of Works Area

14.2 Site Specific Measures

In each of the above areas, specific measures shall be required to prevent contamination of the watercourse. The contractor shall develop the detailed CEMP and provide standard construction management measures to minimise the risk from the works, either directly or via the existing drainage infrastructure.

This Section should be read in conjunction with relevant chapter of the EIAR and planning conditions as applicable.

The works shall be completed in line with the recommendations of the following guidelines:

- CIRIA C648 Control of Water Pollution from Linear Construction Projects: Technical Guide (Murnane et al. 2006);
- CIRIA C649 Control of Water Pollution from Linear Construction Projects: Site Guide (Murnane et al. 2006);
- 'Control of Water Pollution from Construction Sites, Guidance for Consultants and contractors' (CIRIA, 2001).
- Inland Fisheries Board document 'Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters'.

Site specific measures are outlined as follows:

- The contractor shall comply with all national laws and regulations on controlling pollution of the environment and shall take all necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, bitumen's, chemicals or other harmful materials.
- Ditches and streams shall be clearly identified on site and shown on method statements and site plans.
- The contractor shall identify and risk assess existing drainage systems and put in place measures to prevent possible contamination from surface run-off emanating from the works.
- No discharge to existing infrastructure/watercourses/ground shall be permitted to take place without the appropriate consents or approvals.
- The contractor shall provide suitable de-watering pumps, settlement tanks and filters to filter all water being pumped/discharged from excavations into existing drains. The contractor shall also take measures to ensure that runoff from open excavations does not enter the surrounding drainage system without being treated. The most likely excavations that may accumulate large quantities of water include the pipeline trenches, CPCF excavation and tunnel shafts. It should be noted that all other excavations regardless of size or depth have the potential to accumulate groundwater and surface water.
- All discharged water from de-watering pumps shall be treated and tested as required to prevent any pollutants entering groundwater or a watercourse. Such

water shall be disposed of as construction site runoff having first passed through a settlement tank or filtration system where appropriate.

- Where feasible all ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility off-site.

- Washing of delivery chutes of concrete lorries, shall take place in a designated area. This area shall contain any runoff from the washing process and be treated and tested as required to prevent any pollutants entering groundwater or a watercourse. The personnel washing the concrete chute shall endeavour to funnel the runoff into the concrete barrel, for disposal at the concrete batching plant.

- All plant and equipment brought to site shall be in good working order with no leaks and maintained as such during the course of the works.

- Fuelling of plant and equipment is to be carried out within compound and material storage areas only (unless agreed otherwise with daa – may be necessary in the case of mobile task lighting or generators) by a trained operative using double skinned bowsers within a designated fuelling area and providing bunded fuel storage. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as "Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001) will be complied with.

- In the case of drummed fuel or other chemicals used during construction, containers will be stored in a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.

- Drip trays to be used during all fuelling operations and a fully maintained spill kit located within the designated fuelling area.

- All oils, solvents and paints used during construction will be stored within temporary bunded areas. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest

tank / container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal. Storage of materials shall be located at least 4m away from water bodies, within designated and bunded areas.

- Where required, silt fencing shall be deployed at the base of stockpiles when storing fine material to prevent runoff outside the designated area.

- A water quality monitoring programme shall be implemented by the contractor and discharges monitored in accordance with consents held. Routine monitoring shall be undertaken at watercourses upstream and downstream of the works, and at all discharge points to measure turbidity, odour and presence of oil film. The contractor shall ensure that all watercourses are free from litter and debris. All discharges to surface water must be analysed with respect of the requirements of the European Communities Environmental Objectives (Surface Water) Regulations (SI No 272 of 2009) and European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012 (S.I. No. 327 of 2012) taking account of both ecological status and chemical water quality limits.

14.2.1 In-channel/ditch/stream Works

In-stream/ditch works apply to the following:

- The construction of headwalls to local drains to intercept greenfield flows associated with the Clean Water Pipeline CW1 on the R108 (Location A on Figure 13-2);
- The construction of a headwall for the emergency overflow from the CPCF storage tank and the CPCF Pipeline on the southern bank of the Cuckoo Stream upstream of the M1 motorway culvert (Location C on Figure 13-2);
- The crossing of a ditch to the south of the South Apron for the proposed pipelines (CW4 and ACP2) and the construction of Decision Point 6 (Location D on Figure 13-2).
- The connection of the Cuckoo Supply Channel Diversion to the existing Cuckoo Supply Channel and backfilling of existing channels following completion of the diversion.
- The construction of the Flow Continuation Structure at the existing Flow Diversion Structure in SA.

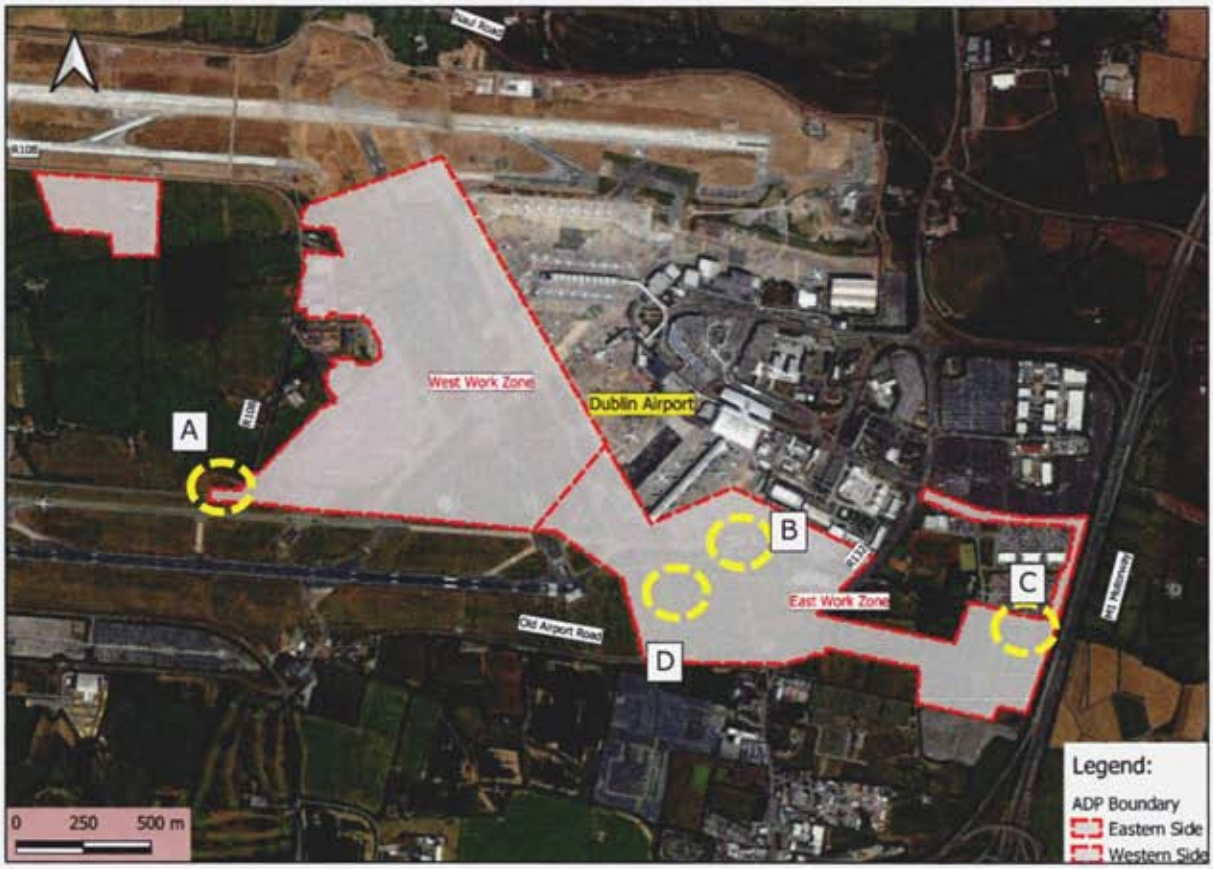

Figure 14-2: Locations of Proposed In-Channel Works

For construction of any works in-stream a detailed Pollution Control Plan, Emergency Response Plan and Method Statement shall be drafted in agreement with Inland Fisheries Ireland (IFI) and having regard to relevant pollution prevention guidelines in particular the IFI document "Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters" and "Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (NRA, 2005)". All works in or adjacent to watercourses will comply with the EPA, IFA and OPW requirements.

Direct disposal to the watercourse of arisings from excavations in-stream and from dewatering activities shall not be permitted as these could impact both on water quality of the watercourse and increased flood risk. Any discharge of such water, after proper treating/de-silting with a limit on the turbidity of the discharge to not more than 80 NTU, will be discussed and agreed with the concerned authority (EPA, Fisheries etc.) prior to the commencement of work.

If it is necessary to culvert or divert via closed conduit(s) the Cuckoo Stream, then the culvert(s) / closed conduit(s) shall be sized in accordance with the OPW's Section 50

consents so as not to cause an afflux (*i.e.*, backing up of the stream increasing the water level).

During the construction phase as part of the CEMP, monitoring will take place to confirm that pollution control measures are effective. Once construction works commence onsite, monitoring and supervision will be required until all mitigation works are implemented effectively. Dewatering of excavations using proprietary settlement tanks or filtration systems will be monitored at least twice daily with dewatering stopped if any silt is evident within the discharge.

Works in the Cuckoo Stream shall be conducted during forecast low flow conditions.

In-stream works shall only take place during the period March to September or as agreed with the IFI.

14.2.2 Works Adjacent to Watercourses

Works adjacent to watercourse apply to the following (refer Figure 13-3):

- Construction of the CPCF storage tank in the Eastlands.
- Construction of the Cuckoo Supply Channel Diversion.
- The construction of a headwall for the outfall from the Clean Water Pipeline CW4 at the discharge point to the Cuckoo Channel in South Apron.
- Construction of CW1 and CW2 in the vicinity of existing drains along the R108.

Temporary stockpiles will be located away from drains and watercourses. Stockpiles will not be located within 10m of any ditches, dry or wet, or watercourses.

Management of stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be required with the final measures to be determined by the contractor, these may include the following:

- Allowing the establishment of vegetation on the exposed soil.
- Providing silt fences at the toe of the stockpile to mitigate runoff during rain events.
- Surrounding stockpiles with cut-off ditches to contain runoff.
- Directing any rainwater runoff to the site drainage system and to a settlement pond (or other) treatment system.

- Providing bunds or another form of diversion to keep runoff from entering the stockpile area.
- All exposed soil surfaces will be within the main excavation site which limits the potential for any offsite impacts.
- Stockpiles will be tightly compacted to reduce run-off and graded to aid in run-off collection.
- Movement of material will be minimised to reduce the degradation of soil structure and generation of dust.
- Excavations will remain open for as little time as possible before the placement of fill and therefore the volume of the stockpiles will be restricted to what is necessary.
- Soil from works will be stored away from existing drainage features to remove any potential impact.
- Where feasible, hoarding will be erected around site boundaries to reduce visual effect. This will also have an added benefit of preventing larger particles from affecting nearby sensitive receptors.
- Weather conditions will be considered when planning construction activities to minimise the risk of run-off from the site and the suitable distance of topsoil piles from surface water drains will be maintained.

14.2.3 Sediment Control

Sediment control will apply to the following:

- Topsoil stripping from the pipeline corridors and at the storage tank (CPCF and West Apron);
- Trench excavation for the pipelines;
- Tunnel shaft excavations for the tunnelled pipelines;
- Excavations for the decision point chambers and kiosks.

As part of good practice to reduce the release of suspended solids into surface water run-off, the following procedures will be employed:

- Excavation works will not be carried out during or following heavy rainfall. Excavations will be covered during high rainfall to avoid the creation of silty water

that may require dewatering. During lighter rain periods, the time period over which excavations are left open will be reduced insofar as is reasonably practicable. Dewatering of excavations will be avoided where possible, if required, this will be achieved by pumping excess water to proprietary settlement tanks or filtration systems located at the construction site. These will be monitored at least twice daily with dewatering stopped if any silt is evident within the discharge. In emergency situations, water with sediment will be tanked off-site to be discharged at a suitable location.

- Where proprietary settlement tank systems are required, they will be located on a level secure platform and water from the excavation will be allowed to settle in these prior to discharge. It will ensure that no water is directly discharged into a watercourse or drainage ditch. A suitable location for the discharge will be identified prior to the placement of the system. Scouring of the grounds surface will be avoided by the discharge system.

Silt fences shall be constructed using a permeable filter fabric (Hy-Tex Terrastop Premium silt fence or similar) and not a mesh. Silt fencing must be installed as per the manufacture's guidelines. The following points are provided to aid the user, however if there is any ambiguity reference to the manufacture's guidelines must be sought:

- Silt fences must be installed downslope of an area where it is likely that silt will be generated;
- To be effective the silt curtain must contain the area where silt is generated and must terminate on high ground;
- The base of the silt fence must be bedded at least 15 – 30 cm into the ground and staked at 2 m intervals;
- The vegetated sod should be peeled back without detaching from the ground, geotextile inserted, and sod restored to hold the base in place;
- Once installed the silt fence needs to be inspected regularly during construction (more frequently during heavy rainfalls), weekly post construction for at least one month, but particularly after heavy rains and periodically thereafter; In sensitive areas multiple rows of silt fencing should be installed. This is a judgement call on site;

- Silt fences should be maintained until vegetation on the disturbed ground has re-established;
- Maintain a record of when it was installed, inspected and removed; and
- Brushing or scraping of roads may be required to reduce dust and mud deposits with collected material being appropriately disposed of and not allowed to enter the surface water system.

14.2.3.1 Pre-Construction Monitoring

Pre-construction water quality monitoring will be undertaken once a week for a 1-month period, prior to the commencement of the construction works. Samples will be taken for total suspended solids (TSS), turbidity, pH, temperature, dissolved oxygen (DO) and hydrocarbons up and downstream of the proposed working areas and/or crossing points, to establish the baseline water quality conditions prior to construction. Samples for turbidity, pH, DO and temperature will be taken in situ; samples for TSS and hydrocarbons will be sent to an accredited laboratory for analysis.

14.2.3.2 Construction Monitoring

During construction, the contractor will monitor the levels of TSS, turbidity, pH, temperature, DO and hydrocarbons at the same locations up and down stream of the works once a week for the duration of the following works:

- Site clearance works, earthworks movements and stockpiling;
- Excavations; and
- Construction works within and adjacent to watercourses.

The above monitoring will alert the contractor to any detrimental effects that particular construction activities may be having on water quality in order that appropriate remedial action can be taken as quickly as possible; and allow the contractor to demonstrate the success of the mitigation measures employed in maintaining any sediment release within the 'trigger' value established.

All excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of potential contaminants to ensure that historical

pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be segregated and appropriately disposed of by a suitably permitted / licensed waste disposal contractor.

15 DUST MANAGEMENT

The contractor shall take all necessary steps to control dust caused during construction of the Works either by construction activities and/or construction traffic including deliveries to and plant departing the site. This section should be read in conjunction with relevant chapter of the EIAR when applicable.

Contractors shall comply with the rules and take on board the recommendations outlined in the *daa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual* in relation to Dust Management. The Contractor shall also take into consideration the best practice guidance from Ireland, the UK and the USA based on the following publications:

- 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014);
- 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings' (The Scottish Office, 1996);
- 'Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance' (UK Office of Deputy Prime Minister, 2002);
- 'Controlling Particles, Vapours & Noise Pollution From Construction Sites' (BRE, 2003);
- 'Fugitive Dust Technical Information Document for the Best Available Control Measures' and the USA (USEPA, 1997); and
- 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated) (USEPA, 1986).

Dust suppression measures shall be used to reduce the potential for dust on site. These shall include but not be limited to:

- Plant shall be fitted with appropriate dust control measures, such as enclosed conveyors, rubber chutes and water suppression, where reasonably practicable, to reduce potential dust emissions. Skips shall be covered;
- Plant and equipment shall be regularly maintained to ensure emissions are kept to a minimum;

- A Non-Road Mobile Machinery (NRMM) register shall be maintained to record off road emissions;
- Stockpiles of materials shall be sited and shaped to prevent dust arisings. If necessary, these shall be treated with a 'dust-buster' or similar or using sheeting;
- Handling of materials, such as soils, shall be kept to a minimum and materials shall be deposited onto the stockpile at a minimum practicable height (2m height is recommended for topsoil to prevent the soil compressing under its own weight). All other stockpiles shall not exceed 10m in height and shall be suitably graded;
- Dust gauges shall be installed, and results shall be reviewed at least monthly and kept on site;
- Carrying out earthworks in close proximity to sensitive receptors during dry and/or windy conditions shall be avoided if reasonably practicable, having regard to programme and contracting arrangements for the relevant works. Where this is unavoidable, appropriate water suppression to control dust shall be made available;
- Spoil materials extracted from the site shall be recycled elsewhere on site, when and where appropriate;
- The storing of potentially dusty materials shall be undertaken away from site boundaries and/or potentially sensitive receptors;
- Spoil materials shall be removed away from site as soon as is practicable, minimising the need to stockpile potentially dusty material;
- If unavoidable, spoil stockpiles shall be regularly dampened down, sheeted or sealed before being removed from site at the earliest opportunity;
- Slopes on stockpiles shall be no steeper than the natural angle of repose of the material and shall maintain a smooth profile. Avoiding site run-off of water or mud to reduce the potential for track-out dust emissions.
- Designed/prefabricated materials shall be used where reasonably practical to reduce the need for grinding, sawing and cutting on site;
- Where cutting, grinding or sawing equipment is required, this shall be done in conjunction with suitable dust suppression techniques, such as water sprays or

local extraction, and where possible undertaken in an area that is away from the sensitive receptors identified;

- Bulk cement and other fine powder materials shall be delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent the escape of material and overfilling during delivery;
- Manipulation of fine materials, such as the mixing of cement, shall take place in an enclosed area that is remote from the site boundary and potentially sensitive receptors;
- Handling large quantities of potentially dusty material shall be done so in an enclosed or shielded environment;
- Vehicles entering or leaving the site with loose or potentially dusty material shall be adequately sheeted;
- Unsurfaced areas of the site shall be regularly dampened down during periods of dry and/or windy conditions. Ensuring adequate water will be made available on the site for effective dust and particulate matter suppression and mitigation, using non-potable water where possible;
- Speed limits of 5 miles per hour (mph) on unsurfaced areas and 10 mph on hard surfaced areas shall be mandatory on site;
- Public roads and access routes adjacent to the site shall be regularly cleaned using wet sweeping methods. Sweepings and cleanings shall be immediately removed and disposed of offsite to a suitably licensed waste management facility;
- Shutting down of all plant and equipment when not in use;
- Minimising engine idling of vehicles when stationary;
- Minimising delivery volumes through use of off-site prefabrication;
- Introduction of a wheel wash for construction traffic. This shall be required at each exit from the site, prior to vehicles returning to either airport roads (where permitted to use these) or public roads;
- Mitigating measures including cleaning of areas and vehicles in the event of dust pollution;

- Minimising drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment, and using fine water sprays on such equipment wherever appropriate;
- Making equipment readily available onsite to clean up spillages as soon as reasonably practicable after the event;
- Delivering bulk cement and other fine powder materials in enclosed tankers and storing them in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
- Construction activities will be modified, reduced or controlled during high or unfavourable wind conditions if they have a potential to increase dust generation;
- Sealing high use haul roads, with stone and / or geogrid, and regularly inspecting and making necessary repairs to the surface as soon as reasonably practicable;
- Storing aggregates in bunded areas and not allowing them to dry out unless required for particular purposes;
- The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust effects and nuisance are minimised;
- During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions;
- The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details;
- It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses;
- A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out;
- It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein;

- At all times, the procedures put in place will be strictly monitored and assessed.

Regular site inspections, at a minimum weekly, will be undertaken to monitor compliance with a dust management plan (refer Section 14.1) to be prepared by the appointed contractor. Inspection results will be recorded and included in monthly reporting.

Dust management measures will include a combination of source management, surface stabilisation, sediment removal from plant machinery prior to entering local road networks and water suppression.

The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed, and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below

15.1 Dust Mitigation Plan

The Works Zones, and in particular the West Works Zone and the western part of the East Works Zone around the South Apron, is located in the Dublin Airport complex. Dust is hazardous to aviation with resultant poor visibility being a danger to airplane landing, dust can scour aircraft surfaces and dust can damage aircraft engines.

The contractor shall develop a dust management plan that will set out as a minimum detail as follows:

- Procedure for Assessment of the Situation regarding dust;
  - Review weather forecast daily for potential high winds (>20km/hr) at nearest weather station (Dublin Airport),
  - Review daily works schedule and need for dust controls,
  - The implementation of dust and emission controls to be progressive and continual during the various stages of construction,
  - Stop dust generating work if wind exceed 20km/hr (10 minute average) and dust controls are not sufficient to mitigate dust generation.
- Implementation of Air Quality Controls;

  - As per Section 14 above.

- Measurement and observation of effectiveness of Air Quality Controls;
  - If visible dust observed leaving site, re-assess the situation and potentially implement additional controls,
  - If a dust complaint is received, re-assess the situation and potentially implement additional controls,
  - Bring any significant air quality issues to the attention of daa.
- Monitoring and Recording;
- Complaints Management;
- Incident Management.

Potential dust emission from unpaved haul roads is a function of parameters such as length of road, average daily traffic, silt content of the soils and vehicle characteristics (speed, weight, etc). The road length and the average daily traffic are the critical parameters. The use of the compounds for storage of materials would minimise the average daily traffic on haul roads.

The quantity of dust emissions from aggregate storage operations varies with the volume of aggregate, moisture content, proportion of fines in the aggregate and the procedure for handling.

Further dust mitigation relevant to the airport are outlined in Section 14.2.

15.2 Particular Works with Potential for Dust Generation

The following works are envisaged to have the potential to generate airborne dust:

- Installation of pipelines by open cut. (generation of dust from dried topsoil and subsoil);
- Installation of pipelines by tunnelling method. (generation of dust from dried tunnel slurry material);
- Construction of pipeline manholes and tunnel shafts. (generation of dust from small scale in-situ concrete mixing and concrete cutting);

- Construction of CPCF tank, West Apron Pollution Tank, West Apron Attenuation Tank and decision point chambers and kiosks. (generation of dust from small scale in-situ concrete mixing and concrete cutting) (generation of dust from open and battered excavations;
- Construction of Cuckoo Supply Channel Diversion and Flow Continuation Structure in SAH;
- Travelling along unbound haul routes (generation of dust from disturbance due to vehicles).

The above list of works includes works throughout the proposed site area and is within the airport complex. Dust emissions from the construction works could impact on airport operation across a range of wind directions due to the extensive nature of the proposed works extending from the R108 to the M1. Various wind directions could exacerbate the potential effects depending on the location of the works area relative to the wind direction.

Based on the list of works outlined above the greatest risk of dust emissions to airport operations would be from the following:

- Topsoil heaps along the pipeline corridors, particularly along the CW2 and CW3 pipeline corridors to the west of runway 16/34 and the CW4 pipeline corridor to the south of Pier 4.
- Unpaved haul roads from Gate 9 through the west works zone.
- Unpaved haul roads from Gate 1B through the east works zone.
- Open excavations for the West Apron Pollution tank.
- Open excavations for the West Apron Attenuation Tank.
- Handling of aggregates for trench backfill.

In general, the greatest risk of dust emissions is from topsoil heaps, unpaved haul roads and open excavations. The mitigation measures outlined at the start of this section will assist in minimising dust emissions from the works.

As per Section 14.1 dust from unpaved haul roads is a function of length and traffic movements and to mitigate the risk of dust the daily traffic movements should be minimised by the contractor as part of an overall dust mitigation plan:

- In dry conditions the haul roads will need to be dampened with water as the primary control to minimise dust emissions. The required application frequency will vary according to soil type, weather conditions and vehicular use;
- A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads;
- In certain wind conditions the limiting or stopping of vehicles may be applicable;
- Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.

Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures:

- Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust;
- At the main site traffic exits, a wheel wash facility will be installed. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.

Available site investigation indicates that sub-soils along the potential haul roads within the pipeline corridors consists of stiff slightly sandy gravelly clay. The clays have a high silt / clay content (30 – 40%). Clays and silts would have particle sizes less than 0.1mm. High silt content is one of the parameters that result in high dust emissions.

Topsoil heaps, where being retained for a significant period of time, should be grassed seeded to prevent wind erosion and dust generation.

Open excavations for tank will generally be deep with the base blinded with concrete as soon as the formation level is reached and thus dust generation would be minimised for such works. Battered sides of excavations can generate dust emissions and to minimise this the tops of battered sides can be covered or kept damp by watering.

Water usage will depend on the area to be wetted, evaporation rates, watering intensity (l/m^2) and time between applications. The watering intensity and evaporation rates would dictate the times between applications.

15.3 Air and Climate Change

Embodied carbon of materials and construction activities will be the primary source of climate impacts during the construction phase. Measures to reduce the embodied carbon of the construction works include:

- Creating a construction program which allows for sufficient time to determine reuse and recycling opportunities for demolition wastes;
- Appointing a suitably competent contractor who will undertake waste audits detailing resource recovery best practice and identify materials can be reused/recycled;
- Materials will be reused on site within the new build areas where possible;
- Ensure compliance with local and regional climate actions plans, including CAP23;
- Prevention of on-site or delivery vehicles from leaving engines idling, even over short periods;
- Ensure all plant and machinery are well maintained and inspected regularly;
- Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site; and
- Sourcing materials locally where possible to reduce transport related CO2 emissions.

The contractor shall endeavour to maintain good air quality throughout construction works. An air quality plan shall be produced, covering NOx mitigation measures, IAQ measures, dust management, air quality monitoring, COSHH management and pollution control.

- Use of prefabrication and modular design to reduce the volume of materials used on site and associated emissions;
- Recycling of building materials such as concrete and reinforcement steel excavated through Aprons and Taxiways where applicable.
- Potential use of Electric Arc Furnace Slag (EAFS) as aggregate for concrete associated with the reinforced concrete tanks.

- Optimisation of imported soil and excavated material shall minimise plant use and deliveries;
- Use low emission plant and Non-Road Mobile Machinery (NRMM) in the construction works;
- The contractors shall endeavour to have 90% of Emission Stage IIIB and above of construction plant equipment, which is updated monthly and kept on register by the contractor;
- Use of electric vehicles where possible, with the provision of electric vehicle charging points;
- Promotion of sustainable travel options should be encouraged;
- A no engine idling policy shall be implemented on site to prevent exhaust and noise emissions;
- Bulk materials leaving site shall be suitably covered;
- Use of electric and hybrid plant where possible should be encouraged.

16 PRELIMINARY WASTE MANAGEMENT PLAN

Contractors shall comply with the contents and recommendations regarding waste management outlined in:

- the daa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual
- the Airport Direction D-O Environment and Pollution.

16.1 Construction & Demolition Waste Management Plan

Contractors are mandated to develop a Detailed Construction & Demolition Waste Management Plan (CDWMP) that complies with the documents mentioned above and is written considering the findings and recommendations included in this preliminary exercise. This shall be submitted to daa prior to commencing the Works in accordance with the EPA's (2021) Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects.

The CDWMP shall help manage waste generation and diversion from landfill to ensure targets agreed between daa and the contractor are met. Waste generation and diversion from landfill shall be monitored and reported.

The contractor shall identify all likely waste streams arising from these works and put in place an appropriate plan for the management of each, including details of proposed licensed waste hauliers and licensed waste disposal facilities as well as their permits to accept particular waste stream.

A dedicated waste segregation area shall be established on site to ensure waste streams are clearly segregated prior to removal from site. All waste skips and containers shall be suitably labelled.

The CDWMP shall provide an estimate of expected volumes for each waste stream, reductions following above approach and on completion final tally for each waste stream.

The CDWMP should include the following as a minimum;

- Names, roles, responsibilities and authority of key personnel involved in waste management on site and in the design team,
- Waste management objectives for the Works,

- Identification and categorisation of waste arisings / material surpluses,
- Proposals for the minimisation, re-use and recycling of wastes,
- Material handling procedures,
- Waste Record keeping procedures,
- Details of authorised waste haulers with appropriate and up-to-date Waste Collection Permits,
- Details of permitted or licensed Recovery / Disposal facilities where waste materials shall be sent, including copies of permits/ licenses,
- The identification of measures to prevent nuisance etc,
- The identification of the amounts intended to be stored temporarily on site and the location of such storage,
- Waste auditing protocols,
- Proposals for training / maintaining awareness and designation of responsibilities,
- Procedures for controlling sub-contractors,
- Designation of separate storage areas for different types of waste materials in order to maximise their re-use and recycling potential.

16.2 Main C&D Waste Categories and Estimates

Numerous types of waste shall be generated throughout the phases of the ADP. Key waste types from construction and demolition activities are included below. Each waste type shall be segregated and removed via licensed hauliers to licensed facilities.

The potential management route for each waste type shall be considered in accordance with the waste hierarchy. Good working practices and takeback schemes, etc. shall be used to reduce the amount of waste generated as an initial step. The waste management route for each waste stream shall be recorded in the Site Waste Management Plan, with a target of at least 98% diversion from landfill to be achieved.

Waste Material	EWC Code
Non-Hazardous	
Soil and Stones	17 05 04
Bituminous materials	17 03 02
Concrete	17 01 01
Iron and steel	17 04 05
Mixture of concrete and bricks	17 01 07
Plastic	17 02 03
Granular fill under pavement	19 09 04
Drilling mud	01 05 04

Table 15-1: European Waste Classification

EWC Code	Waste Description	Source of Waste (Construction Activity)	Estimated quantity (+25%, -15%)	UoM	Potential Management Route
17 03 02	Soil and Stones	Excavation for CW1/CW2 Pipeline	7,075	m^3	Disposal
17 03 02	Soil and Stones	Excavation for CW1/CW2 Pipeline	7,125	m^3	Reuse
17 05 04	Soil and Stones	Excavation for CW3 Pipeline (Partially Tunnelled)	5,175	m^3	Disposal
17 03 02	Soil and Stones	Excavation for CW3 Pipeline (Partially Tunnelled)	5,035	m^3	Reuse

EWC Code	Waste Description	Source of Waste (Construction Activity)	Estimated quantity (+25%, -15%)	UoM	Potential Management Route
17 05 04	Soil and Stones	Excavation for CW4 Pipeline (Partially Tunnelled)	17,425	m^3	Disposal
17 03 02	Soil and Stones	Excavation for CW4 Pipeline (Partially Tunnelled)	7,660	m^3	Reuse
17 05 04	Soil and Stones	Excavation for Airfield Contaminated Pipelines (Partially Tunnelled)	9,595	m^3	Disposal
17 03 02	Soil and Stones	Excavation for Airfield Contaminated Pipelines (Partially Tunnelled)	7,850	m^3	Reuse
17 05 04	Soil and Stones	Excavation for CPCF Pipeline (Partially Tunnelled)	27,590	m^3	Disposal
17 05 04	Soil and Stones	Excavation for CPCF Pipeline (Partially Tunnelled)	18,525	m^3	Reuse
17 05 04	Soil and Stones	Excavation for Decision Points	6,150	m^3	Disposal
17 05 04	Soil and Stones	Excavation for Decision Points	2,570	m^3	Reuse
17 05 04	Soil and Stones	Excavation for CPCF Tank	140,180	m^3	Disposal
17 05 04	Soil and Stones	Excavation for CPCF Tank	46,660	m^3	Reuse
17 05 04	Soil and Stones	Excavation for Outlet to North Fringe Sewer & Futureproofing	1,505	m^3	Disposal

EWC Code	Waste Description	Source of Waste (Construction Activity)	Estimated quantity (+25%, -15%)	UoM	Potential Management Route
17 05 04	Soil and Stones	Excavation for Outlet to North Fringe Sewer & Futureproofing	2,550	m^3	Reuse
17 05 04	Soil and Stones	Excavation for West Apron Works – Tanks and Pipelines	50,690	m^3	Disposal
17 05 04	Soil and Stones	Excavation for West Apron Works – Tanks and Pipelines	62,350	m^3	Reuse
17 05 04	Soil and Stones	Cuckoo Supply Channel Diversion	12,000	m^3	Disposal / Reuse
17 05 04	Soil and Stones	Excavation for Pipework at South Apron Area	3,780	m^3	Disposal
170 05 04	Soil and Stones	Excavation for Pipework at South Apron Area	6,230	m^3	Reuse
17 03 02	Bituminous Materials	Crossing of Runway 16/34, Taxiway W1 and internal road	260	m^3	Disposal
17 01 01	Concrete	Crossing of Taxiway W2	65	m^3	Disposal
		West Apron	1,320	m^3	Disposal
17 04 05	Iron and steel	Crossing of Taxiway W2 and West Apron	75	m^3	Disposal
17 01 07	Mixture of concrete and bricks	Concrete pipelines and associated concrete manholes where replaced.	200	m^3	Disposal
17 02 03	Plastic	Various pipes, ducts crossings	50	m^3	Disposal

EWC Code	Waste Description	Source of Waste (Construction Activity)	Estimated quantity (+25%, -15%)	UoM	Potential Management Route
19 09 04	Granular fill under pavement	Crossing of Runway 16/34, Taxiway W1, W2, West Apron	1,190	m^3	Disposal
01 05 04	Drilling mud	Tunnelling of pipelines	6,000	m^3	Disposal

Table 15-2: Construction and Demolition Waste Estimates

16.3 Waste Management procedures

The contractor shall supply all waste containers/skips as required for each of the identified waste streams, locations should be close to relevant works and as agreed with daa. It is the responsibility of the contractor to gather and remove all waste and spoil including that created by sub-contractors. All waste containers are to be emptied on a regular basis and at a minimum before they are full, overflowing containers shall not be acceptable.

The contractor shall remove all waste containers/skips from airport property on completion of the contract.

All waste containers shall be enclosed and lockable to prevent FOD (Foreign Objects Debris). Each container shall have a temporary nameplate attached identifying the waste stream and bearing the contractor's name.

A secure, lockable and controlled store (in the compound and materials storage area unless agreed otherwise) shall be provided for the storage of chemicals and other hazardous materials to be used in the Works.

A record of all waste leaving site, who is hauling it and receiving waste disposal facility shall be maintained and forward to daa regularly during the Works.

- All sub-contractors should provide a waste forecast for waste types and quantities expected to be generated.

- Waste generation should be reduced as much as possible. Offcuts, surplus materials and packaging should be returned to suppliers for closed loop recycling where possible.
- Single-use plastics should be avoided where possible.
- Re-use materials where possible.
- Avoid waste generation from incorrect storage of materials causing damage and contamination.
- Cover skips to prevent dust, wind-blown litter and rainwater accumulation where possible.
- All waste emanating from site shall be controlled, recorded, transferred and disposed of in accordance with the Waste Management Act 1996 (S.I. No. 10 of 1996) and Waste Management (Amendment) Act 2001 and associated regulations.
- Licence documentation for all waste carriers removing waste and for all waste destinations receiving waste must be held on file. Waste consignment notes (for a minimum 3 years) for hazardous waste and waste transfer notes (for a minimum 2 years) for non-hazardous waste must be held on file and readily available for inspection and auditing purposes.

16.4 Risk of Asbestos

Asbestos Containing Materials (ACM) were widely used in the building and construction industry up until 1999. daa wishes to ensure that all staff and contractors are protected from the health risks associated with ACM in the workplace, and thus has a general policy that applies to all works carried out at Dublin Airport.

It is mandatory that contractors and Project Managers follow daa's internal framework described in the "Asbestos Management Policy" for the management of ACMs.

Previous surveys detected asbestos in existing buildings in the vicinity of North Runway (Farmlands), which is outside the works area. The data available for the existing pipes in the works area do not indicate the presence of asbestos cement (AC) pipes. No works to existing buildings and no demolition works are proposed as part of the construction of the proposed drainage infrastructure. It is therefore not anticipated that ACMs will be encountered during the construction works for the proposed drainage infrastructure.

16.5 Foreign Object Debris (FOD)

The following risk is specifically identified because strict management of waste is required to mitigate against it. This section should be read in conjunction with relevant chapter of the EIAR, when applicable.

Airside works must comply with all the rules and recommendations included in the *Airport Direction D-O Construction Projects*.

Foreign Object Debris (FOD) is a particular risk at an airport where materials or debris could cause damage to aircraft, and regardless of specific works locations there exists the possibility that windblown materials could present an issue if materials/waste is not properly secured or contained within securely covered containers. The contractor shall provide details of proposed measures to mitigate against this risk and windblown materials in general. These measures should include the following;

- Provision of facilities for the collection and disposal of FOD such as FOD bins and compactors,
- FOD hazard and control process implemented by contractor,
- Removal of any FOD observed,
- Fix and store objects that may cause a FOD hazard if blown.

It is the direct responsibility of all contractors working at the airport to ensure that a FOD free environment is maintained. All companies must have staff training and procedures that reflect these responsibilities.

Vehicles and equipment airside should be maintained in a clean and serviceable condition, not only for reasons of safe vehicle operation but also to minimise the leakage of fluids and depositing of FOD from these vehicles.

Before proceeding from one part of the airport to another via a route that crosses the airfield, all vehicles must be inspected to ensure that anything carried in or on the vehicle is secured. All doors and tail or side boards must be securely shut, and no part of the vehicle or trailer is loose and likely to become detached.

17 CONTROLS/MITIGATION EMERGENCY RESPONSE

In the event of an environmental incident occurring, despite the preventative measures and mitigations in place as identified in this CEMP and to be further developed by the contractor, then the CEMP shall include proposals for the management of those incidents to minimise their potential effects on people, the water environment, air, and flora and fauna as relevant to the particular incident. This section should be read in conjunction with relevant chapter of the EIAR, when applicable.

Emergency incidents are those occurrences that give rise to significant negative environmental effects including but not limited to the following:

- Any malfunction of any mitigation measure and/or environmental protection system,
- Any emission that does not comply with the requirements of the CEMP, EIAR and relevant licenses,
- Any circumstance with the potential for environmental pollution,
- An unexpected discovery (*e.g.,* sub-surface contamination or archaeology),
- Any emergency that may give rise to environmental effects (e.g. significant spillages or fire outbreak).

Emergency Incident management for airside sites shall comply with all the rules and recommendations included in the *Airport Direction D-E Emergency Response.*

Environmental incidents have the potential to adversely affect operations through potential prosecution, contractual issues, public relations issues, through to increased costs for clean-up / management fees and delays to the build programme. The reporting of environmental incidents is vital to ensure they are dealt with correctly, adverse effects negated or minimised and that valuable lessons are learnt. Where environmental incidents are reported, actions can be formally completed that ensure control measures are put in place to avoid any future recurrence on site and, where relevant, across the company.

Environmental Emergency	An environmental incident which requires immediate attention and is potentially at such a scale that senior management or outside parties (*i.e.,* Fire Brigade for spills) are required to manage or be informed without delay. Any situation where damage/danger to the environment has occurred or is likely to occur shall be reported to the ADM, who will report it to daa's Corporate Environmental Officer who is contactable at the number stated in the Airport Direction D-E Emergency Response. In accordance with the Airport Direction D-E Emergency Response Fingal County Council shall be responsible for environmental / pollution control in the event if a major incident at Dublin Airport.
Environmental Incident	A breakdown in the implementation of controls which may cause or lead to pollution of water, air, land or environmental damage. This could be: • An unplanned event that has caused serious environmental damage or loss, pollution or contamination; • A breach of legal requirements including a breach of a consent, condition or receipt of a notice from a statutory authority; • A breach of contractual environmental conditions without permission from the client.
Near miss	An environmental incident that was narrowly avoided.
Observation	A relatively minor incident/occurrence but if not remedied could amount to a more severe outcome. A "satisfactory" observation can also be used to document "best-practice"
Action	Specific requirements to be undertaken to prevent a near miss or incident. Usually required for items of relatively minor severity but if not rectified. An Action will be attributed to an individual either as result of an "unsatisfactory" observation or an environmental incident / near miss.

Table 16-1: Environmental Incident Classification

17.1 Spill Control

Spill control shall be planned and managed according to the *daa Construction Contractor's Health & Safety and Environmental Rules for working on daa Infrastructure Manual.* The contractor's CEMP shall set out site-specific procedures outlining how spillages should be dealt with and emergency responses.

Particular care shall be taken in the vicinity of the Cuckoo Stream which has been identified as a sensitive receptor. Also, particular care shall be taken in the vicinity of existing paved surfaces that are trafficked by vehicles and aircraft, which is also a sensitive receptor.

Sufficient types and quantities of spill response equipment should be available on site and should be kept where spills may occur. The quantity of spill response equipment should be sufficient to contain any likely spill that may occur on site. The spill containment equipment shall be replenished if used and shall be checked on a scheduled basis.

Staff should receive training on spill procedures on a regular basis (including toolbox talks). Spill kit equipment shall be stored on site and located strategically throughout the site to reflect activities which occur in these areas. Spill kits shall be inspected and maintained at least bi-annually or after an incident and should contain absorbent material, drain covers and absorbent booms.

The following steps provide an indicative procedure to be followed in the event of an oil/fuel spill occurring on site:

- Identify and stop the source of the spill and alert people working in the vicinity,
- Notify the Environmental Manager immediately giving information on the location, type, and extent of the spill so that they can take appropriate action,
- If applicable and safe to do so, eliminate any sources of ignition in the immediate vicinity of the incident,
- Contain the spill using the spill control materials, track mats or other material as required. Do not spread or flush away the spill,
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses and/or sensitive habitats,
- If possible, clean up as much as possible using the spill control materials,

- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited,
- The Environmental Manager shall inspect the site as soon as practicable and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring,
- The Environmental Manager shall notify daa and the appropriate internal and external stakeholders.

17.2 Emergency Incident Response Plan

The detailed CEMP shall include an Emergency Incident Response Plan which shall contain emergency phone numbers and the method of notifying daa, local authorities, statutory authorities, and internal and external stakeholders. Contact numbers for key personnel of the contractor shall also be included therein. Contractors shall be required to adhere to and implement these procedures and ensure that all staff and personnel on site are familiar with the emergency arrangements. Refer to Section 4.2 above also.

The Emergency Incident Response Plan shall be developed considering all the rules and recommendations included in the *daa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual*.

It is the responsibility of the Project Manager or his nominee to ensure that the emergency procedure is periodically tested to ensure it is effective. Frequency of testing should be determined by the level of risk for a particular Project Element; however, it is recommended that this be carried out at least once per year or once during the Project Element lifetime where Project Element duration is less than one year.

The test should be logged as good practice on the reporting system. The test should be reviewed to determine the effectiveness of the procedure and the need to amend the requirements if necessary.

17.3 Reporting

In the event of an emergency incident occurring, the Environmental Manager shall be required to investigate and provide a report to daa including the following, as a minimum:

- A description of the incident, including location, the type and quantity of contaminant and the likely receptor(s),

- Contributory causes,
- Negative effects,
- Notification to relevant statutory authorities and relevant parties,
- Consultation with appropriate environmental specialists when relevant,
- Measures implemented to mitigate adverse effects,
- Any recommendations to reduce the risk of similar incidents occurring.

Note the daa liaison must be notified immediately (or as soon as reasonably practicable) in the event of such an incident occurring.

The cause of any incident shall be determined by those involved when the incident or emergency occurred and those involved in the clean-up procedure. The appropriate corrective actions shall be implemented as soon as possible on detection of the incident. All incidents must be reported on the reporting system. Where there has been direct damage to the environment it may be necessary to report this to the Regulator (Environmental Protection Agency). If direct damage has occurred, the daa shall be notified prior to contacting the Regulator.

For larger incidents the Environmental Manager shall complete an Environmental Incident Report, fully detailing actions undertaken and review to prevent recurrence. This report should be issued to the EPA within 48 hours.

All incidents and near-misses must be logged on the reporting system and appropriate actions must be assigned to relevant persons.

All observations, both satisfactory and unsatisfactory, must be recorded on the reporting system with actions assigned where appropriate.

18 CONCLUSION

The CEMP will be a live document which will be reviewed throughout the construction process through regular auditing, monitoring and site inspections. This will ensure that the environmental performance of construction activities is subject to continual improvement and ensure that environmental objectives and targets outlined in the Plan are achieved. Revisions to the CEMP may include any changes and improvements made during the works from an environmental perspective.

daa

AIRFIELD DRAINAGE PROJECT

Construction Traffic Management Plan

D22029-NOD-XXX-XX-XXX-RP-C-520-0050 RevD

October 2023

NICHOLAS O'DWYER

daa plc

AIRFIELD DRAINAGE PROJECT

D22029-NOD-XXX-XX-XXX-RP-C-520-0050 REVD

CONSTRUCTION TRAFFIC MANAGEMENT PLAN

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October 2023

PROJECT NO. Project No.					
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1 INTRODUCTION

The Construction Traffic Management Plan (CTMP) has been developed to assess the construction traffic impacts associated with the development of the Airfield Drainage Project (ADP). The proposed ADP is located in the central area of the Dublin Airport airfield and in the Eastlands area. The proposed development includes interfaces with two regional roads; namely the R108 and the R132.

The scope of the ADP considered in this report includes the following:

- Establishment of site compounds (east compound and west compound);
- Site clearance and excavation of topsoil from the proposed pipeline corridors and the site of the proposed Central Pollution Control Facility (CPCF) in the Eastlands;
- Construction of the Clean Water Supply Pipelines through the airport complex; including part of the CW1 section on the R108;
- Reconfiguration of existing South Apron network;
- Repurposing of the existing Airfield Trunk Culvert;
- Installation of decision points and monitoring kiosk;
- Construction of Airfield Contaminated Pipelines (ACP1 and ACP2);
- Construction of the West Apron Drainage Upgrade incorporating pipelines, decision points, clean flow attenuation, storage of contaminated flow, pumping station and control kiosks;
- Construction of the CPCF Pipeline;
- Bulk excavation for a Central Pollution Control Facility (CPCF) at Eastlands;
- Construction of the CPCF storage tank at Eastlands (i.e. a large underground concrete tank);
- Construction of a rising main (with section of gravity sewer) from the CPCF storage tank outlet to the existing North Fringe Sewer (NFS) on the R132. This will involve a crossing of the south bound lane of the R132;
- Provision of works to enable a future connection to be made from the outlet from the CPCF to the planned GDD (Orbital) sewer;
- Construction of drainage upgrade works in West Apron, consisting of interconnecting pipework, decision points, a contaminated storage tank (WA-PT), a clean flow attenuation tank (WA-AT) and ancillary structures;
- Construction of power and communications ducting;
- Enhancement of the flood control berm in the Eastlands;
- Construction of an electrical substation in the Eastlands.

This CTMP is a "living document". Therefore, any changes which may occur in the planning process and in the detailed construction programme can be incorporated, as can inputs by the design team at detailed design, the contractor(s) and the Client. The commitments included are the minimum commitments that the contractors shall follow, and other commitments will be developed during the construction phase in consultation with the various stakeholders, including the Local Authorities.

The CTMP has been developed in conjunction with the following documentation:

- Construction Environmental Management Plan;
- Planning Drawings for the ADP;
- daa's Interim Construction Logistics Strategy (proposed site compound locations).

The CTMP should be read in conjunction with the **Construction Environmental Management Plan (CEMP)**.

1.1 Objectives

This document is prepared as an Appendix to the Construction Environmental Management Plan (CEMP). This CTMP has been prepared prior to the appointment of a contractor(s), material suppliers and final construction phase programme.

The objective of this CTMP is to ensure that the residual impacts to the public road network during the construction phase of the project which have been identified in the application documentation are minimised and that transport related activities are carried out as safely as possible and with the minimum disruption to other road users. The CTMP has also been prepared for the purpose of identifying appropriate and safe methods of access for construction traffic to the proposed development.

The primary objectives of this CTMP are to:

- Outline minimum road safety measures to be undertaken at site access / egress locations during the construction phase, including approaches to such access / egress locations;
- Demonstrate to the Client, contractor(s), and suppliers the need to adhere to the relevant guidance documentation for such works; and
- Provide the basis for the preparation of a final TMP by the contractor(s) appointed to carry out the works;
- Maintain free traffic flow along the public road networks (i.e. national, regional, and local roads) and at designated site access points;
- Ensure the efficient free flow of operatives entering and exiting at works zones;
- Ensure the safety and protection of the public due to the construction traffic associated with the ADP;
- Manage the distribution of materials to the work zones and removal of spoil materials;
- Segregate construction personnel and machinery plant throughout all project stages;
- Accommodate the welfare of circa 160 construction personnel during peak construction activity at the CPCF;

- Provide robust traffic management principles and practices will need to be enforced to ensure construction traffic does not create congestion and cause inconvenience to the adjacent stakeholders and the general public.

The CTMP shall address the following aspects of the traffic management which are explained in detail in this report:

- Site constraints;
- Key stakeholders;
- Public safety;
- Site Access Control and Security;
- Delivery Management and Routes;
- Timings of Material Deliveries to Site;
- Delivery Management System;
- Traffic Volume Analysis;
- Pedestrians and Vulnerable Users;
- Routing of Construction Traffic;
- Temporary Traffic Management;
- Traffic Management Signage;
- Temporary Traffic Control;
- Lane Closures;
- Road Closures;
- Implementation of Traffic Management Plan;
- Enforcement of Traffic Management Plan;
- Communication and Emergency Procedures;
- Road Cleaning; and
- Plant and Machinery.

Particular mitigation measures are identified in various sections of the EIA and summarised below, and these requirements shall be included in the Construction Traffic Management Plan.

1.2 Implementation and Monitoring

The principal contractor shall agree and implement measures to monitor the effectiveness of the CTMP, in conjunction with the Local Authority and Client. On finalisation of the CTMP, the contractor shall adopt the plan and associated monitoring measures.

2 KEY SAFETY GUIDANCE NOTE

Guidance for the temporary control of traffic at road works to facilitate the safety of the public during the works shall be provided in accordance with the Department of Transport, Tourism and Sports suite of traffic management documents outlined below:

- Traffic Signs Manual - Chapter 8, Temporary Traffic Measures and Signs Roadwork's (DoTTS August 2019);
- Temporary Traffic Management Guidelines (DoTTS August 2019);
- Temporary Traffic Management Operations Guidance (DoTTS August 2019).

These Guideline documents shall be read in conjunction with primary Safety Health & Welfare at Work legislation including the 2005 Act, the Safety, Health and Welfare (Construction) Regulations 2013, and any amendment to them (the Construction Regulations).

In addition, this CTMP will be developed to comply with the following daa documentation:

- Airport Direction D-O Construction Projects;
- The daa Contractor Safety Handbook D00-9001-1907, and
- All other relevant daa Health and Safety Policy documents, which shall be referenced in the contract documents.

All participants in the project team will be required to engage with the contract specific health and safety objectives, to provide a safe working environment and to provide safe systems of work at all times.

It is intended to direct all current and future Sub-Contractors associated with the project to utilise the Production Control Management System (which incorporates the Last Planner programming tool) to carefully coordinate the works and provide all safety resources and systems considered as a part of this planning process prior to the commencement of the works. The logistics requirements for all works are also to be considered as part of the short-term planning of the construction works.

The key message for all Sub- Contractors is to plan the implementation of the construction works early and coordinate the interfaces carefully to provide **A SAFE WORKING ENVIRONMENT AND SAFE SYSTEMS OF WORK** at all times.

3 PROJECT INTRODUCTION

3.1 Location

The following sections outlines the location of the project, the work zones associated with the project and the associated compounds.

3.1.1 Site Location

The ADP is located at Dublin Airport, Collinstown, Co. Dublin, refer Figure 1. Public roads in the general area of the site include the M1 motorway to the east, the M50 motorway to the south, the L2015 (Old Airport Road) to the south, the regional road R108 to the north, south and west and the local road (L72746 Naul Road) to the north.

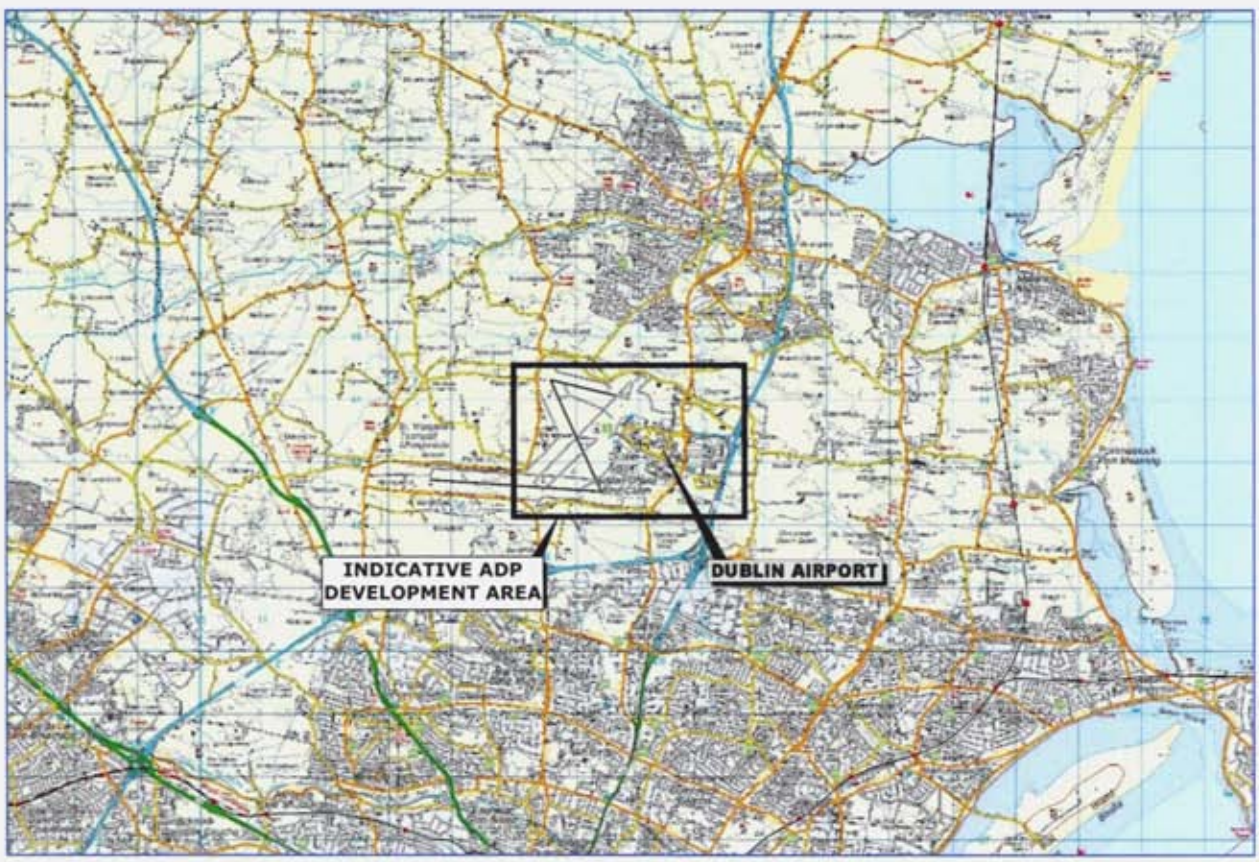


Figure 1: Site Location Map

The relevant public roads (Figure 2) adjacent and within the area of proposed works are as follows:

- **R132 (Swords Road):**
  Immediately to the southeast of the existing South Apron. The proposed Central Pollution Control Facility (CPCF) is proposed to be located to the east of this road. The proposed CPCF Pipeline route is proposed to cross this road via trenchless construction methods. The discharge pipework from the CPCF tank is proposed to discharge to the North Fringe Sewer which is located on the R132 and will require an open cut crossing of the eastern lanes of the R132;

- **R108 to the west of the airport campus:**
  The proposed Clean Water Pipeline CW1 is proposed to be constructed in part along the R108;

- **R108 (Naul Road):**
  To the north of the airport campus. There is no proposed works anticipated which would directly impact this road;

- **L2015 (Old Airport Road):**
  To the south of the airport campus. There is no proposed works anticipated which would directly impact this road;

Figure 2 Public Roads Around Dublin Airport

3.1.2 Works Zones

The ADP has two principal works zones and ancillary work zones associated with these two locations, see Figure 3. The principal work zones are:

- **<u>West Works Zones comprising:</u>**
  - Clean Water Supply Pipelines: CW1, CW2, CW3 and part of CW4;
  - Decision points DP1, DP2A/2B, DP3, DP4, DP5A and DP5B and associated control kiosks;
  - Part of the Airfield Contaminated Pipeline;
  - West Apron drainage upgrade works.

- **<u>East Works Zones comprising:</u>**
  - Clean Water Supply Pipelines: part of CW4;
  - Part of the Airfield Contaminated Pipeline;

- Decision points DP6, D7 and DP8;
- CPCF Pipeline;
- Central Pollution Control Facility (CPCF) and ancillary works.

Figure 3 ADP – Work Zones (Source: CEMP Figure 4-19)

3.1.3 Compounds

Main Compounds

Two areas have been identified as main construction compounds, namely the West Compound and the East (Eastlands) Compound, as shown in the Figure 4. These compounds will be utilised by the ADP. An outline function of these compounds is also included in the Construction Logistics Strategy.

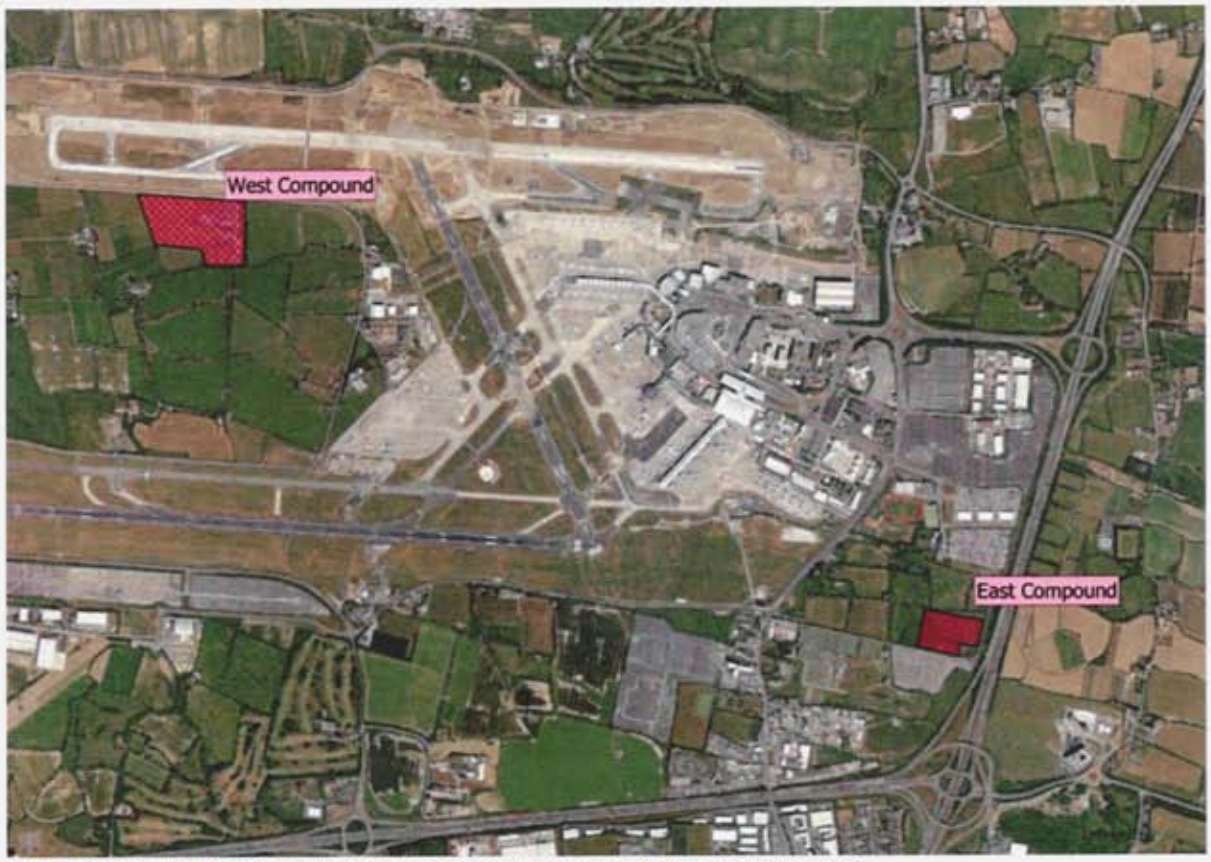


Figure 4 Construction / Material Storage Compounds (Source: CEMP Figure 8-1)

All deliveries shall be coordinated in line with the daa Campus Wide Construction Logistics Strategy which shall consider the presence of other programme contractors located in both main compounds.

Figure 5 and Figure 6 show the proposed indicative layouts of the East and West compounds for the purpose of the ADP works. Each compound typically contains security hut, offices, canteen, welfare facilities, pipe storage, plant storage and storage for miscellaneous construction materials. The compounds are proposed to have an area allocated for temporary storage of spoil from the tunnelling operations in the East and West Work Zones (refer to details below on Potential Tunnelling Compounds).

Large diameter pipes for the construction of the CPCF Contaminated Pipeline in the East Work Zone would be delivered by articulated lorry, typically one to two pipes per load, and stored in the east compound until required at the work zone. Similarly pipes for the various pipelines in the West Work Zone would be delivered by articulated lorry, with variable numbers of pipes per load, and stored in the west compound until required at the work zone. It is envisaged that each compound would store at any one-time sufficient pipework for the construction of circa 1km length of pipeline. Deliveries of pipes to the compounds would be expected to be continuous over a period of time to initially create the stockpiles and then periodically to keep the stock replenished. This could be variable depending on the capacity of the pipe manufacturer to produce the pipes and also if different manufacturers are required to sources the pipes to achieve the contractor's programme.

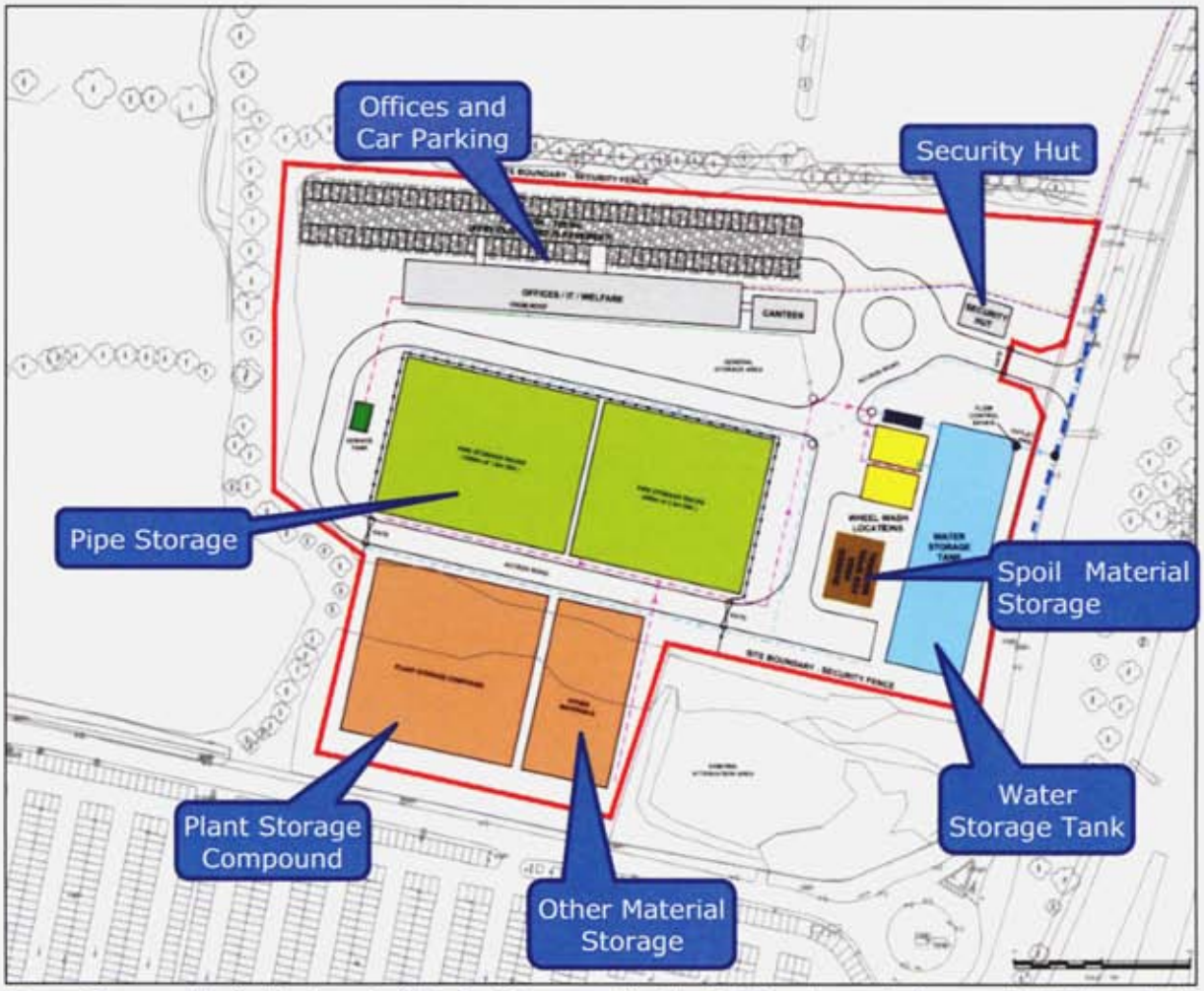


Figure 5 Proposed Indicative Layout of the East Compound for the ADP Requirements (Source: CEMP Figure 8-2)

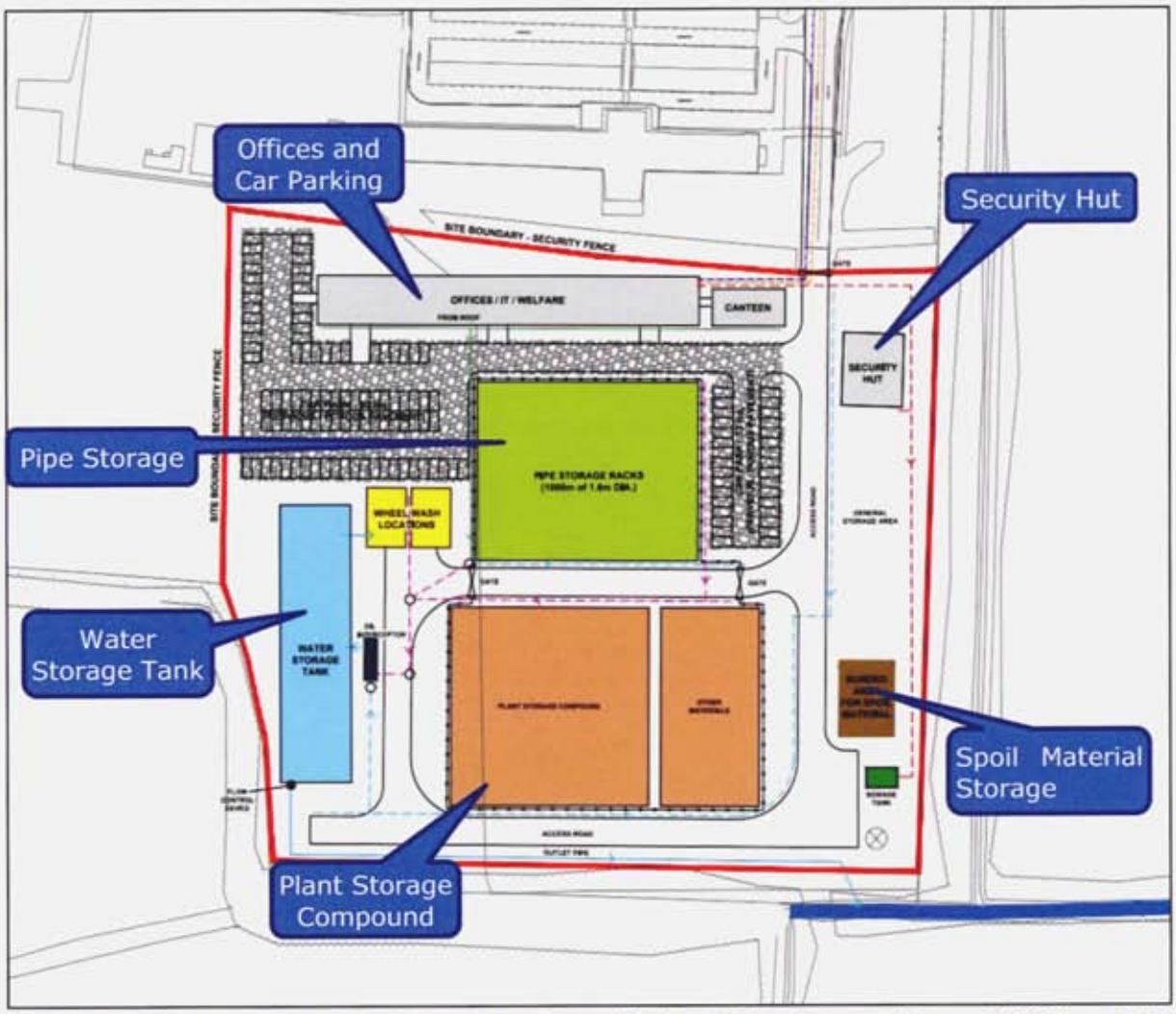


Figure 6 Proposed Indicative Layout of the West Compound for the ADP Requirements (Source: CEMP Figure 8-3)

Potential Tunnelling Compounds

In addition to the proposed west and east compounds described above, there will also be compounds set up at the drive and reception shafts for the tunnelling of pipelines. The proposed locations of these potential tunnelling compounds are shown in Figure 7. Each tunnelling compound will be self-contained and include sufficient stockpiled materials within the compound boundary to allow tunnelling to proceed without the need for other stockpiled areas within the airport boundary.

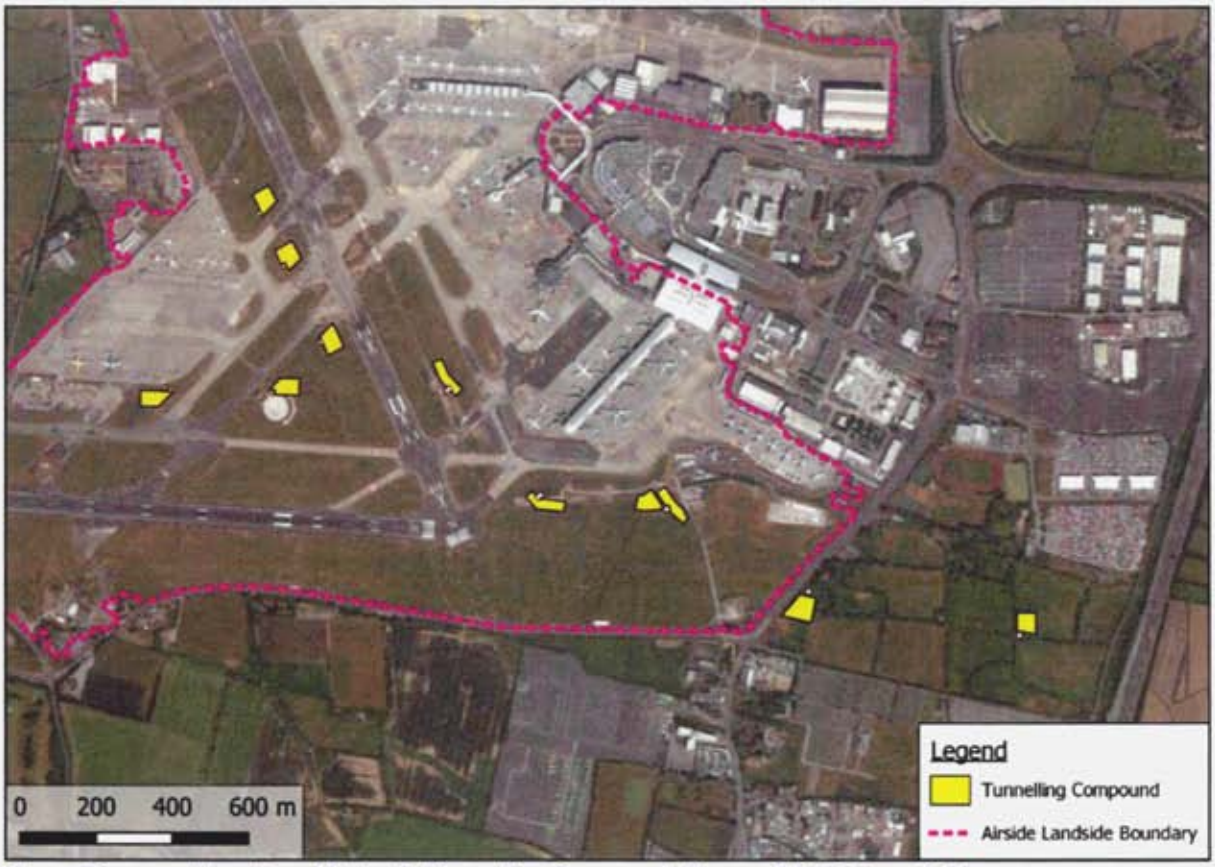


Figure 7 Proposed Location of Potential Tunnelling Compounds (Source: CEMP Figure 8-4)

A typical layout of the tunnelling compound is shown in Figure 8. For tunnelling operations, it is envisaged that spoil will be removed immediately from the work zones. An area of the East Compound has been reserved for use as a spoil stockpile (for 48 hours' worth of tunnelling spoil), in order that the tunnelling will not be held up by any temporary interruptions to the waste removal process.

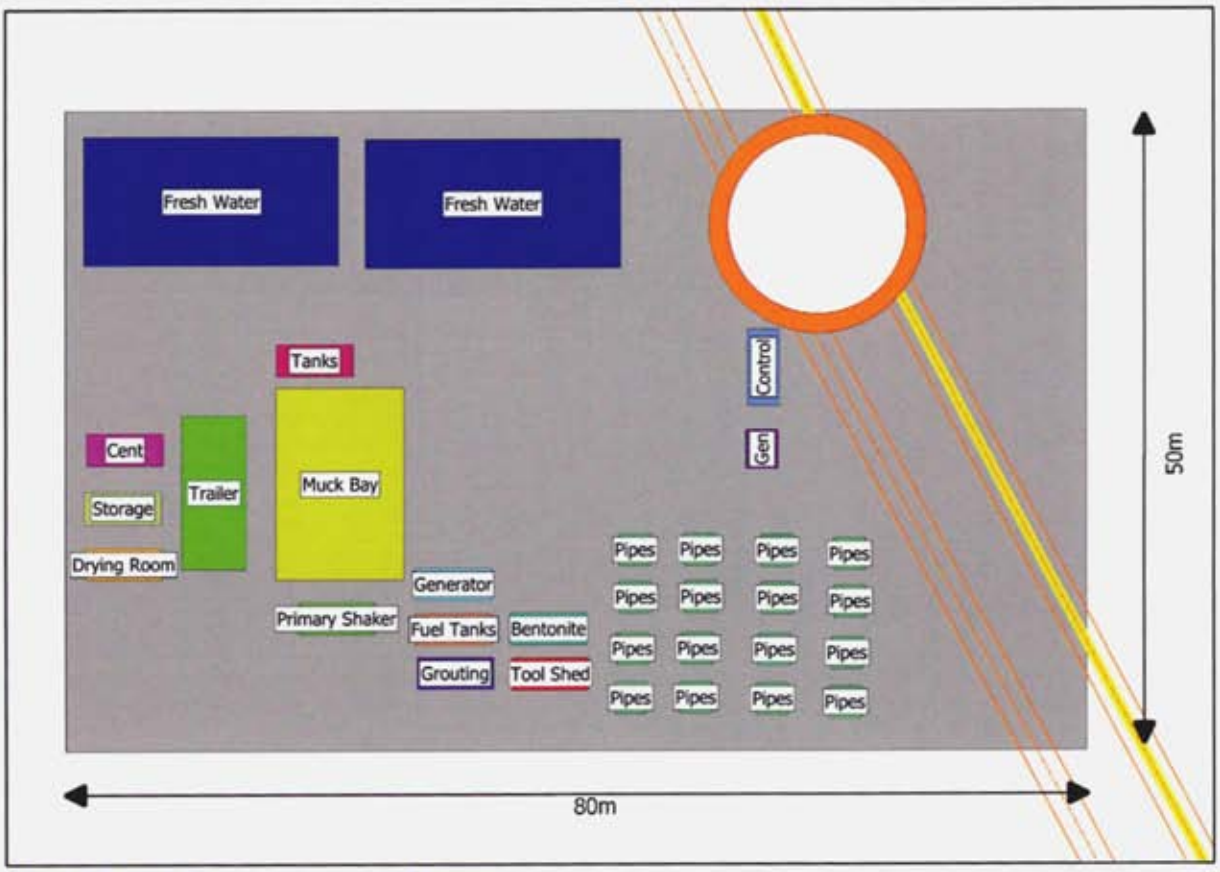


Figure 8 Typical Tunnelling Compound Layout

Open Cut Area Compounds

For open cut areas, the work zones are expected to be corridors along the proposed pipeline section.

3.2 Construction Methods

The full details of the construction method are outlined in the Construction Environmental Management Plan (CEMP) (refer Section 4.3). A summary of the construction methods and their interface with the public road are summarised in Table 3-1.

Table 3-1: Summary of Works on Public Roads

Road / Road Classification	Works	Construction Method	Temporary Traffic Management	Road Speed at Works Zone
R 108 Level 2	Gravity pipeline – Clean Water Supply Pipeline CW1 (Part)	Open excavation	• Road Closure, • Diversion • Traffic Control System	80km/h

Road / Road Classification	Works	Construction Method	Temporary Traffic Management	Road Speed at Works Zone
R132 (southbound lane) Level 1	Rising Main / gravity sewer from the CPCF storage tank	Open excavation	Type A: • Traffic Control System • Temporary Lane Closure	60km/h
R132 Level 1	CPCF Pipeline	Tunnelling	None	60km/h

Other construction methods are required within the works zones airside and landside but not in the public road network including open excavation for below ground structures (i.e. Central Pollution Control Facility).

3.3 Site Working Hours

Working hours on the Dublin Airport campus would normally be between 08:00 and 19:00 Monday to Friday and 08:00 to 14:00 Saturday, with no activities taking place on Sundays or Bank Holidays. However, the proposed works shall require working hours that are outside those stated above.

In particular, there shall be a necessity for tunnelling operations to proceed on a 24-hour basis. Nightworks may also be required due to height restrictions in certain parts of the airport campus. Transportation of construction plant from the compounds to the works zones may have to be carried out at night, particularly where transportation is required through the airport complex. Other works, such as large concrete pours for the CPCF, may require out-of-hours working. Where possible, short-term works on high volume roads should be carried out at off-peak times including night-time working. Weekend working shall also be required.

The Contractor shall be encouraged to adjust shift and delivery times to minimise operational impacts on the landside road network or terminal areas. This shall also assist in the mobility of workers in relation to car parking and access from the construction staff parking to the works site. Section 7.1 of the CEMP shows the standard day shift, rush hour, peak passenger times and optimum delivery times which is to be applied to the Contractor's delivery schedule.

The contractor shall obtain the written permission of daa at least 48 hours in advance of working outside the specified hours and shall take all practical efforts to minimize these works.

3.4 Site Constraint

A number of key site constraints have been identified due to the works and the existing environment. A summary of these site constraints are outlined below:

- Airside projects that will include restricted access to areas and will require security clearance.
- Live overhead services (ESB).

- Live underground services traversing site (ESB, Gas, Fuel, Foul, Water Main, fibre).
- Waterways running adjacent to and through the site as described in Environmental Impact Assessment Report (EIAR).
- Crossing of live high-volume traffic dual carriageway with pipelines.
- Lane width[1] available outside of work zones on the public roads.
- Storage space within work zones.
- Typical construction phase traffic access/egress at gates being utilised at the same time to access other construction works.

3.5 Key Stakeholders

The ADP has a number of stakeholders including internal project stakeholders such as:

- The Client (daa);
- Project Manager;
- Designers;
- Appointed Contractor and sub-contractors.

Statutory stakeholders include:

- Fingal County Council and;
- Transport Infrastructure Ireland.

External stakeholders utilising the infrastructure in the vicinity of the works that maybe impacted by the construction traffic associated with the ADP would include:

- local residents;
- agricultural land users;
- communities and businesses;
- commuters to and from the airport and environs;
- bus companies;
- Garda Traffic Corp;
- motorists and non-motorised user.

[1] Lane Width – The minimum width of traffic lane to be maintained at all times for use by the road user. This may vary depending on the characteristics of the traffic being catered for (TSM Chp 8, Aug 2019).

4 PUBLIC SAFETY

Delivery vehicle movements to / from the compounds and work zones, including works in the public road will present the most significant public interface risk. Maintaining the safety of the general public is of paramount importance. The following series of robust controls and proactive measures will mitigate the risk of this key interface:

The following measures will be adopted around the perimeter of the project for security, protection, and safety purposes:

- Security fencing is provided to the airport and shall bound the non-airside work zones;
- All site access will be well lit, clean, level, well signed and controlled by experienced gatemen. Gates will be closed at all times when not providing access;
- At roadworks sites, where there is existing provision for pedestrians/cyclists, consideration should be given to providing or maintaining facilities or access;
- Where footways or off-road cycle tracks are affected by construction or maintenance work, a safe route should be provided for vulnerable road users (VRUs[2]), at all times past the work zones. This may be done by channelling the footway or track or providing a route on the carriageway by using suitable barriers and, where necessary, providing the appropriate signs indicating that the footway is closed;
- Suitable temporary traffic management for the protection, safety and maintenance of facilities for VRUs shall be provided in accordance with section 8.2.8 of the Department of Transport Traffic Signs Manual, Chapter 8;
- In order to minimise site congestion, waiting time and inconvenience to other trades, residents and other third parties, the surrounding roads will not be used as a holding area for vehicles waiting to enter the site.

4.1 Impact on Stakeholders

As identified in Table 3-1, the construction works will interface with two public roads:

- **R108:**
  This regional road is a single carriageway. The construction works are located in the vicinity of Gate 11. The works consist of the construction of open cut gravity pipelines for short distances;
- **R132:**
  This regional road is an urban dual carriageway. The construction works are located north of the R132/R108 signalised junction with two crossings required:
  - Outlet to NFS via rising main / gravity sewer, from lands to the east of the R132, connecting to an existing manhole in the southbound carriageway;

[2] Vulnerable Road Users (VRU) - This term includes all pedestrians, cyclists, mobility impaired pedestrians, pushchairs and wheelchair users (TSM Chapter 8, August 2019).

- CPCF Contaminated Pipeline constructed via tunnelling methods under the dual carriageway. This pipeline and associated construction method will not impact on road users.

Section 6.0 outlines the proposed traffic management measures associated with the proposed works zones on the R108 and R132 regional road with respect to traffic, cyclists and pedestrians.

5 KEY CONSIDERATIONS

5.1 Site Access

Access to the site will be managed by the deployment of Security Officers at key access points situated around the perimeter of the site with the assistance of an access control system utilising turnstiles and barriers/bollards. The construction site fencing will be kept secure at all times; the perimeter will be secured using fencing circa 2.4m to 3m high for the duration of the construction works. The contractor will be responsible for installing the temporary boundary fencing required.

Access to and from the work zones is via the existing road network in the vicinity of the airport campus as indicated in Figure 9, Figure 10, Figure 11 and Figure 12. It is proposed to access different parts of the site using different access points as follows:

Western Works:
For the pipelaying works to the western side of the site and works at West Apron (West Works Zone – refer Section 3.1.2), it is proposed to access the airfield via Gate 9, off the R108 road as shown in Figure 9. Removal off-site of surplus excavated material and other similar traffic movements off site would be via the routes shown in Figure 10.

Eastern Works – Airside:
For the pipelaying works to the eastern side of the site (CW4, Airfield Contaminated Pipeline and part of the CPCF contamination line), it is proposed to access the airfield via Gate 1B, off the Naul Road just to the west of the roundabout on the R132 as shown in Figure 11.

Eastern Works – Landside/Eastlands:
For the tank and pipeline construction works in Eastlands, and access to the east compound, it is proposed to access the site via the road to the car hire facility (i.e. via the access point shown in Figure 11). Removal off-site of surplus excavated material and other similar traffic movements off site would be via the routes shown in Figure 12.

The estimated construction traffic volumes are variable depending on phasing of the works and the work type. The peak construction traffic volume will be associated with the excavation for the CPCF, the concrete pours for the CPCF, the excavation for the West Apron tanks (polluted and clean tanks) and the concrete pours for the West Apron Pollution Tank.

Average estimated traffic movements for HGVs, LGVs and operatives' vehicles during each phase of construction is provided in Table 5-1 (extract Section 10.4 of CEMP). A movement is classed as a one-way trip. A round trip is classed as two movements. The percentages in brackets in Table 5-1 represents the envisaged variation of the estimated average daily traffic movements.

Table 5-1: Construction Traffic Estimates (Source Table 10-1 of CEMP)

Works Description	Type of traffic	Daily Traffic Movements (One-Way Trip)
Construction of Pipelines CW1 and CW2	HGV	10 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Pipeline CW3	HGV	8 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Pipeline CW4	HGV	18 traffic movements (+25%, -25%)
	LGV	4 traffic movements (+25%, -25%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Decision Point DP1A	HGV	4 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Decision Point DP3	HGV	16 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of Decision Point DP4	HGV	4 traffic movements (+25%, -25%)
	LGV	6 traffic movements (+50%, -50%)
	Cars	60 traffic movements (+25%, -25%)
Construction of Decision Point DP5A, DP5B	HGV	20 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	20 traffic movements (+25%, -25%)
Construction of Pipelines & Structures at Decision Point DP6, DP7 & DP8 at South Apron	HGV	10 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	20 traffic movements (+25%, -25%)
Construction of Airfield Contaminated Pipelines (ACP 1 and ACP2) including Cuckoo Diversion Channel, etc at Cuckoo Channel	HGV	16 traffic movements (+25%, -25%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Construction of CPCF Pipeline	HGV	17 traffic movements (+50%, -50%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	36 traffic movements (+25%, -25%)
Construction of Outlet to North Fringe Sewer including Futureproofing Gravity Outlet Section	HGV	10 traffic movements (+100%, -100%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	40 traffic movements (+25%, -25%)
Excavation for CPCF	HGV	236 traffic movements (+25%, -25%)
	LGV	4 traffic movements (+50%, -50%)
	Cars	50 traffic movements (+25%, -25%)
Construction of CPCF Tank & Electrical Sub-Station	HGV	28 traffic movements (+25%, -25%)
	LGV	11 traffic movements (+50%, -50%)
	Cars	101 traffic movements (+25%, -25%)
West Apron Tank - excavations	HGV	143 traffic movements (+25%, -25%)
	LGV	6 traffic movements (+50%, -50%)
	Cars	20 traffic movements (+25%, -25%)

Works Description	Type of traffic	Daily Traffic Movements (One-Way Trip)
West Apron Tank – constructions	HGV	16 traffic movements (+50%, -50%)
	LGV	8 traffic movements (+50%, -50%)
	Cars	80 traffic movements (+25%, -25%)
Pipe and backfill material deliveries	HGV	84 traffic movements (+25%, -25%)
	LGV	0 traffic movements (+50%, -50%)
	Cars	10 traffic movements (+25%, -25%)

Figure 9: Site Access Routes (West Works) – Gate 9 (Source: CEMP Figure 10-3)

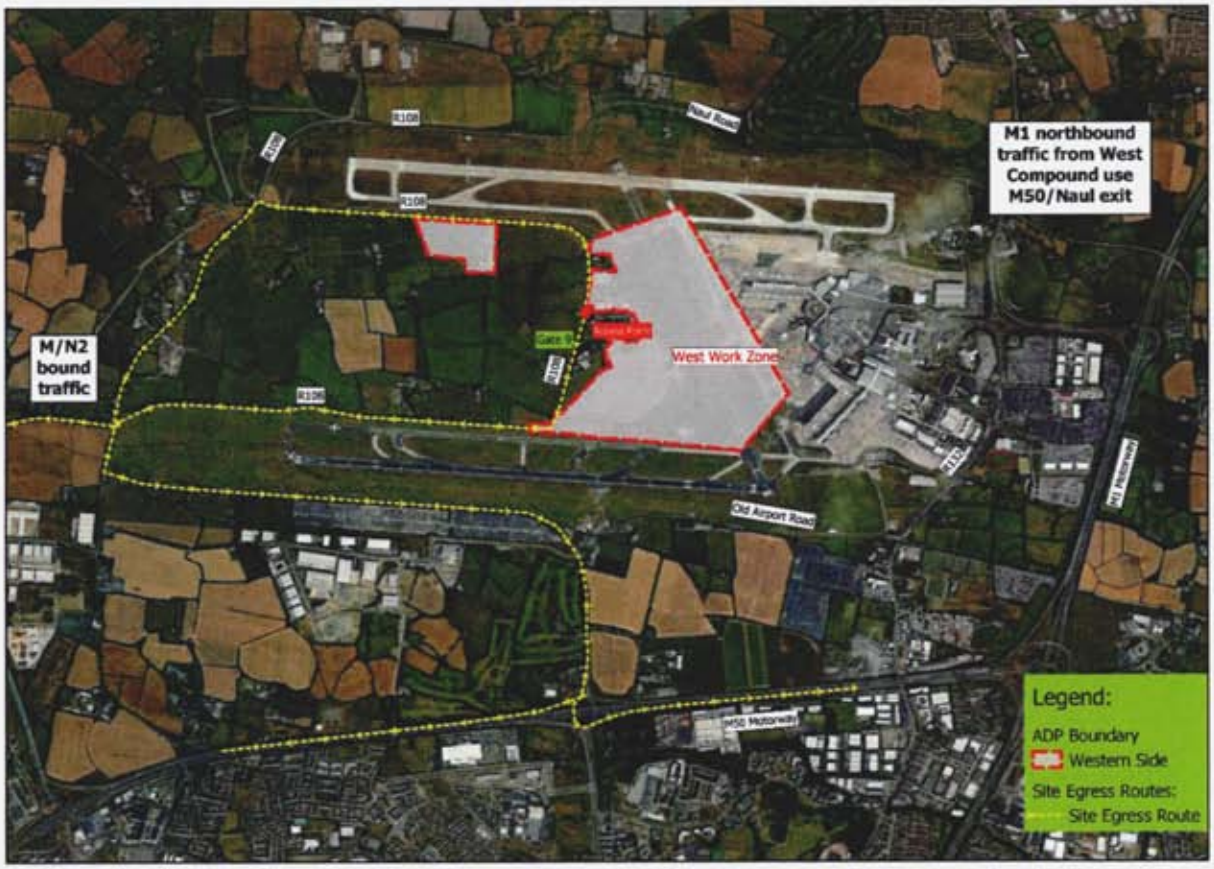


Figure 10: Site Egress Routes (West Works) – Gate 9 (Source: CEMP Figure 10-4)

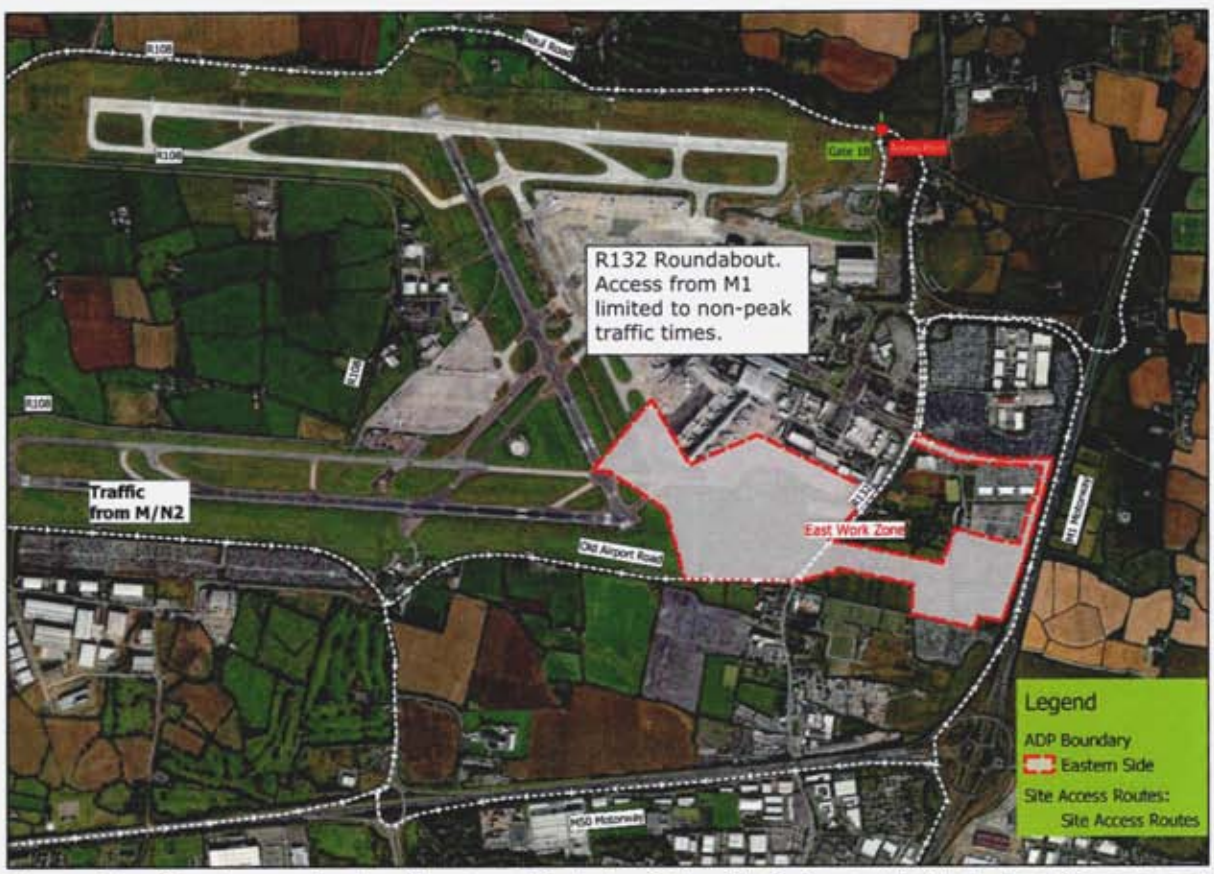


Figure 11 : Site Access Routes (Eastern Works) – Gate 1B & Access Point to East Compound

(Source: CEMP Figure 10-5)

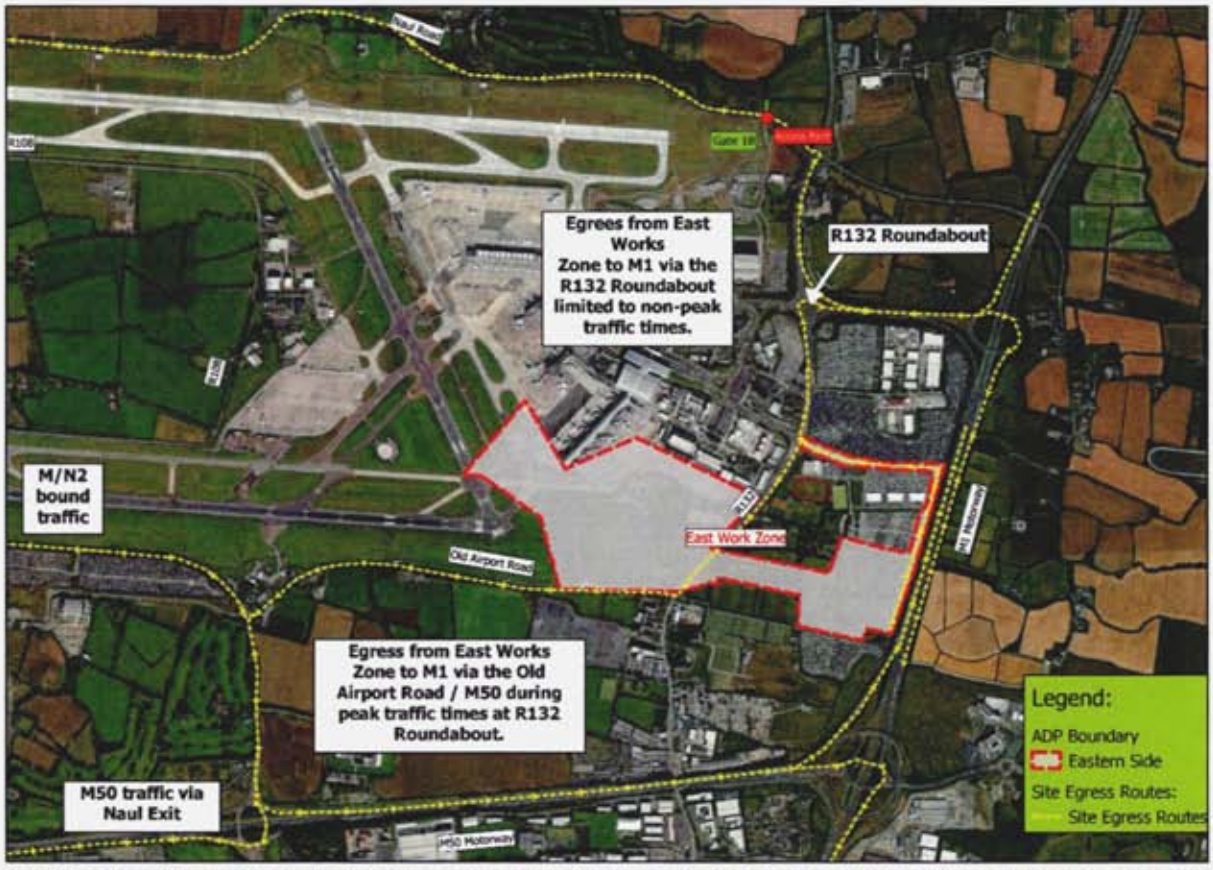


Figure 12 : Site Egress Routes (Eastern Works) – Gate 1B & Access Point to East Compound (Source: CEMP Figure 10-6)

The access points have been assessed for use with the largest vehicle available in Ireland (large articulated truck). A swept path analysis (autotrack) has been carried out for entry and exit via the access points. The results of this analysis in graphical format are included in Appendix 1 of this CTMP and this shows that the largest vehicles can enter and exit at each of the proposed access points.

Static advance warning signs should be located in advance of the site access location visible to motorists in both directions of travel. Traffic management operatives will be located at each delivery vehicle entrance to control the movement of vehicles coming in from the site access points. There will be a security provision continuous throughout each day of the year on the project (24/7 - 365).

Access to the site for delivery of construction material and removal of surplus materials will be managed, as outlined in Section 5.4, through the supply chain using distinct routes:

- Access route via the M50;
- Access route via the N2;
- Access route via the M1;
- R108 to the west works zone and west compound;
- R132 and Naul Road to the east works zone and east compound.

Access to the R108 for construction of part of the CW1 pipeline will be via the R108 from the West Compound.

Access to the R132 for construction of the CPCF connection to the NFS will be via the R132 from the East compound.

The contractor shall note that Dublin Airport operates 24 hours/day, 365 days/year, and that there will always be ongoing live airport operations around the Works.

5.1.1 Site Access Control and Security

Site access control and security shall be managed as specified in the daa Construction Contractors Health & Safety and Environmental Rules for working on daa Infrastructure Manual. Details of the requirements to be performed by the contractor are outlined in the CEMP Section 11 Site Access Control and Security and in summary include:

- Employees to receive induction for working at the airport;
- Security/Gatemen on all access points to the works and associated compounds to prevent unauthorized entry;
- All employees to have a unique identification badge with photograph and register to be maintained of all employees actively working on this site;
- A record of all deliveries to and removals from the site to be maintained and made available to daa on request;
- Access to the site shall be managed by the deployment of Security Officers at key access points situated around the perimeter of the site with the assistance of an access control system utilizing turnstiles and barriers/bollards;
- A traffic marshal shall be located at the delivery vehicle entrance to control the movement of vehicles coming in from the site access points.

Visitors and construction staff entering the landside site will be directed through the main security office which will control administration of all personnel and visitor passes. Access beyond the security office will be via security pass activated turnstiles.

Site security strategy
The location and high profile of the project means that security measures for the project are of paramount importance to ensure that it is delivered securely without disruption to the public road network, neighbours and construction process.

Maintaining access to all parts of the site at all stages of the construction is essential. There are key issues to consider in determining security arrangements for the project. These are:

1) The exclusion of unauthorized persons;
2) The exclusion of the public from construction areas;
3) The monitoring and control of the Critical Part Security Restricted Area (CSPRA) boundary;
4) Coordination with daa security.

Security is achieved by ensuring all construction personnel and visitors are given access through a security pass system and all gates are permanently manned during working hours and remain closed wherever possible. Gates are within the site, rather than on the immediate perimeter, to prevent a build-up of traffic entering the site. Security will reserve the right to inspect vehicles entering or exiting the site for the review of property theft.

The security office will be manned and will operate as the incident control centre for the project, acting as the emergency response control point for the project and coordinating with neighbours and adjacent contractors.

Visitors and construction staff entering the landside site will be directed through the main security office which will control administration of all personnel and visitor passes. Access beyond the security office will be via security pass activated turnstiles.

Physical site security

Once site possession has been taken, a thorough review will be undertaken of the external perimeter to ensure that it meets the client and Contractor standards. The perimeter fencing will be maintained to an exemplary standard, reflecting the sensitivities of the location, and will comply with the requirements of the client once established; the security strategy will be reviewed monthly and constantly updated to reflect the changing construction sequence.

5.2 Site Accommodation & Welfare Facilities

The principal welfare accommodation (i.e. canteen, offices, toilets) will be located in the East and West Compounds (refer Figure 5 and Figure 6).

Due to the congested location of the project i.e. Airport services to the immediate area will need to be prioritised, therefore the workforce will travel to site by public road network and park adjacent to the site compounds within designated areas near the offices. Transport services will be provided from the car park within the compound to the work zones.

Rules regarding cars parked in the car park will state that all cars are to be positioned by "reverse parking". By requiring reverse parking, the risk of backing out blindly into oncoming traffic is removed. Contractors reserve the right to place a warning sticker on cars not compliant with site parking rules. Re-offending cars will be removed from site and access badge revoked.

Site work vans and mobile workshops vans will have temporary parking facilities on site at the works face. (To limit and police the number of vehicles entering the work zones the Contractor will issue a limited number of permits to the workforce).

These proposals will:

- reduce the number of vehicles on the road network associated with movements during the site working hours, when increased traffic volumes associated with deliveries and haulage will be ongoing.
- Reduce the potential for vehicles to be parked on the public road networks, potentially obscuring visibility.
- Reduce the potential for collision within the car parking areas with vehicles driving forward out of spaces with better visibility of oncoming vehicles.

5.3 Compounds

Two areas have been identified as construction compounds, namely the West Compound and the East (Eastlands) Compound, as shown in Figure 3. The West Compound is accessible directly from the R108. The East (Eastlands) Compound is accessible via the existing red zone car park access routes, as shown in Figure 13.

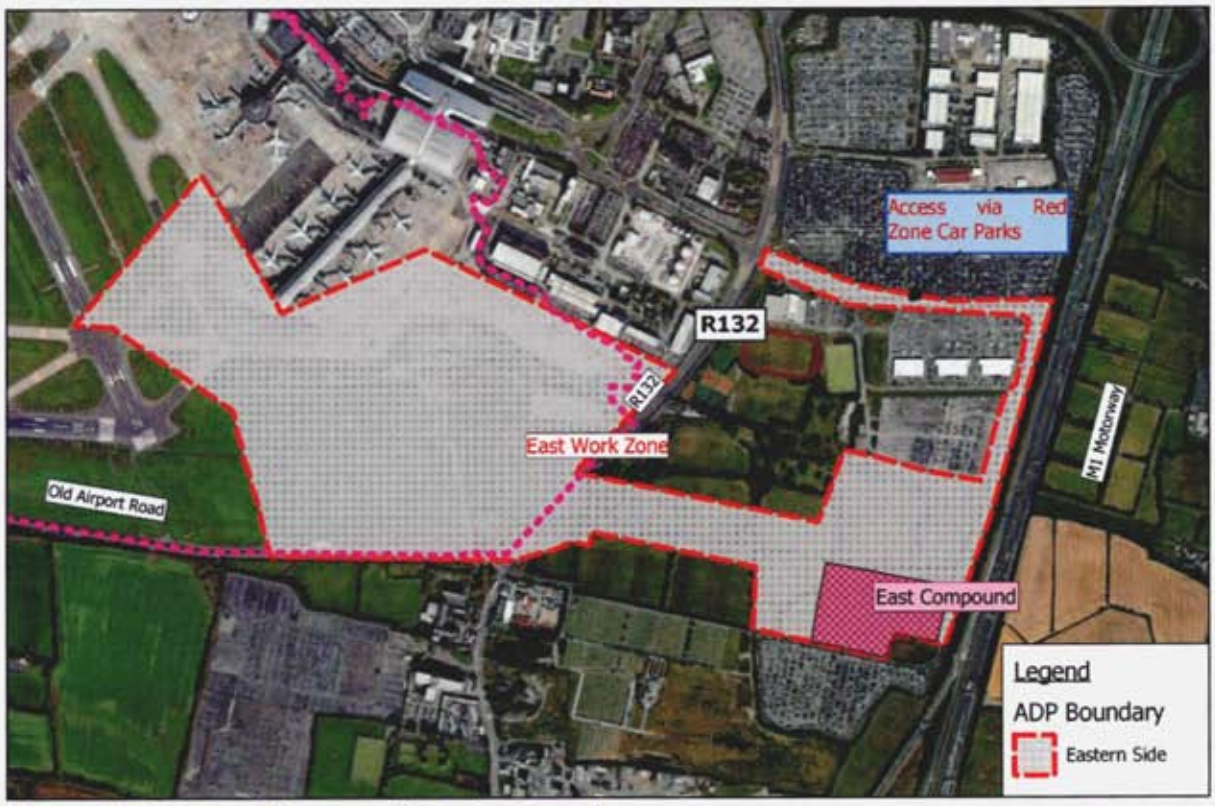


Figure 13: Proposed Access to East Compound

Figure 14 shows a schematic of envisaged traffic movements associated with the compounds.

Deliveries of materials, such as pipes and associated fittings, would be made to the two compounds from suppliers for stockpiling in advance of construction. These materials would be held in the compounds and stock would be called off when required for delivery to the work zones. The use of compounds maximizes efficiency and leads to overall reduction in vehicle numbers delivering to the work zones.

The materials to be stored in the compounds consists of pipes and other associated pipeline construction materials (refer Figure 5 and Figure 6). It is envisaged that each compound would store at any one time sufficient pipework for the construction of a 1km length of pipeline. The storage of pipes would include those to be installed by open cut and tunnelling methods. Pipes would be transported as required from the compounds to the relevant working area within the work zones.

Each compound will have space available for the storage of construction plant, refer Figure 5 and Figure 6. Plant would be transported as required from the compounds to the relevant working area within the work zones. Plant associated with the envisaged tunnelling construction methods is likely to be transported direct to the tunnelling compounds (refer Figure 7) during the establishment of these compounds.

All construction traffic requiring access to the landside construction zones will need to be processed through the compounds. The intention will be to consolidate construction materials which will reduce traffic frequency to the construction site and control construction traffic to avoid queuing on the public road network adjacent to site entry gates.

Removal of surplus materials from the works zone in the Eastlands will be via a haul route via the existing access road to the red zone car park. Removal of surplus materials from the west work zone will be direct onto the R108.

Some deliveries such as concrete would be delivered direct to the work zones as required.

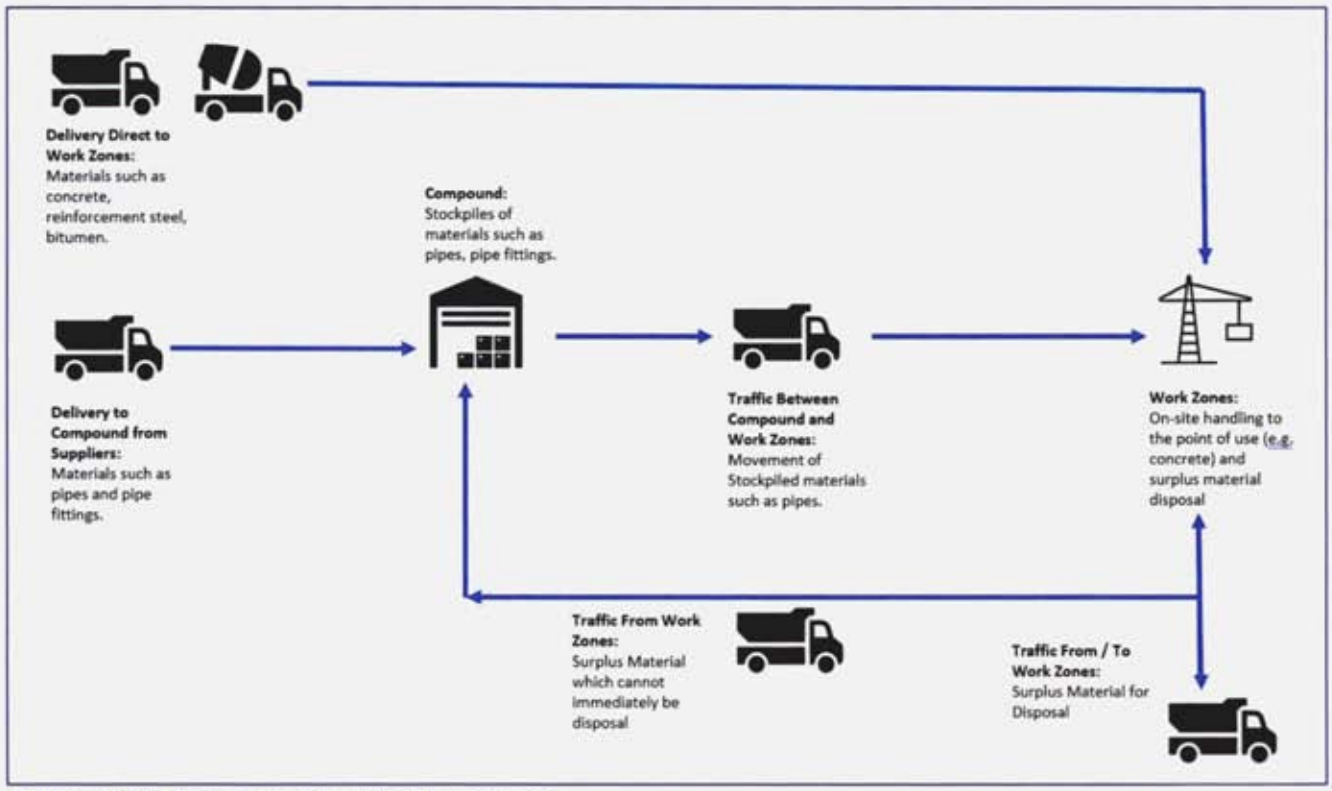


Figure 14: Schematic of Traffic Movements

5.4 Delivery Management & Routes

An outline function of the compounds is shown in Figure 14. The EPA Guidance Note 'Storage and Transfer of Materials for Scheduled Activities' shall be considered when designing material storage and containment on site. A Logistic Manger will be responsible for the management of the delivery and storage of all deliveries to and from the compounds and work zones.

Advanced notice for delivery vehicles arriving at the compounds is required to avoid an ad-hoc system of delivery. The preferred system will sequence and schedule delivery and construction vehicle arrivals / departures to avoid traffic congestion and safety risk to the neighbours and local businesses.

Delivery bookings need to be submitted at least 48 hours in advance to allow sufficient time to co- ordinate delivery vehicle movements and the associated use of on-site materials handling equipment. Regular delivery meetings will be held between all parties and the Logistic Manager to make any adjustments and ensure that the delivery schedules are pre-agreed with all.

There is expected to be a significant number of soil movements, for disposal off site, in the early stages of the project, as outlined in Section 5.5, which outlines estimated maximum daily volumes of construction traffic. These vehicle movements will be managed via an electronic delivery management system and on tracking sheets.

5.4.1 Delivery Routes

The existing services and operations will be ongoing at Dublin Airport and are to be uninterrupted by the proposed works. The proposed delivery routes shall be restricted to ensure that strategic roads to Dublin Airport are not compromised by significant increases in construction traffic volumes.

It is proposed that construction vehicles would only have access to the following roads outside the peak traffic hours defined in the CEMP:

- M1 spur route and existing R132 roundabout (refer Section 5.4.3).

There are 3 delivery routes associated with the ADP, these are shown in Figure 9 and Figure 11:

- Delivery to the West Compound
- Delivery to the East compound
- Delivery from the compounds to the work zones

Section 5.5 address construction traffic in terms of projected construction staff movements and overall construction traffic movements including deliveries and movements associated with the disposal of excavated material from pipeline routes and tank construction in West Apron and in the Eastlands.

5.4.2 Delivery Routes to and from West Compound

Deliveries to the West Compound would be via the R108 (refer Figure 5 and Figure 15). Figure 5 in Section 5.1 shows the access routes towards the R108 from the major routes in the vicinity of Dublin Airport, i.e. from the M50, N2, M1.

Construction traffic from the West Compound to the west works zone would be to Gate 9 via the R108 as shown in Figure 15.

Refer to Section 5.4.4 for the proposed delivery management system.

Figure 15: Site Access Points (western side)

5.4.3 Delivery Routes to and from East Compound

Deliveries to the East compound would be via the R132.

Construction traffic from the East compound to work zones within the Eastlands would be internally within the Eastlands. Works zones in Eastlands includes construction of the proposed Airfield Contaminated Pipeline, CPCF Contaminated Pipeline and the construction of the proposed CPCF Storage Tank and associated infrastructure including pumping station, electrical substation, control kiosk, access road and interconnecting pipework. The construction of the proposed CPCF Storage Tank will involve a large bulk excavation for the below ground reinforced concrete structure. The majority of the excavated material from the excavation would be exported off site to a waste facility, to be determined by the appointed contractor, via the M1, M50 and N2.

Construction traffic from the East compound to work zones to the west of the R132 would be to Gate 1B via the R132 and Naul Road as shown in Figure 11. Construction related traffic from Gate 1B to the work zone would be via a defined haul route through the airport complex (airside).

To minimise construction traffic through Gate 1B consideration would be given in the construction methodology for the CPCF pipeline to position the drive shafts for the proposed tunnel pipeline construction within the Eastlands where pipeline materials would be stored locally in the East compound.

To avoid impacting the known congestion points, the M1 spur route and the existing R132 roundabout, deliveries should be scheduled outside peak traffic hours. Section 7.1 of the

CEMP outlines the envisaged optimum delivery hours for the project so as to minimise operational impacts on the landside road network.

Refer to Section 5.4.4 for the proposed delivery management system.

Figure 16: Site Access Points (eastern side)

5.4.4 Delivery Management System

The appointed contractor would be responsible for implementing an electronic management system to provide an efficient and effective means of controlling all deliveries. Its implementation would ensure that all deliveries arrive at the right time and ensure that the space available is used as effectively as possible.

5.5 Traffic Volume Analysis

Staff

The total number of construction operatives on-site will vary considerably throughout the duration of the ADP. The average number of construction operatives is estimated to be 93 site operatives, with peak estimated at 160, see Figure 17. In general, this estimate is based on a single pipelaying crew for each of the pipelines (i.e. CW1, CW2, CW3, CW4, Airfield Contaminated Pipeline, CPCF Contamination Line, Outlet pipeline). It also assumes two concrete shuttering crews and two concrete placing gangs for the CPCF and West Apron tank construction works.

Construction operatives mobilising to site and demobilizing from site may not be able to avoid impacting the known congestion points, the M1 spur route and the existing R132

roundabout. Construction operative traffic from the M50 can access the works zones and compounds via the Naul exit as shown in Figure 11 so as to avoid the congestion points.

Construction staff arriving to site via car or van would park at the designated areas in the east and west compounds.

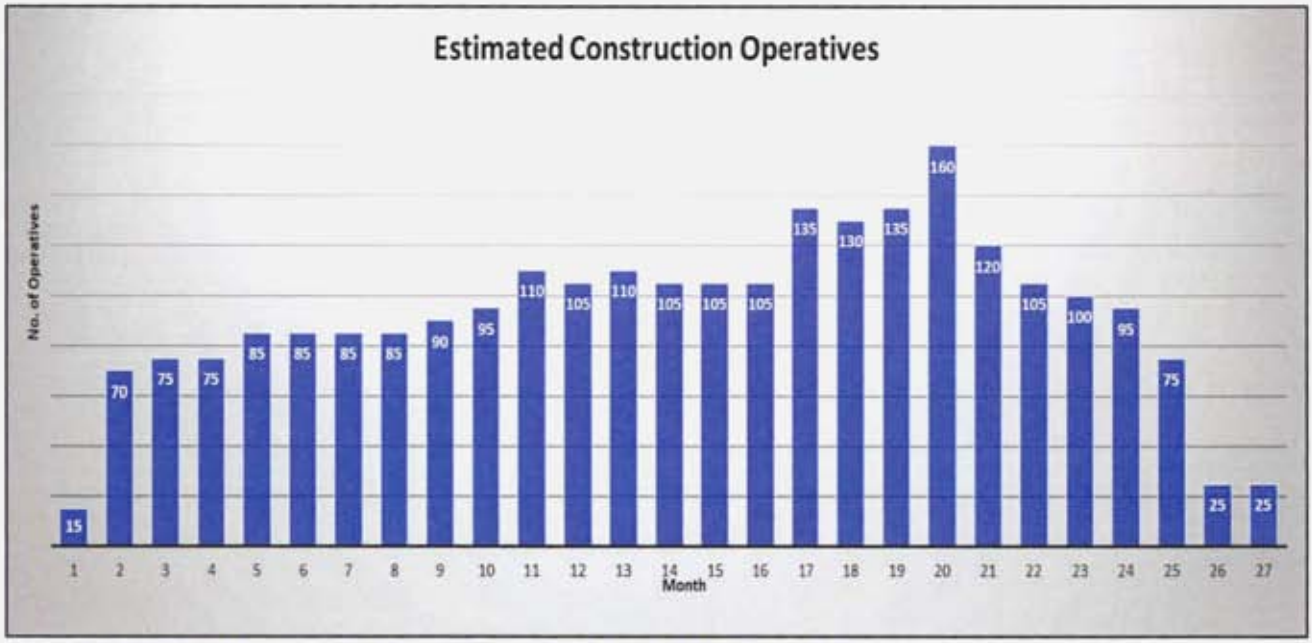


Figure 17: Estimated Construction Operatives on Site (Source: CEMP Figure 7-2)

Construction Traffic Volumes

Construction traffic movements to and from the two works zones will take place for various construction related activities including but not limited to:

- Disposal of surplus excavated materials from pipeline trenches, manholes, chambers, tunnel shafts, tunnelled pipelines, the West Apron tanks and the CPCF storage tank.
- Delivery of construction materials such as pipes, backfill material, concrete, steel, precast materials, mechanical equipment, etc either direct to the works zone or from the compounds.

The estimated construction traffic volumes are variable depending on phasing of the works and the work type. The peak construction traffic volume will be associated with the excavation for the CPCF, the concrete pours for the CPCF, the excavation for the West Apron tanks (polluted and clean tanks) and the concrete pours for the West Apron Pollution Tank. As detailed in Table 5-1: Construction Traffic Estimates (Source Table 10-1 of CEMP), the peak single one-way movement is 236 HGVs/day for the excavation from the CPCF.

Figure 18 shows the monthly variation in traffic movements (one-way) over the duration of the works. The split of the total estimated traffic movements is 45% associated with the west works zone and 55% associated with the east works zone.

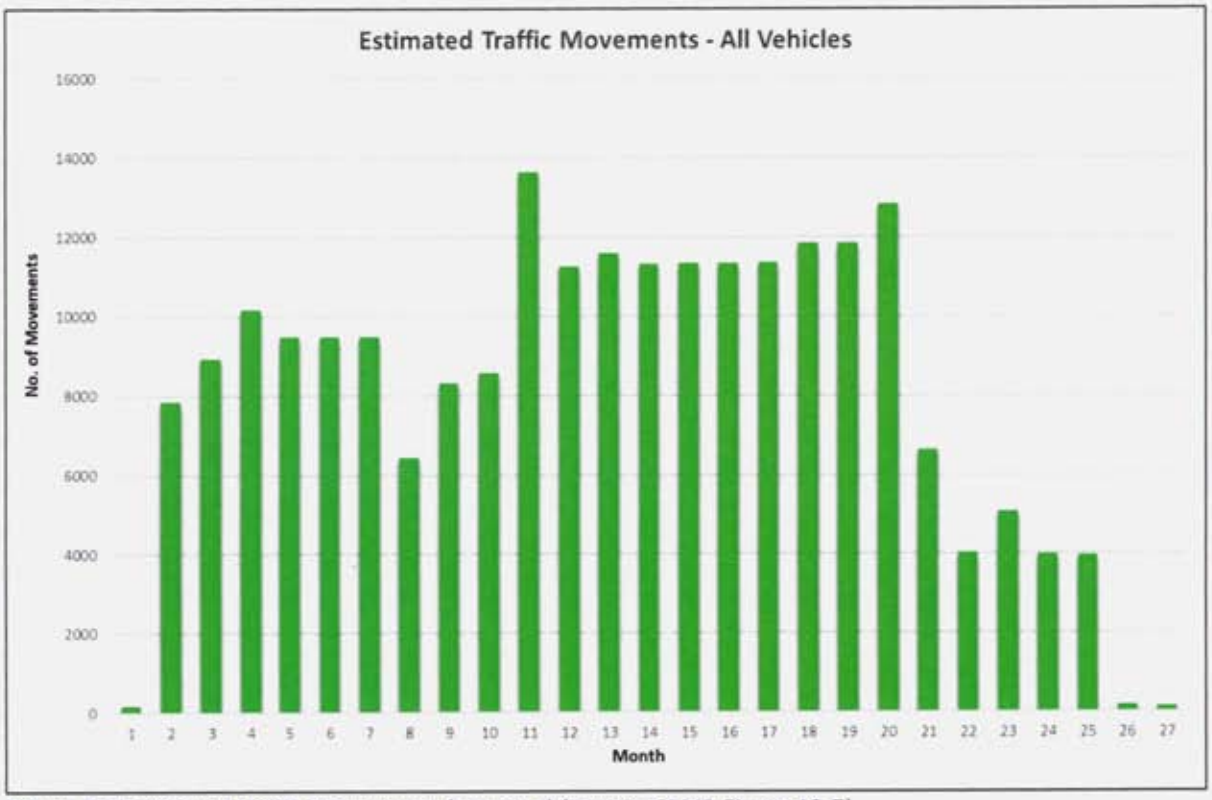


Figure 18: Estimated Traffic Movements (one-way) (Source: CEMP Figure 10-7)

The maximum estimated monthly traffic volume is 13,650 traffic movements.

Construction traffic movements to and from the works zones will be via the routes shown in Figure 9, Figure 10, Figure 11 and Figure 12 and will be subject to site access control and security as described in Section 5.1.

Construction traffic movements associated with the removal of surplus excavated materials from the works zones to suitable disposal sites may not be able to avoid impacting the known congestion points, the M1 spur route and the R132 roundabout, but this will depend on the location of the disposal site(s) to be determined by the appointed contractor(s).

Construction traffic, associated with the disposal of surplus material, from the west works zone can access the main routes as follows:

- The M50 can be accessed via the Naul exit;
- The N2 to the west can be accessed via the R108;
- The M1 can be accessed via the Naul exit onto the M50.

Traffic associated with deliveries to the west compound would be via the R108 from the M50, N2 and M1.

Figure 19 shows these routes that are proposed to avoid the congestion points on the M1 spur route and the R132 roundabout associated with traffic movements to and from the west works zone.

Figure 19: Envisaged Construction Traffic Routes – West Works Zone

Construction traffic, associated with the disposal of surplus material, from the east works zone can access the main routes as follows:

- The M50 can be accessed via the R132 and the Naul exit outside peak traffic times from Gate 1B;
- The M50 can be accessed via the R132 and the Naul exit from the Eastlands;
- The M50 can be accessed via the Naul Road in a westerly direction from Gate 1B in peak and outside peak traffic times;
- The N2 to the west can be accessed via the R132 outside peak traffic times and via the Naul Road during peak traffic times from Gate 1B;
- The N2 to the west can be accessed via the R132 from the Eastlands;
- The M1 can be accessed from the Eastlands via the R132 and Naul exit onto the M50 at peak traffic times on the M1 spur route and R132 roundabout;
- The M1 can be accessed from Gate 1B via the Naul Road in a westerly direction onto the M50 at peak traffic times on the M1 spur route and R132 roundabout;
- The M1 can be accessed from Gate 1B and the Eastlands via the R132 and the M1 spur road / R132 roundabout outside peak traffic times.

Figure 20 shows these routes that are proposed to avoid the congestion points on the M1 spur route and the R132 roundabout associated with traffic movements to and from the east works zone.

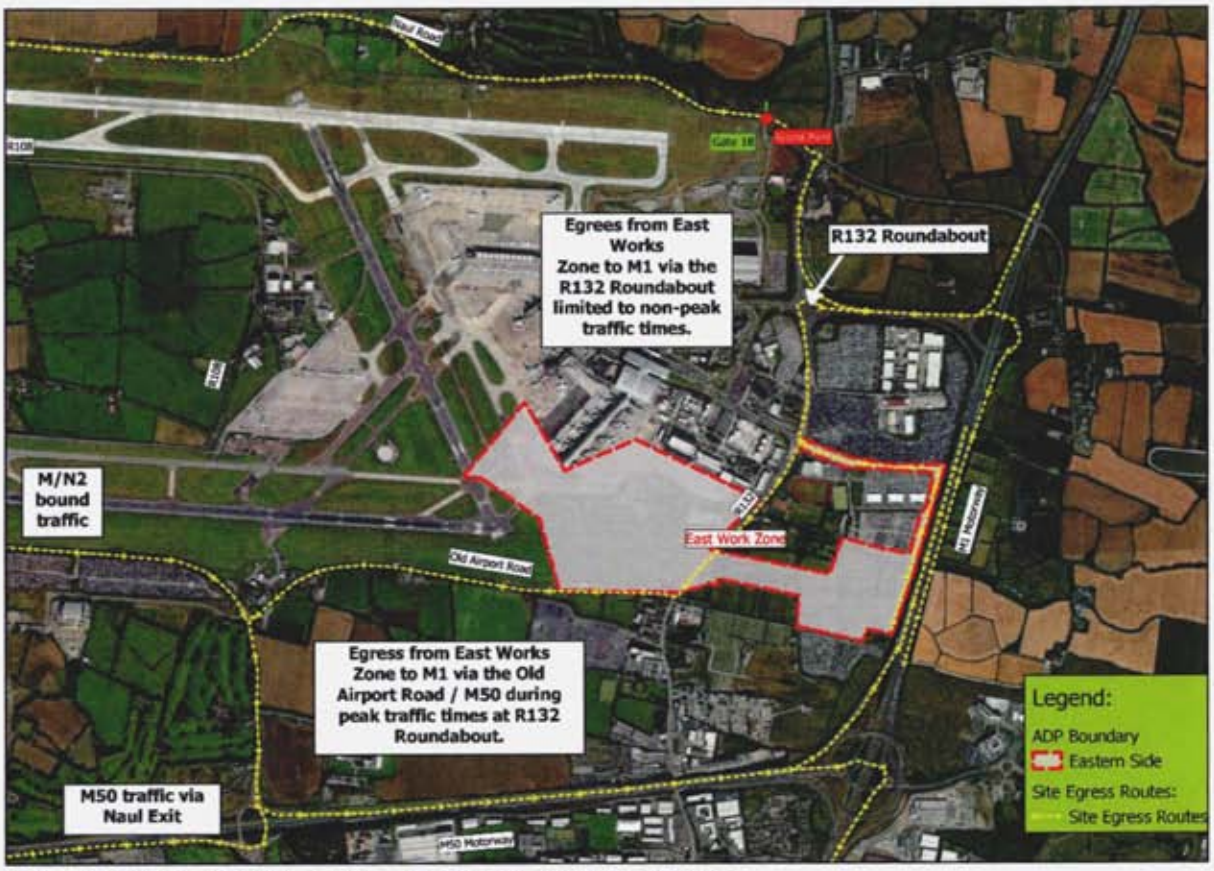


Figure 20: Envisaged Construction Traffic Routes – East Works Zone

6 TRAFFIC AND ROAD MANAGEMENT

The contractor and PSCS will be responsible for the traffic and road management associated with the ADP. The Contractor will consider these principal issues that affect traffic and road movements:

1. Maintaining good neighbour policy;
2. Maintaining site security;
3. Vehicle - Pedestrian Segregation. Manoeuvring of vehicles;
4. Delivery Co-ordination;
5. Loading and Storage;
6. Delivery times.

6.1 Separation of Pedestrians / Vulnerable users and Vehicles

Regulation 15 of the Construction (Health Safety and Welfare) Regulations requires that every construction site shall be organized in such a way that, so far as is reasonably practicable, pedestrians and vehicles can move safety and without risk or injury to all parties. This regulation requires the provision of safe, effective and functional pedestrian and vehicle segregation. It is therefore recommended that pedestrians and vehicles should, wherever practicable, not share access / egress points or circulation routes.

Therefore, wherever vehicles and pedestrians are required to utilise adjacent access during construction around the project, suitable physical segregation with signage shall be installed to demarcate safe pedestrian routes.

The Vehicle entry gate points will be isolated from site pedestrians by use of designated pedestrian routes and physical barriers. This arrangement satisfies the requirements but will be reviewed as the project proceeds to ensure that construction activity does not present any additional risks. At the ADP site accesses TMOs are not required for segregation of vehicles and vulnerable road users:

- **Gate 9 and West Compound:**
  Due to the character of the rural road (level 2 road – refer Section 3.2 Table 3-1) it is not envisaged that there will be high volumes of pedestrians or other vulnerable road users. The access gate will be isolated from pedestrians.

- **Gate 1B:**
  The road character here is transitioning from rural to urban on approach to the roundabout at the junction of the Naul Road / R132. Due to the lack of amenities and facilities west of Gate 1B, it is envisaged that the footfall will be low and measures to keep vehicles and pedestrians separated are not required.

- **Access Point to East Compound:**
  An existing footway is present along one side of the carriageway of the red zone car park access road approaching the East compound. This provides segregation of vehicles and pedestrians to amenities, refer Figure 21.

Figure 21: East Compound Access Road via Red Zone Car Park Road (Source: Google Street View, August 2019)

Should any additional risk be subsequently identified then appropriate action will be taken to eliminate or minimise such risk. Appropriate signage will be fixed to gates, at all areas where it is possible for vehicles to come into contact with pedestrians, and to denote vehicle and pedestrian crossover areas. If they cannot reasonably be avoided TMO will be in attendance.

The following measures shall be introduced both onsite and on the public roads:

- No parking or mounting of adjacent kerbs for the purpose of waiting, loading or offloading of materials / equipment / plant;
- No parking permitted at construction work areas;
- It is envisaged that all operatives' cars will park at the site compound and work force will be transferred via construction shuttle buses to the proposed development site;
- Construction shuttle buses will be provided for operatives working between work zones on the same day removing the need to relocate cars between sites (Note this bus will run at regular intervals and will not guarantee instant access to work zones);
- Signage to warn vulnerable road users and motorists on the public road of site entrances;
- Signage to warn site vehicle operatives of pedestrians crossings;
- Physical barriers within working areas to segregate site operatives and site vehicles;
- The contractor will provide Traffic Management Operatives in order to ensure safe egress/access. All TMOs are to have appropriate training, and to wear orange hi-visibility vests/Jackets;
- No uncontrolled pedestrian traffic to be allowed through site areas;

- Pedestrian zebra crossing points with all interface with site construction traffic routes.

6.2 Temporary Traffic Management

The contractor will be responsible for the provision of Temporary Traffic Management by competent and trained personnel. Where works require TTM, the PSCS must ensure that the hazards associated with working on the road are addressed. They must ensure that a TTMP is in place and that it is implemented correctly. Only appropriately trained and competent operatives, supervisors, managers or other competent persons should be engaged in the assessment, design, installation, maintenance and removal of TTM.

Contractors must carry out site-specific risk assessments and put in place measures to mitigate and control those risks. This may include having Safe Operating Procedures (SOPs) or Safe System of Work Plans (SSWPs) in place for installation and removal of TTM.

Traffic Management Operatives (TMO) will form part of the Temporary Traffic Management for the safe management of deliveries and to limit disruption to the general public and surrounding road network.

The Contractor shall liaise with Fingal County Council Traffic Operations Team to ensure proposed traffic management plans are as per requirements.

Preliminary Temporary Traffic Management options for each area of works interfacing with the public road are summarised but not limited to the below:

- Site Access – static advanced signage, TMOs;
- Construction Haul Routes (depending on lane width) – static advanced signage, one-way construction routes;
- Works within the public road requiring lane closure (R132)
- Works within the public road requiring road closure (R108) – road closures, diversion route, night works.

6.2.1 Traffic Signage and Variable Message Signs (VMS)

The contractor shall undertake consultation with the relevant authorities for the purpose of identifying and agreeing signage requirements. Such signage shall be installed prior to works commencing on site. All traffic signage for use at roadwork's (warning, regulatory and information) must comply with Clause 8.3.1-8.3.3 of the Department of Transport Traffic Signs Manual, Chapter 8.

The Contractor shall allow for variable message signs (VMS) in accordance with Chapter 8 paragraph 8.3.4 of the Traffic Signs Manual on approach routes affected by traffic management measures, restrictions or road closures. The VMS's must be in place 2 weeks before traffic management measures commence advising motorists of the upcoming road works. Once works have commenced these VMS shall advise drivers of the restrictions, the alternative routes where appropriate, and any Special Speed Limit. VMS locations are to be agreed with the Fingal County Council and other Local Authorities affected by the TTM, as part of the process for agreeing the Contractor's Temporary Traffic Management proposals.

In summary, the contractor will be required to ensure that the following elements are implemented:

- Consultation with the relevant authorities for the purpose of identifying and agreeing signage requirements;
- Provision of temporary signage indicating site access route and locations for contractors and associated suppliers; and
- Provision of general information signage to inform road users and local communities of the nature and locations of the works, including project contact details.

6.2.2 Temporary Traffic Control and Traffic Signals

The Contractor will be responsible for the provision of Temporary Traffic Management (TTM) by competent and trained personnel. Where works require TTM, the PSCS must ensure that the hazards associated with working on the road are addressed. They must ensure that a TTMP is in place and that it is implemented correctly. Only appropriately trained and competent operatives, supervisors, managers or other competent persons should be engaged in the assessment, design, installation, maintenance and removal of TTM.

All temporary traffic control measure for use at roadwork's (i.e. Stop and Go, and traffic signals) must comply with Clause 8.3.7 of the Department of Transport Traffic Signs Manual, Chapter 8.

Where congestion is visible at nearby junctions, modifications to existing traffic signals may be required. Where roads works are placed adjacent to existing junctions, traffic signal outages may be required.

6.2.3 Lighting

Where floodlighting of the work zones is required in poor daylight conditions and darkness, the positioning of the lighting units should be such as to not cause glare to drivers. Workmen should be protected from stepping inadvertently from the illuminated area into an unilluminated traffic lane.

In addition to lighting, signs, chevrons, barriers and other devices should be reflectorised. Reflectors should be used to ensure that the work area is adequately marked if the lighting is vandalised or otherwise fails.

6.2.4 Lane Closure

The ADP has identified the requirement for temporary footway / cycleway and traffic lane closures on the R132 where the discharge pipework from the proposed CPCF storage tank is proposed to enter an existing manhole, which is part of the North Fringe Sewer system, and is located on the southbound lane of the R132.

Outline Temporary Traffic Management (TTM) Plans have been developed for information purposes to be developed by the Contractors TTM Designer in conjunction with the relevant Roads Authorities. These works are proposed as night-time works to reduce the impact on traffic flows. The following Figures outline the TTM (see Figure 22, Figure 23 and Figure 25). This Outline TTM take into consideration the proximity to the existing operating traffic signalised junction immediately south of the construction works. The Contractor and the TTM Design shall liaise with the relevant Roads Authority in charge of the traffic signal operations as modifications may be required to the sequencing during this TTM.

The three phased of works are as follows:

- **Phase 1:**
  TTM and construction of the pipeline in the footway and cycleway (refer Figure 22)

- **Phase 2:**
  TTM and construction of the pipeline in lanes 1 and 2 (refer Figure 23 and Figure 24)

- **Phase 3:**
  TTM and construction of the pipeline in lanes 2 and 3 (refer Figure 24 and Figure 25)

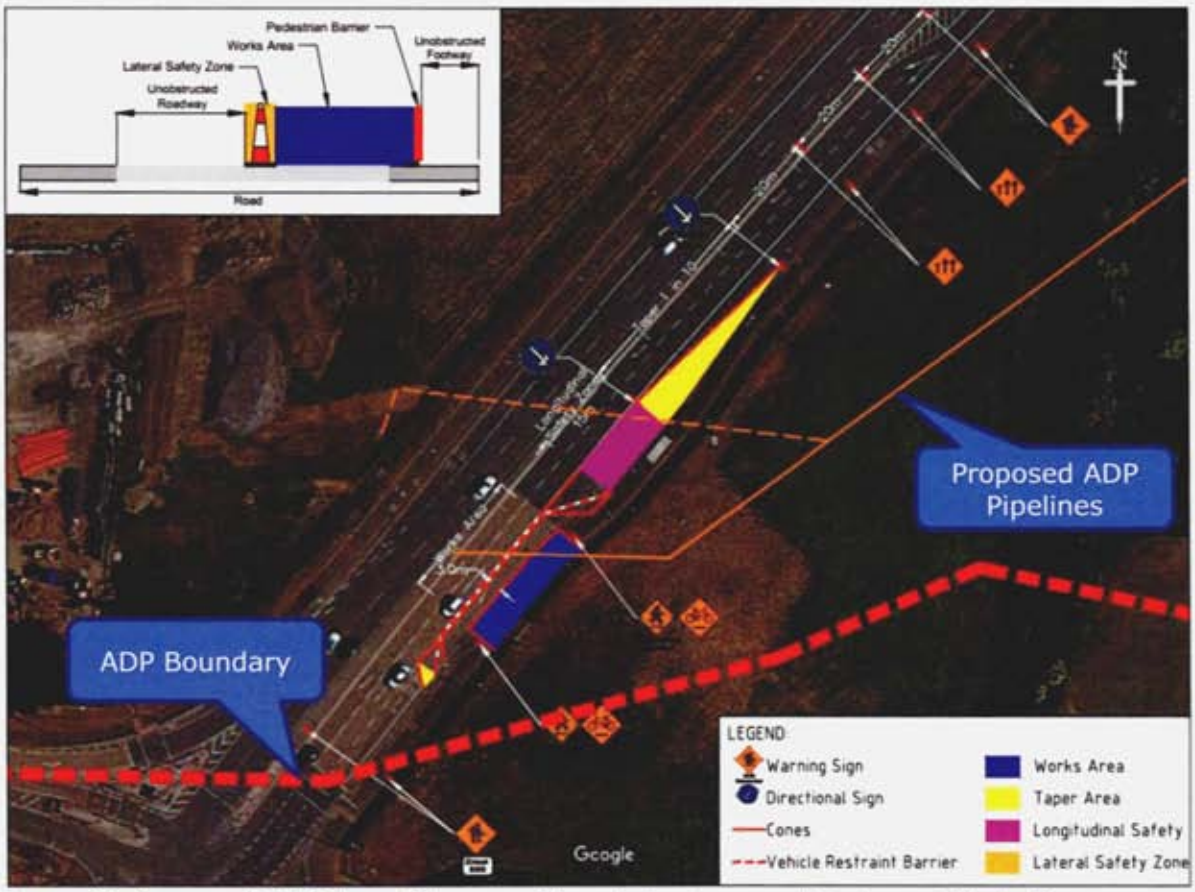


Figure 22: Proposed R132 Lane Closure – Phase 1 Footway and Cycleway Works Area

Due to the proximity of the works to the controlled pedestrian crossing, bus stop and the long diversion route (i.e. 0.8km), this assessment indicated that suitable provisions for vulnerable road users' (VRUs) should be retained as part of the Outline Temporary Traffic Management. To accommodate the existing combined footway / cycleway facilities an off-ramp facility with ramps for at grade access and a minimum width of 3.0m shall be provided.

Due to the high volume of traffic on the R132, a vehicle restraint system is proposed as part of the Outline TTM to separate the VRU from passing live traffic.

To accommodate suitable taper and longitudinal safety zones the bus stop will be temporary suspended in this proposed design. The Contractor and their TTM Design to discuss with relevant Roads Authorities and Bus Service providers to ensure that bus stops north of this location on the R132 may be utilised during the time of interruption to the service.

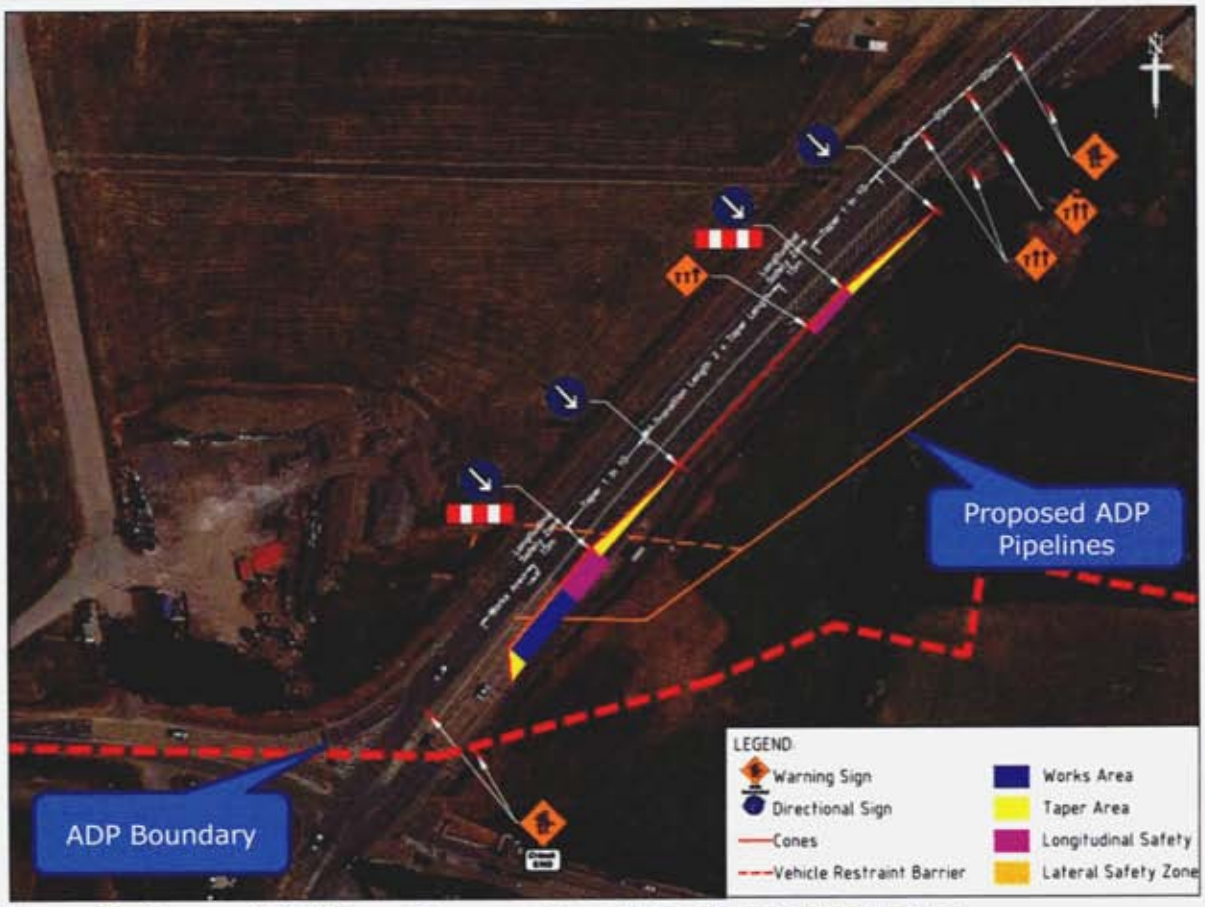


Figure 23: Proposed R132 Lane Closure – Phase 2 Lane 1 and 2 Works Area

Phase 2 of the OTTM indicates a work area in Lane 1 and Lane 2 (i.e. the nearside lanes), see Figure 15 and Figure 24. In accordance with the relevant standards, Lane 1 will be closed while works are ongoing within Lane 2. In Phase 2 the footway and cycle facilities shall be reopened with suitable barriers between the works area and the public.

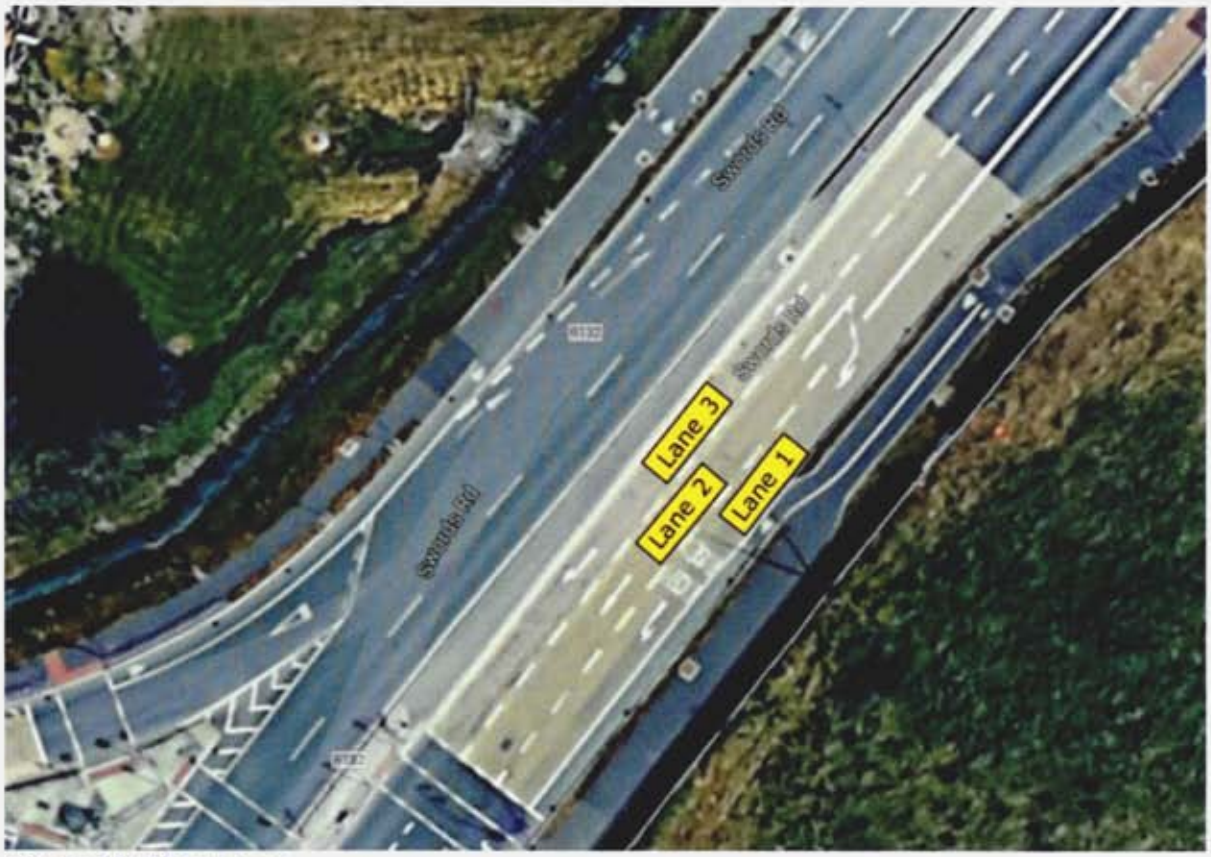


Figure 24: R132 Lanes

In Phase 2 of the Lane Closure, the Bus Stop immediately north of the work area is within the TTM and shall not be used. As previously mentioned, the Contractor and TTM Designer to discuss with the relevant Roads Authorities and service providers to ensure suitable provisions are made.

Phase 3 of the OTTM indicates work area in Lane 2 and Lane 3 (i.e. offside lanes – refer Figure 16), see Figure 25. All southbound traffic is directed into the Bus Lane past the work area. The Bus Stop may be retained during these works subject to the required lane widths.

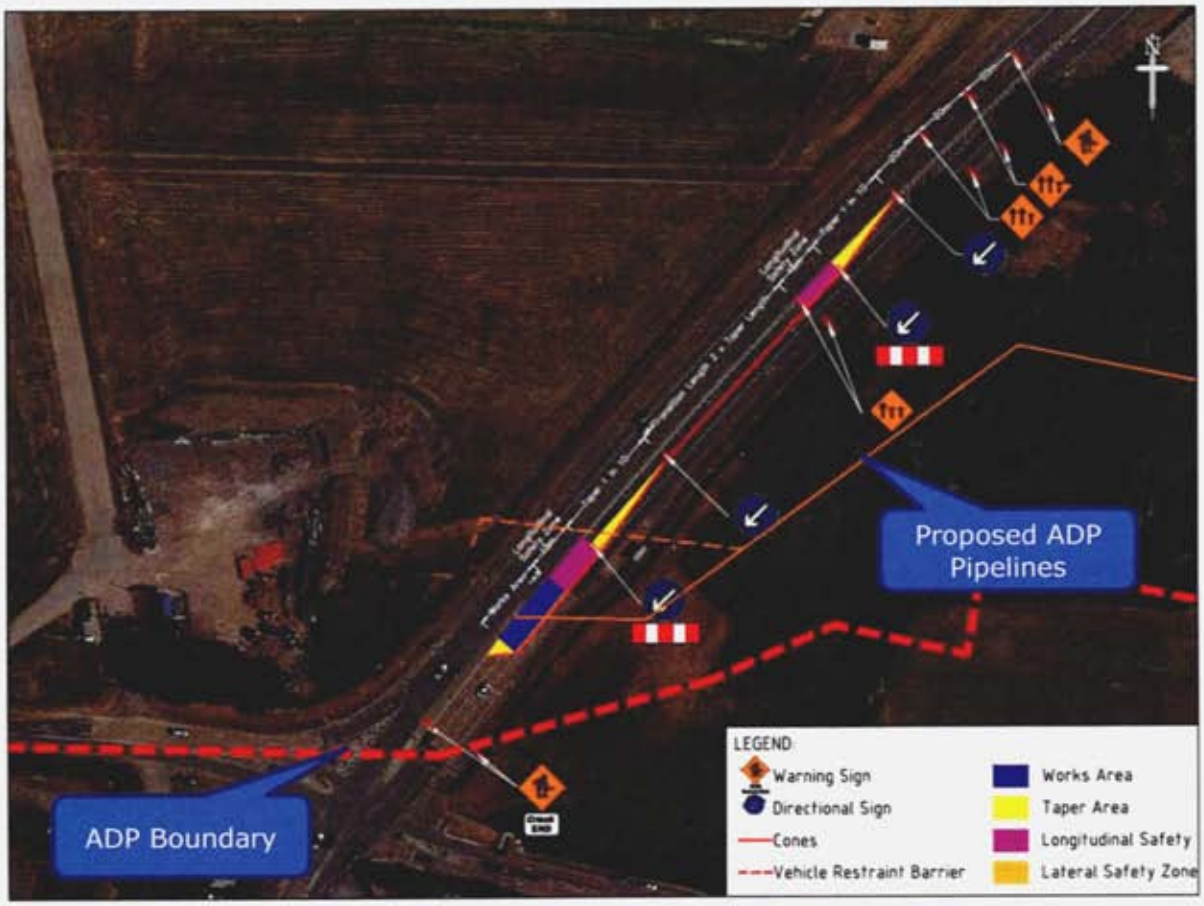


Figure 25: Proposed R132 Lane Closure – Phase 3 Lane 2 and 3 Works Area

The details in the above figures are OTTM Plans. The TTM Designer shall be prepare detailed TTM Plans for all phases. These plans shall include but are not limited to additional phasing TTM Plans for daytime and night-time works, installation and removal plans and sequencing plans between each phase of TTM. A method statement shall be prepared by the Contractor and its TTM designer to address the detailed design specifics of how these works will be undertaken safely.

TTM is a temporary design and details shall be provided to the PSDP and associated HST1 Temporary Works Designer's Certificate provided.

6.2.5 Road Closure and Detour

Applications for Temporary Road Closures shall be made to Fingal County Council. This is a separate statutory process to the road opening license. The statutory procedures related to road closures, including timeframes, are set out under Section 75 of the 1993 Roads Act and the Regulations published under Statutory Instrument S. I. No. 119 of 1994. Typically, this will be six weeks minimum notice.

The ADP has identified the requirement for a road closure on the R108 in the vicinity of the airside western Gate 11 (see Figure 26). These closures will be short in duration, with road closure times and appropriate measures to be agreed with the Fingal County Council and other relevant stakeholders prior to the toad closure. It is envisaged that road closures will be undertaken during night-time when traffic volumes are at their lowest, subject to agreement with the Fingal County Council and other relevant stakeholders.

An outline Temporary Traffic Management Plan for the Road Closure is provided in Figure 27. This plan details the proposed diversion route, temporary traffic management signage and local access routes. The Contractor shall agree the diversion route with the relevant Roads Authorities.

Figure 26: Proposed layout indicating the Road Closure on the R108

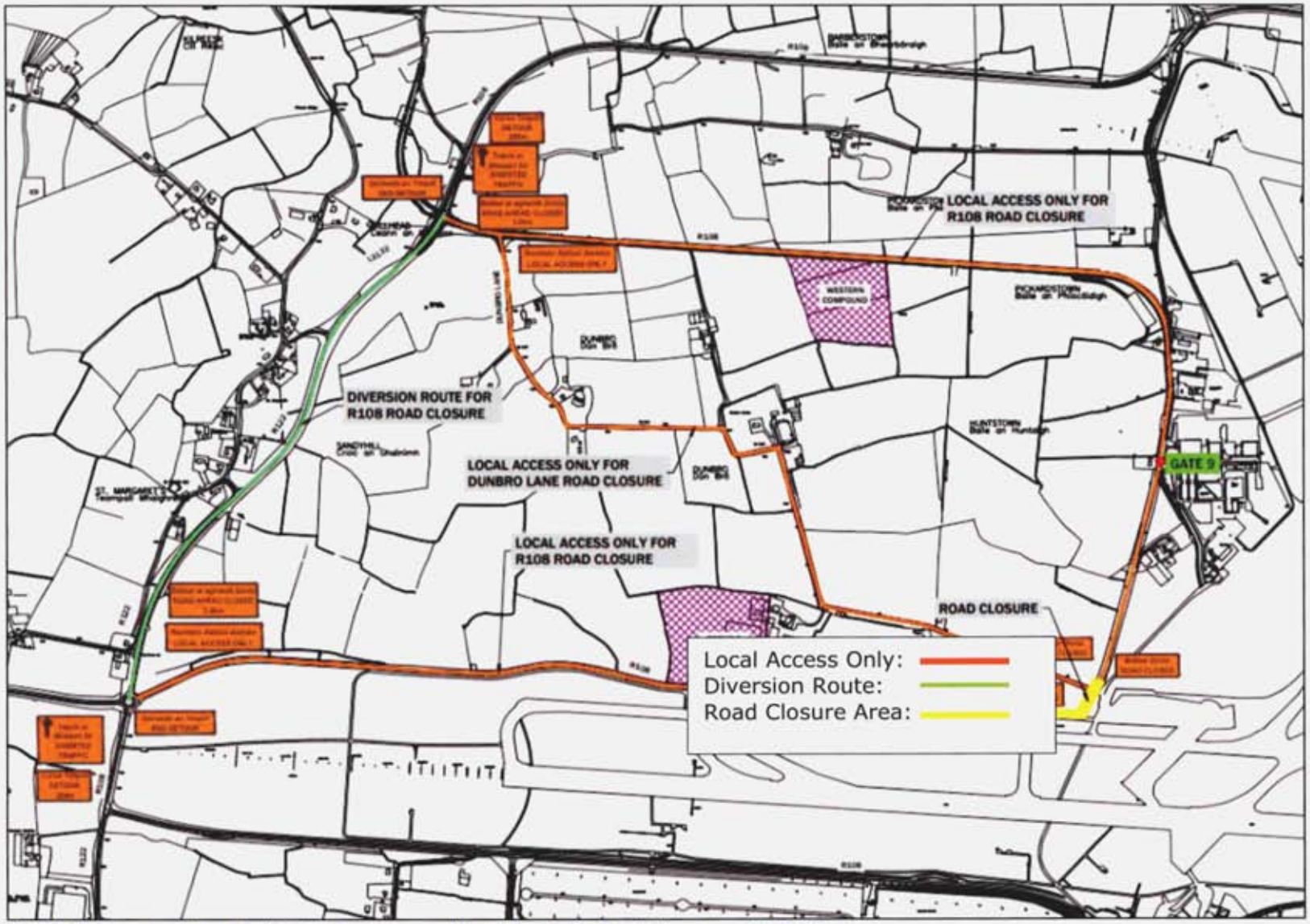


Figure 27: Proposed layout indicating Diversion and Local Access for Road Closure on the R108

For the duration of the road closure, a diversion route using the existing road network (i.e., a road of similar character) and directional and information signage shall be used in accordance with clause 8.2.4.6 of the Department of Transport Traffic Signs Manual, Chapter 8.

6.2.6 Enforcement of Traffic Management Plan

All project staff and material suppliers will be required to adhere to the final TMP. The contractor shall agree and implement monitoring measures to confirm the effectiveness of the TMP and compliance will be monitored by the resident engineer on behalf of the Client. Regular inspections / spot checks will also be carried out to ensure that all project staff and material supplies follow the agreed measures adopted in the TMP.

7 COMMUNICATIONS & EMERGENCY PROCEDURES

7.1 Site Communication

The project will operate a Temporary Business Radio (TBR) or Trunked Radio system in accordance with the Commission for Communications Regulation: Guidance Notes – Guidelines for Business Radio Licences.

The radio system will facilitate one to one calling, caller group calling and a dedicated emergency channel for managing of site emergencies. The base station for the system will be located in the project office. The contractor will be required to comply with daa rules and apply for specific licenses, to ComReg, to operate on dedicated frequencies.

Radio handsets will be issued to key individuals from supervisors upwards. Each hand-set will be allocated to an individual who will sign to accept receipt and acknowledgement that they will be financially responsible for any loss or damage to the unit.

When issued with a radio, each recipient will receive full training on it use including how the emergency channel is to be used.

Any sub-contractor intending to utilise an additional radio system over and above the proposed site radio system must submit proposal to logistics team to include but not limit to all relevant license/permits/frequencies to be used during the works.

7.2 Communication

In all aspects of the management of traffic, the Contractor's PSCS, shall liaise with the following parties;

- Employer's Representative;
- Fingal County Council Roads Department;
- Dublin City Council Roads Department;
- Garda Síochána, ambulance & fire services;
- Private and Public Bus Services.

The PSCS, shall consult all relevant authorities as listed above during the development of the Construction Stage Traffic Management Plan. The Contractor shall co-ordinate the implementation of the developed traffic management plan throughout the duration of the works. The PSCS shall take into account the impact of the construction works on general traffic, businesses, and local property owners. Where a problem arises with traffic management, the PSCS shall consult with the PSDP, the Employers Representative and Fingal County Council and revise or modify the temporary traffic management plan as necessary, as per paragraph 3.3.4 of the 'Guidance for the Control and Management of Traffic at Road Works'.

The PSCS shall consult with the Garda Síochána, and fire and ambulance services in the preparation of the Construction Stage Traffic Management Plan and during the implementation of the works.

7.3 Public Notice

The Contractor shall liaise with the Roads Authority in respect of any temporary road closures, lane closures, and other traffic management controls required to be carried out to ensure the safety of the workforce and the general public during the duration of the works. The advertising of such notices in local press, local radio, and leaflet drops will be required to warn motorists and local businesses and residents of the changes involved and new road layouts to be expected.

7.4 Emergency Procedure

The emergency procedures are to be provided by the contractor for the project and is to be in line with any/all health and safety requirements set out in the daa Construction Contractors Health, Safety and Environmental Rules and D-E Emergency Response documents.

The contractor shall ensure that unobstructed access is provided to all emergency vehicles along all routes and site accesses. The contractor shall provide to the local authorities and emergency services, contact details of the contractors' personnel responsible for construction traffic management.

In the case of an emergency the following procedure shall be followed:

- Emergency Services will be contacted immediately by dialling 999 / 112;
- Exact details of the emergency / incident will be given by the caller to the emergency line operator to allow them to assess the situation and respond in an adequate manner;
- The emergency will then be reported to the Site Team Supervisors and the Safety Officer;
- All construction traffic shall be notified of the incident (where such occurs off site);
- Where required, appointed site first aiders will attend the emergency immediately; and
- The Safety Officer will ensure that the emergency services are en-route.

7.5 Incident Management

Under the SHWW Act, there is a statutory requirement to record and report incidents causing injury. Projects must include for the provision of an incident management system to record site incidents, including those that are related to TTM. The incident management system adopted must be capable of identifying and highlighting unexpected levels or categories of incidents.

The incident management system should be a part of the TTMP so that it requirements are established early in the design process. On large projects, such as this project with multiple construction sites operating at the same time, the appointment of a dedicated Temporary Traffic Operations Supervisor (TTOS[3]) under the terms of the contract provides a first line of reporting to assist in this procedure.

The incident management system should include:

- an operational structure with a formal reporting system and review meetings;
- the name of the person with responsibility for record keeping; and
- an outline contingency plan.

The logistics resource will be managed by the contractor as a part of the project delivery management team, supported by Security Officers and the on-site Duty Management Control Room. This team will be at the forefront of any incident management. Due to the close proximity of local residents, incident liaison will be a priority for the whole project team including security. All incidents must be reported in full accordance with the incident reporting process.

[3] Temporary Traffic Operations Supervisor (TTOS) - the person on site with direct responsibility for implementation, maintenance and removal of temporary traffic management arrangements (Temporary Traffic Management Guidance, August 2019)

8 PROGRESSIVE CLEANING

8.1 Public Road Cleaning

It is a requirement that the main contractor will be required to carry out road sweeping operations to remove any project-related dirt and material deposited on the road network by construction / delivery vehicles. Road sweepers will dispose of material following sweeping of road network, to licensed waste facility.

8.2 Vehicle Cleaning

It shall be a requirement of the works contract that the main contractor will be required to provide wheel washing facilities, and any other necessary measures to remove mud and organic material from vehicles exiting the various sites. In addition, the cleaning of delivery trucks such as concrete delivery trucks shall be carried out at the specific location/ yard and shall not be undertaken at the works locations.

8.3 Vehicle Covers

The works required for the Central Pollution Control Facility and other excavation works for the ADP will require haulage of bulk excavated materials and other waste products offsite to licensed disposal facilities. It shall be a requirement that all loads of materials leaving site shall be assessed and covered where necessary to reduce dust impacts.

9 PLANT, MACHINERY AND EQUIPMENT

The main items of plant that are expected within the work zones and road work zones are outlined in the CEMP under section 4.3.10 Plant, Machinery and Equipment. In the interest of safety on site all vehicles and self-propelled plant used in the construction works shall be fitted with roof-mounted amber flashing lights and reversing machinery noise whilst in the working areas.

Plant required to reduce the impact on the road network shall include but not be limited to:

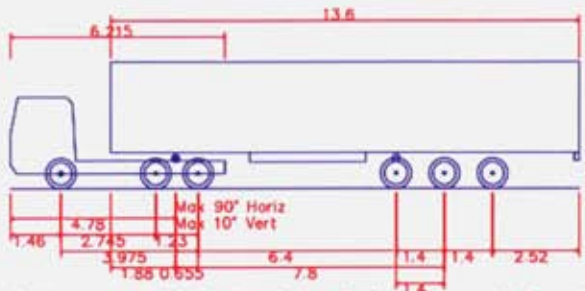
- Road sweepers (Section 8.1)
- Wheel wash (Section 8.2).

Appendix 1:

Autotrack Analysis Drawings

Appendix 1

Autotrack Analysis Drawings



Articuloted Vehicle with Twin Steered Tractor	
Overall Length	16.500m
Overall Width	2.550m
Overall Body Height	3.691m
Min Body Ground Clearance	0.426m
Max Track Width	2.500m
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	6.987m

Autotrack Outline - Gate 9 - Entry Left Turn

Autotrack Outline - Gate 9 - Entry Right Turn

Autotrack Outline - Gate 9 - Exit Right Turn

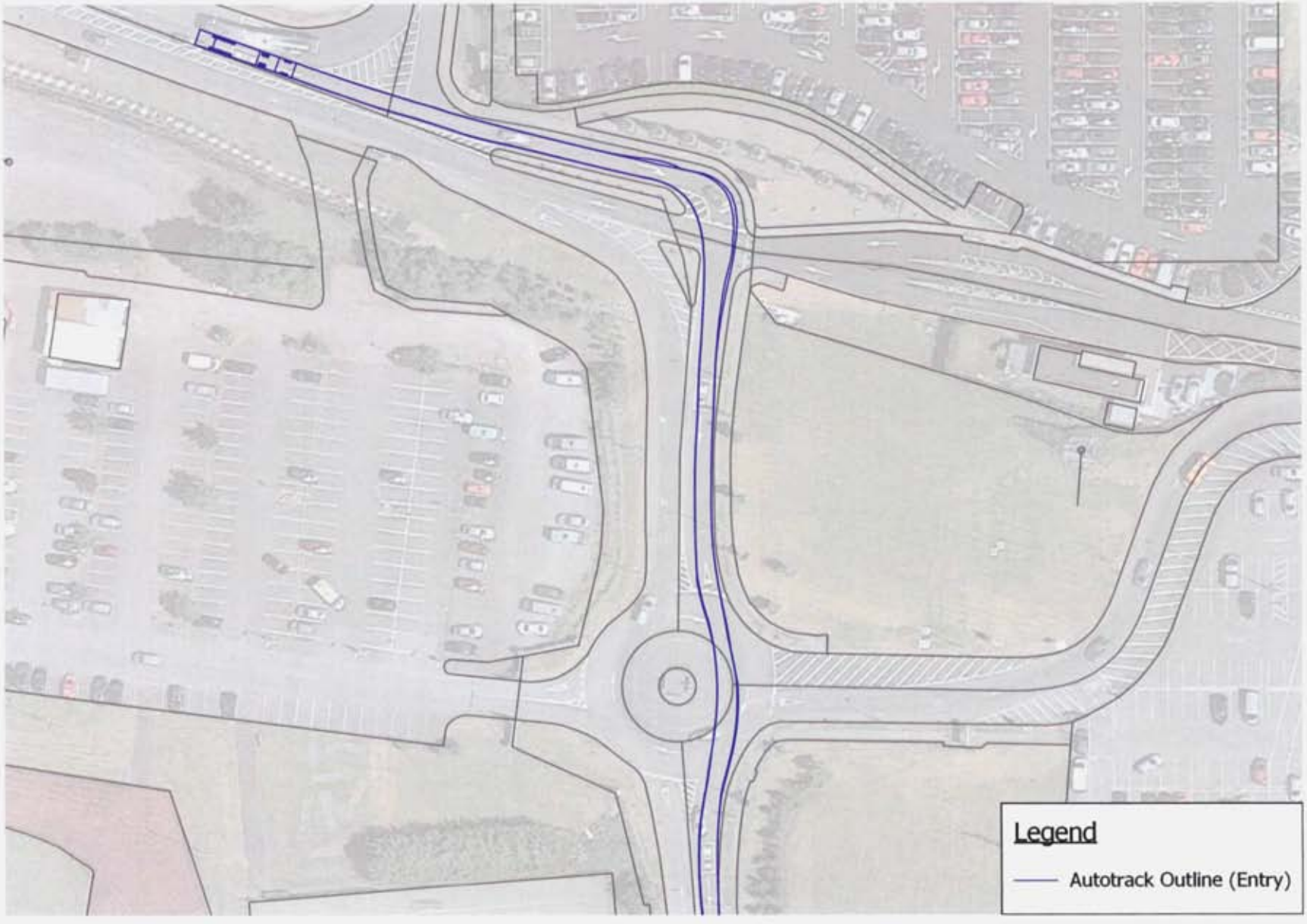
Autotrack Outline - Gate 9 - Exit Left Turn

Autotrack Outline - Gate 1B - Entry Right Turn

Autotrack Outline - Gate 1B - Entry Left Turn

Autotrack Outline - Gate 1B - Exit Left Turn

Autotrack Outline - Gate 1B - Exit Right Turn



Autotrack Outline-Eastern Access-Entry

Autotrack Outline-Eastern Access-Exit

Technical Appendix 9 – Biodiversity

NICHOLAS O'DWYER

daa

Appendix 9.1

Breeding & Winter Birds

NICHOLAS O'DWYER

daa

Introduction

In May and June 2022 breeding bird surveys were conducted at lands at Dublin Airport, in North County Dublin. Three breeding bird surveys were completed in all by Hugh Delaney, a freelance Ecologist (Birds primarily) who has extensive surveying experience on numerous sites with ecological consultancies over 12+ years. Hugh, a lifelong birder, is local to the Dun Laoghaire-Rathdown area in Dublin and is especially familiar with the bird life and its ecology in the environs going back over 30 years.

Breeding Bird Survey Methodology

Breeding bird surveys are conducted from soon after sunrise or as early as so possible, taking several hours or longer depending on site size. They are conducted then in order to detect as many singing species as possible and birds that are generally more active early in the day. All species on site, singing, foraging, and passing through site are recorded, and any evidence of breeding recorded. Optimal weather conditions are chosen, if possible, in order to gather the most data.

Site Location

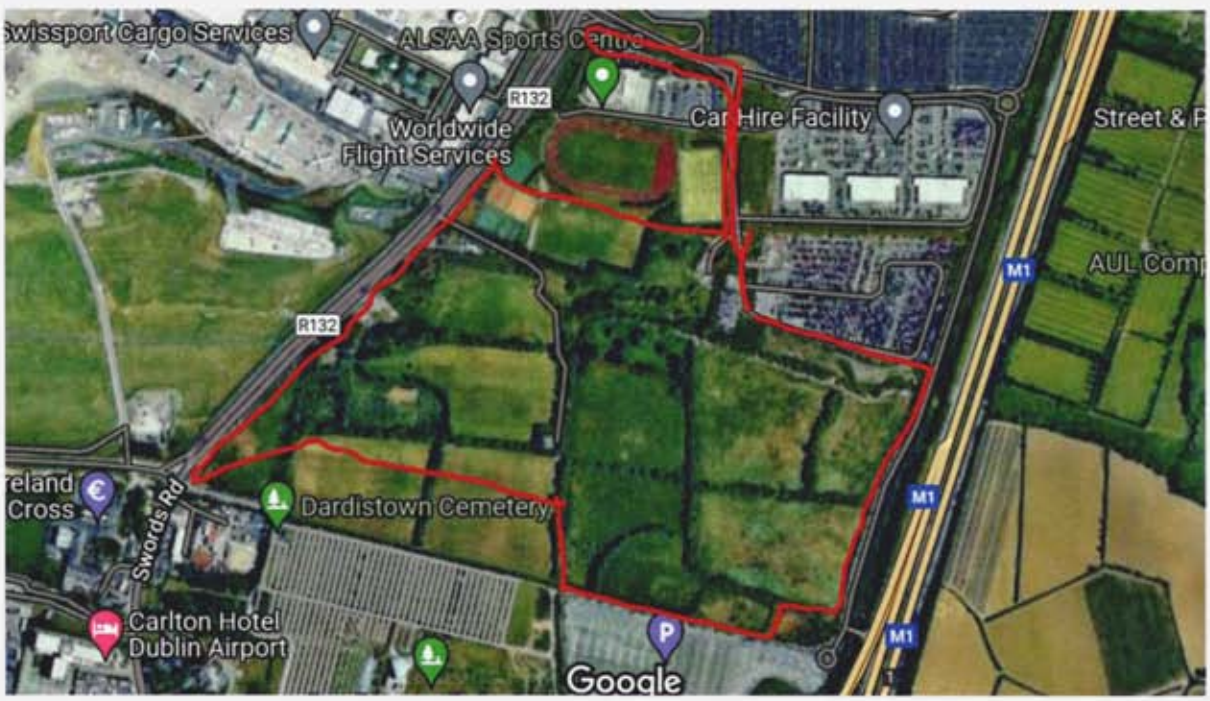


Fig. 1 Dublin Airport Site

Site Description

Site comprises fields (with playing fields at the west side) bordered by hedgerows and larger trees, denser area of trees towards the middle part of north side of the site. A small stream passes from west to east at the north end of the site.

Specific site survey methodology

Site traversed from north to south following all field margins etc.

Table 1. *List of all bird species noted on-site*

Species Noted On-Site	Conservation Status
Herring Gull (*Larus argentatus*)	Amber
Lesser black-backed Gull (*Larus fuscus*)	Amber
Blackbird (*Turdus merula*)	Green
Mistle Thrush (*Turdus viscivorus*)	Green
Song Thrush (*Turdus philomelos*)	Green
Long-tailed Tit (*Aegithalos caudatus*)	Green
Coal Tit (*Periparus ater*)	Green
Blue Tit (*Cyanistes caeruleus*)	Green
Great Tit (*Parus major*)	Green
Bullfinch (*Pyrrhula pyrrhula*)	Green
Goldfinch (*Carduelis carduelis*)	Green
Chaffinch (*Fringilla coelebs*)	Green
Chiffchaff (*Phylloscopus collybita*)	Green
Linnet (*Linaria cannabina*)	Amber
Swallow (*Hirundinidae*)	Amber
Willow Warbler (*Phylloscopus trochilus*)	Amber
Blackcap (*Sylvia atricapilla*)	Green
House Martin (*Delichon urbicum*)	Amber
Goldcrest (*Regulus regulus*)	Amber
Meadow Pipit (*Anthus pratensis*)	Red
Pied Wagtail (*Motacilla alba*)	Green
Robin (*Erithacus rubecula*)	Green
Dunnock (*Prunella modularis*)	Green
Wren (*Troglodytidae*)	Green
Starling (*Sturnidae*)	Amber
Woodpigeon (*Columba palumbus*)	Green
Hooded Crow (*Corvus cornix*)	Green
Jackdaw (*Corvus monedula*)	Green
Rook (*Corvus frugilegus*)	Green
Magpie (*Pica pica*)	Green
Buzzard (*Buteo buteo*)	Green
Sparrowhawk (*Accipiter nisus*)	Amber

Survey Results

May 14th, 2022

Sunrise- 05.27hrs/Sunset- 21.16hrs. Weather – Wind F1 Southwest, Cloud 3/8, Dry, 11c, Excellent visibility. On-site 06.15hrs – 10.30hrs.

Species recorded – Herring Gull, Blackbird, Mistle Thrush, Song Thrush, Coal Tit, Blue Tit, Bullfinch, Goldfinch, Chaffinch, Chiffchaff, Willow Warbler, Blackcap, Goldcrest, Meadow Pipit, Pied Wagtail, Robin, Dunnock, Wren, Starling, Woodpigeon, Hooded Crow, Jackdaw, Rook, Magpie, Buzzard.

Herring Gull (x15) Birds (<15 minimum) noted passing over the site, no birds observed foraging on-site.

Blackbird (x9) Three in song at the north side of the site and two in song at the south side of the site, four others noted foraging on-site, one bird noted provisioning food to a nest location at the northwest side of the site.

Mistle Thrush (x2) Two foraging on playing fields at west side of site intermittently during the morning.

Song Thrush (x3) Two in song at the north side of site and one in song at the southeast corner of the site.

Coal Tit (x2) Two birds noted in song at the north side of the site at 06.40hrs.

Blue Tit (x20) Two pairs noted provisioning food to recently fledged young at the north end of the site during the morning, minimum of 20 noted.

Bullfinch (x2) Pair noted foraging at the southeast corner of site at 07.10hrs.

Goldfinch (x6) Minimum of six in song around the site, mainly at the north end of the site.

Chaffinch (x3) Two in song at the south end of site and another in song at the northwest corner of the site during the morning.

Chiffchaff (x1) One in song at the northeast corner of the site at 07.15hrs.

Willow Warbler (x3) Two in song at the north of site adjacent the stream in center part and one in song at the southeast corner of the site during the morning.

Blackcap (x2) Two in song at the north end of the site throughout the morning.

Goldcrest (x3) Two in song at the north end of the site and another in song at the southwest corner of the site.

Meadow Pipit (x2) Two in song in fields at the east side of the site intermittently during the morning.

Pied Wagtail (x1) One noted foraging at the north end of the site at 08.15hrs.

Robin (x10) Adults noted provisioning food to recently fledged young at the center of the north part of the site and other birds noted in song (3) and foraging around the site.

Dunnock (6) Minimum of four noted in song around the site with others noted foraging on-site.

Wren (x10) Six noted in song around the site and adults noted provisioning food to at least 2 recently fledged young at the southeast corner of the site.

Starling (x15) Noted foraging mainly at the southwest corner of the site during the morning.

Woodpigeon (x15) Three in song around the site and others noted foraging on-site on the playing fields at the west side of the site.

Hooded Crow (x8) Minimum of eight adults noted foraging on-site.

Jackdaw (x25) Minimum count of birds foraging on-site mainly at southwest part of the site.

Rook (x20) Minimum count of bird foraging at the west side of the site.

Magpie (x8) Minimum count of birds noted foraging on-site.

Buzzard (x2) Two noted passing over the site, one at 07.45hrs and one at 09.15hrs both in a southerly direction.

Species proved breeding – Blackbird, Robin, Wren were all observed to be breeding on site during the site assessments. .

May 28th, 2022

Sunrise- 05.07hrs/Sunset- 21.37hrs. Weather – Wind F1 North, Cloud 5/8, Dry, 12c, Excellent visibility. On-site 06.15hrs – 10.15hrs.

Species recorded – Herring Gull, Lesser black-backed Gull, Blackbird, Song Thrush, Coal Tit, Blue Tit, Long-tailed Tit, Goldfinch, Chaffinch, Linnet, Chiffchaff, Willow Warbler, Blackcap, Goldcrest, Meadow Pipit, Pied Wagtail, Robin, Dunnock, Wren, Swallow, House Martin, Starling, Woodpigeon, Hooded Crow, Jackdaw, Rook, Magpie.

Herring Gull (x20) Birds (<20 minimum) noted passing over the site, single birds observed foraging on playing fields briefly during morning.

Lesser black-backed Gull (x5) Birds noted passing over site only during the morning.

Blackbird (x12) Three in song at the north side of the site and three in song at the south side of the site, others noted foraging on-site, a were pair observed providing food to two recently fledged at the south end of site at 07.30hrs.

Song Thrush (x3) One in song at the north side of site and one in song at the southeast corner of the site. A bird was noted delivering food to a nest location at the northeast corner of the site at 07.05hrs.

Coal Tit (x2) Two birds noted in song at the north side of the site intermittently during the morning.

Blue Tit (x15) One pair noted provisioning food to recently fledged young at the north end of the site during the morning, other birds noted foraging on-site minimum of 15 noted.

Long-tailed Tit (x2) Pair noted delivering food to a nest location at the southeast corner of the site during the morning.

Goldfinch (x12) Minimum of five in song around the site, mainly at the north end of the site, others noted foraging around the site.

Chaffinch (x4) Two noted in song at the north end of the site during the morning, pair also noted foraging at the west side of the site.

Linnet (x5) One in song at the southeast corner of the site and others noted foraging around the site.

Chiffchaff (x1) One again in song at the northeast corner of the site during the morning.

Willow Warbler (x2) One in song at the north of site adjacent the stream in center part and one in song at the southeast corner of the site during the morning.

Blackcap (x3) Two in song at the north end of the site and one in song at the southeast corner throughout the morning.

Goldcrest (x7) Pair noted provisioning food to recently fledged young at the north end of the site at 08.45hrs.

Meadow Pipit (x1) One in song in fields at the east side of the site intermittently during the morning.

Robin (x8) A minimum of five in song around the site and recently fledged young also observed in several locations.

Dunnock (8) Minimum of three noted in song around the site with others noted foraging on-site.

Wren (x13) Seven noted in song around the site and adults noted provisioning food to at least 4 recently fledged young at the north end of the site at 09.10hrs.

Swallow (x6) Minimum number noted foraging over the site during the morning.

House Martin (x5) Minimum number noted foraging over the south end of the site during the morning.

Starling (x30) Noted foraging mainly at the southwest corner of the site during the morning.

Woodpigeon (x20) Five in song around the site and others noted foraging mainly on the playing fields at the west side of the site.

Hooded Crow (x6) Minimum of six adults noted foraging on-site, including a pair tending a nest at the southwest corner of the site.

Jackdaw (x20) Minimum count of birds foraging on-site mainly at southwest part of the site.

Rook (x15) Minimum count of bird foraging at the west side of the site.

Magpie (x10) Minimum count of birds noted foraging on-site.

Species proved breeding – Blackbird, Song Thrush, Blue Tit, Long-tailed Tit, Goldcrest, Robin, Wren, Hooded Crow.

June 16th, 2022

Sunrise- 04.56hrs/Sunset- 21.55hrs. Weather – Wind F1 Southeast, Cloud 5/8, Dry, 12c, Excellent visibility. On-site 06.00hrs – 09.45hrs.

Species recorded – Herring Gull, Lesser black-backed Gull, Blackbird, Song Thrush, Coal Tit, Blue Tit, Great Tit, Goldfinch, Bullfinch, Chaffinch, Linnet, Chiffchaff, Willow Warbler, Blackcap, Goldcrest, Meadow Pipit, Pied Wagtail, Robin, Dunnock, Wren, Swallow, House Martin, Starling, Woodpigeon, Hooded Crow, Jackdaw, Rook, Magpie, Sparrowhawk, Buzzard.

Herring Gull (x25) Birds (<25 minimum) noted passing over the site, no birds observed foraging on-site.

Lesser black-backed Gull (x5) Birds noted passing over site only during the morning.

Blackbird (x10) Two in song at the north side of the site and three in song at the south side of the site, others noted foraging on-site.

Song Thrush (x4) One in song at the north side of site. A pair noted provisioning food to a recently fledged bird at the southwest corner of the site at 08.35hrs.

Coal Tit (x7) Pair noted provisioning food to recently fledged young at the north end of the site during the morning.

Blue Tit (x20) Minimum number noted foraging around the site including recently fledged young.

Great Tit (x2) Pair noted foraging at the northeast corner of the site at 09.30hrs.

Goldfinch (x12) Minimum of five in song around the site, mainly at the north end of the site, others noted foraging around the site.

Bullfinch (x3) Three noted foraging at the southeast corner of the site at 07.15hrs.

Chaffinch (x5) One in song at the northeast corner of the site and a pair noted provisioning food to young at the south end of the site at 07.45hrs.

Linnet (x6) Minimum of six noted foraging at the east side of the site during the morning.

Chiffchaff (x1) One noted foraging at the north end of the site at 06.45hrs.

Willow Warbler (x4) Pair noted provisioning food to at least two young in center of site during the morning.

Blackcap (x2) Two in song at the north end of the site.

Goldcrest (x5) One in song at the northeast corner of the site and a minimum of four noted foraging around the site.

Meadow Pipit (x2) Pair noted at the east side of the site.

Robin (6) A minimum of four in song around the site and recently fledged young also observed in several locations.

Dunnock (10) Minimum of four noted in song around the site with others noted foraging on-site.

Wren (x10) Six noted in song around the site and recently fledged juveniles also observed around the site.

Swallow (x4) Minimum number noted foraging over the site during the morning.

House Martin (x8) Minimum number noted foraging over the site during the morning.

Starling (x30) Noted foraging mainly at the west side of the site during the morning.

Woodpigeon (x15) Two in song around the site and others noted foraging around the site.

Hooded Crow (x10) Minimum of ten adults noted foraging on-site.

Jackdaw (x30) Minimum count of birds foraging on-site mainly at the west side of the site.

Rook (x10) Minimum count of bird foraging at the west side of the site.

Magpie (x8) Minimum count of birds noted foraging on-site.

Buzzard (x2) Pair observed soaring over center of site at 09.20hrs.

Sparrowhawk (x1) Male observed hunting at the west side of the site at 09.10hrs.

Species proved breeding – Song Thrush, Coal Tit, Blue Tit, Chaffinch, Willow Warbler, Robin, Wren.

Summary of Breeding Bird Survey observations at Dublin Airport site May-June 2022

Thirty-two Bird species were recorded at the Dublin Airport site over three breeding bird surveys in May and June 2022. Of these species recorded eleven species were proven breeding on-site these being – Blackbird, Robin, Wren, Song Thrush, Blue Tit, Coal Tit, Long-tailed Tit, Goldcrest, Chaffinch, Willow Warbler and Hooded Crow. Breeding species recorded on-site that are amber-listed on Birdwatch Ireland's Bird of conservation concern in Ireland 2020-2026 were Willow Warbler and Goldcrest.

Dublin Airport (Dardistown) Winter Bird Surveys 2022-2023

Introduction

Between November 2022 and March 2023 10 winter bird surveys (two per month) were undertaken at lands at Dardistown, Dublin Airport, North County Dublin, by Hugh Delaney, a freelance Ecologist (Birds primarily) having completed work on numerous sites with ecological consultancies over 10+ years. Hugh is local to the Dun Laoghaire-Rathdown area in Dublin and is especially familiar with the bird life and its ecology in the environs going back over 30 years.

Winter Bird Survey Methodology

Winter bird surveys are conducted from soon after sunrise until late in the afternoon, or alternatively started later in the day until sunset, the site is monitored throughout the survey period and all bird species utilizing the site recorded, including species flying through overhead. Checks are also made on suitable habitat nearby or adjacent to the site for comparative purposes and to monitor any interchange of birds between sites. Target species (species of more special interest) utilizing the site will be mapped and estimates of the time these species frequented the site recorded.

Site Location

Fig. 1 Dublin Airport Dardistown site (outlined in red). Playing fields situated at the west side of the site.

Fig. 2 Secondary site at west side of Airport off R108.

Site Description

Main Dardistown site comprising an area of fields adjacent to Dublin Airport, fields comprising largely of rough grassland within the exception of maintained playing fields at the west side of the site. Fields bordered by hedgerows and larger trees, and area of larger trees is situated midway along the north end of the site. A small stream bisects the north end of the site flowing west to east with some wetter patches in fields adjacent the stream at the east side of the site.

The secondary site at the west side of the Airport in Fig.2 comprises an area of rough ground bordered by a hedgerow and the R108 to the north.

Specific site survey methodology

Entire site was traversed several times during each survey, starting from the west side and moving east and vice versa, following the fields down to the south end of the site, then returning north following same pattern. Extended observations were made on the playing fields area when targets were present. Early survey visits and later survey visits were made alternatively between surveys to ascertain bird movements early in the day and later in the day.

November 5th, 2022

Sunrise- 07.31hrs/Sunset 16.45hrs. Weather – Wind F3 West, Cloud 3/8, Dry, 10c, Excellent visibility. On-site 08.00hrs – 14.00hrs.

Species recorded – Buzzard, Sparrowhawk, Snipe, Herring Gull, Black-headed Gull, Woodpigeon, Feral Pigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Song Thrush, Mistle Thrush, Blackbird, Goldcrest, Wren, Coal Tit, Blue Tit, Starling, Magpie, Jackdaw, Rook, Hooded Crow, Chaffinch, Linnet, Goldfinch, Bullfinch.

08.00hrs-12.00hrs – Site traversed from the northwest corner to east and south and back in reverse. One **Snipe** (<1) was flushed from field at the northeast corner of the site adjacent the stream. Herring Gull (<6) were noted intermittently foraging in the playing fields at the west side of the site, with occasional birds passing over the site with Black-headed Gull (<15 of each species). Other species recorded foraging around the site – Meadow Pipit (<15), Blackbird (<6), Mistle Thrush (<3 on playing

fields), Song Thrush (<5), Robin (<6), Dunnock (<6), Pied Wagtail (<3), Woodpigeon (<25), Blue Tit (<4), Coal Tit (<4), Chaffinch (<5), Bullfinch (<2), Linnet (<6), Rook (<30), Buzzard (<1), Jackdaw (<12) and Starling (<20).

12.00hrs-14.00hrs – Herring Gull (<1) and Black-headed Gull (<4) were observed foraging intermittently on the south end of the playing fields. Other species recorded were Goldcrest (<5 at north end), Meadow Pipit (<10), Chaffinch (<8), Bullfinch (<4), Goldfinch (<45) and Linnet (<10). Sparrowhawk noted hunting at the west side of the site at 13.15hrs. No other target species recorded. At the secondary site at the west side of the Airport – Linnet (<15), Goldfinch (<2), Wren (<2), Meadow Pipit (<3), Robin (<3) and Blackbird (<2) were the only species recorded.

November 22nd, 2022

Sunrise- 08.02hrs/Sunset 16.19hrs. Weather – Wind F2 West, Cloud 7/8, Dry, 3c, Excellent visibility. On-site 10.00hrs – 16.00hrs.

Species recorded – Buzzard, Snipe, Herring Gull, Lesser black-backed Gull, Black-headed Gull, Woodpigeon, Feral Pigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Song Thrush, Blackbird, Goldcrest, Wren, Coal Tit, Blue Tit, Long-tailed Tit, Starling, Magpie, Jackdaw, Rook, Hooded Crow, Chaffinch, Linnet, Goldfinch, Bullfinch.

10.00hrs-12.00hrs – Site traversed from the northwest corner to east and south and back in reverse. Five **Snipe** (<5) were flushed from field at the northeast corner of the site adjacent the stream. Herring Gull (<3), Lesser black-backed Gull (<1) and Black-headed Gull (<10) were noted intermittently foraging in the playing fields at the west side of the site, with occasional birds passing over the site. Other species recorded foraging around the site – Meadow Pipit (<10), Blackbird (<10), Song Thrush (<5), Robin (<8), Wren (<6), Stonechat (<1 at south end of site), Dunnock (<5), Pied Wagtail (<5), Woodpigeon (<40), Blue Tit (<6), Coal Tit (<2), Long-tailed Tit (<3), Chaffinch (<8), Bullfinch (<4), Linnet (<20), Rook (<10), Jackdaw (<15) and Starling (<30). Buzzard (<3) noted occasionally soaring over the east side of the site. No other target species recorded.

12.00hrs-16.00hrs – Black-headed Gull (<6) were observed foraging intermittently on the north end of the playing fields. Other species recorded were Goldcrest (<2 at north end), Meadow Pipit (<8), Chaffinch (<3), Goldfinch (<30) and Linnet (<16). Buzzard (<2) noted foraging north end of site at 12.40hrs. No other target species recorded. At the secondary site at the west side of the Airport – Goldfinch (<2), Wren (<3), Meadow Pipit (<4), Dunnock (<3), Robin (<3) Song Thrush (<2) and Blackbird (<4) were the only species recorded.

December 3rd, 2022

Sunrise- 08.20hrs/Sunset 16.09hrs. Weather – Wind F1 East, Cloud 6/8, Dry, 5c, Excellent visibility. On-site 08.30hrs – 14.30hrs.

Species recorded – Sparrowhawk, Woodcock, Snipe, Herring Gull, Black-headed Gull, Woodpigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Song Thrush, Mistle Thrush, Blackbird, Goldcrest, Wren, Great Tit, Blue Tit, Starling, Magpie, Jackdaw, Rook, Hooded Crow, Raven, Chaffinch, Linnet, Goldfinch, Bullfinch.

08.00hrs-12.00hrs – Site traversed from northwest to east and south and back in reverse. **Woodcock** (<3) were flushed from the two fields at the east site of site adjacent M50. Two **Snipe** were flushed from field at the northeast corner of the site adjacent the stream. Black-headed Gull (<5) and Herring Gull (<3) were noted intermittently foraging in the playing fields at the west side of the site, with occasional

birds passing over the site (<10 of each species). Other species recorded foraging around the site – Meadow Pipit (<10), Blackbird (<12), Song Thrush (<2), Robin (<5), Stonechat (<2 at south end of the site), Dunnock (<6), Pied Wagtail (<2), Woodpigeon (<20), Blue Tit (<7), Great Tit (<3), Chaffinch (<20), Linnet (<15), Rook (<10). A Sparrowhawk was observed hunting over the east side of the site at 11.10hrs.

12.00hrs-14.30hrs – Herring Gull (<3) and Black-headed Gull (<5) were observed foraging intermittently on the playing fields. Raven (<2) passed west over the site at 12.35hrs. Other species recorded were Goldcrest (<3 at north end), Meadow Pipit (<5), Stonechat (<2 at south end of site), Chaffinch (<25), Bullfinch (<5), Goldfinch (<15) and Starling (<30 on playing fields). No other target species recorded. At the secondary site at the west side of the Airport Goldfinch (<5), Wren (<2), Mistle Thrush (<1), Meadow Pipit (<3), Skylark (<1) and Blackbird (<2) were the only species recorded.

December 27th, 2022

Sunrise- 08.40hrs/Sunset 16.12hrs. Weather – Wind F3 Southwest, Cloud 7/8, Dry, 6c, Excellent visibility. On-site 10.00hrs – 16.00hrs.

Species recorded –Buzzard, Snipe, Herring Gull, Black-headed Gull, Woodpigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Song Thrush, Fieldfare, Blackbird, Goldcrest, Wren, Great Tit, Blue Tit, Long-tailed Tit, Starling, Magpie, Jackdaw, Rook, Hooded Crow, Chaffinch, Linnet, Redpoll, Goldfinch, Bullfinch.

10.00hrs-12.00hrs – Site traversed from northwest to east and south and back in reverse. Four **Snipe** (<4) were flushed from field at the northeast corner of the site adjacent the stream. Black-headed Gull (<6) were noted intermittently foraging in the playing fields at the west side of the site, with occasional birds and Herring Gull (<5) passing over the site. Other species recorded foraging around the site – Meadow Pipit (<8), Blackbird (<10), Song Thrush (<4), Fieldfare (<2), Robin (<8), Stonechat (<1 at south end of the site), Dunnock (<7), Pied Wagtail (<3), Woodpigeon (<25), Blue Tit (<4), Great Tit (<1), Long-tailed Tit (<10), Chaffinch (<14), Redpoll (<2), Linnet (<5), Goldfinch (<30 at west side of site). Buzzard (<2) noted intermittently perched and soaring over the north end of the site.

12.00hrs-16.00hrs – **Snipe** (<1) was flushed from the southeast corner of site. Herring Gull (<4) and Black-headed Gull (<2) were observed foraging intermittently on the playing fields during afternoon. Other species recorded were Goldcrest (<2 at north end), Meadow Pipit (<6), Stonechat (<1 at south end of site), Chaffinch (<10), Bullfinch (<2), Goldfinch (<15), Redpoll (<3) and Starling (<45 on playing fields). No other target species recorded. At the secondary site at the west side of the Airport, Buzzard (<1), Goldfinch (<3), Wren (<2), Meadow Pipit (<5), Skylark (<2) and Blackbird (<1) were the only species recorded.

January 5th, 2023

Sunrise- 08.39hrs/Sunset 16.22hrs. Weather – Wind F2 Southwest, Cloud 8/8, Dry, 11c, Excellent visibility. On-site 08.00hrs – 14.00hrs.

Species recorded – Buzzard, Sparrowhawk, Oystercatcher, Woodcock, Snipe, Herring Gull, Black-headed Gull, Common Gull, Woodpigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Song Thrush, Redwing, Mistle Thrush, Blackbird, Goldcrest, Wren, Great Tit, Coal Tit, Blue Tit, Magpie, Jackdaw, Rook, Hooded Crow, Raven, Chaffinch, Linnet, Goldfinch, Bullfinch.

08.00hrs-12.00hrs – Area traversed from northwest to east, **Snipe** (<1) flushed from edge of stream at the east side of the site at 09.30hrs. A roosting **Woodcock** (<1) was flushed from the field at the

northeast corner of site adjacent the M1 at 09.40hrs. An **Oystercatcher** was foraging at the largest playing field at the west side of site from 10.42hrs to 12.10hrs, also foraging here were Mistle Thrush (<5) and Redwing (<2). Buzzard (<2) observed at several intervals soaring mainly over the north side of the site during the morning. Other species recorded foraging around the site – Goldcrest (<3), Meadow Pipit (<5), Song Thrush (<4), Robin (<6), Dunnock (<4), Pied Wagtail (<2), Woodpigeon (<15), Blue Tit (<5), Coal Tit (<4), Chaffinch (<10), Linnet (<12). Black-headed Gull (<10), Common Gull (<3) and Herring Gull (<8) noted occasionally passing over the site, none observed foraging on-site.

12.00hrs-14.00hrs – Raven (<2) flew south over the site at 12.20hrs. A Sparrowhawk was noted hunting at the north end of the site at 13.05hrs. Other species recorded were Bullfinch (<2), Goldfinch (<10), Linnet (<6), Meadow Pipit (<6), Dunnock (<5), Robin (<4), Blue Tit (<2), Great Tit (<3), Blackbird (<8), Song Thrush (<3). No other target species recorded. At the secondary site at the west side of the Airport Linnet (<12), Goldfinch (<5), Wren (<2) and Blackbird (<2) were the only species recorded.

January 20th, 2023

Sunrise- 08.27hrs/Sunset 16.45hrs. Weather – Wind F1 Southwest, Cloud 5/8, Dry, 2c, Excellent visibility. On-site 10.30hrs – 16.30hrs.

Species recorded – Buzzard, Oystercatcher, Snipe, Herring Gull, Black-headed Gull, Woodpigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Song Thrush, Redwing, Mistle Thrush, Fieldfare, Blackbird, Goldcrest, Wren, Great Tit, Coal Tit, Blue Tit, Long-tailed Tit, Magpie, Jackdaw, Rook, Hooded Crow, Raven, Chaffinch, Linnet, Goldfinch, Siskin, Bullfinch, Reed Bunting.

10.30hrs-12.00hrs – Site surveyed from northwest to east moving south and back in reverse in afternoon. **Snipe** (<6) flushed from the three fields at the east side of the site. Buzzard (<2) observed foraging in trees in middle of site at 10.55hrs. At the playing fields at the west side of site **Oystercatcher** (<4) observed foraging from 11.05hrs-12.15hrs with one bird remaining to 13.10hrs at rugby field at the north end of the site. Herring Gull (<3) and Black-headed Gull (<9) observed foraging intermittently on the playing fields during the morning with small numbers (<10) noted passing over the site. Also recorded were Redwing (<25 foraging at the west side of the site), Fieldfare (<15 at west side of site), Blackbird (<15), Song Thrush (<3), Mistle Thrush (<2), Goldcrest (<2 at north end), Chaffinch (<12), Goldfinch (<20), Bullfinch (<3) Siskin (<2) and Reed Bunting (<1). No other target species recorded.

12.00hrs-16.30hrs – Herring Gull (<2) and Black-headed Gull (<5) noted foraging on the playing fields from 13.00-15.15hrs. **Oystercatcher** (<2) noted foraging on playing field at southwest corner of site from 14.50-15.40hrs. Buzzard (<3) noted intermittently mainly at the east side of the side during the afternoon. Other species recorded were Redwing (<20), Fieldfare (<15), Chaffinch (<180, Goldfinch (<30), Linnet (<10), Dunnock (<8), Robin (<4), and Woodpigeon (<35). Raven (<1) passed south over middle of site at 15.22hrs. No other target species recorded. At the secondary site at the west side of the Airport, Linnet (<10), Goldfinch (<2), Robin (<2), Dunnock (<4), Wren (<2) and Blackbird (<4) were recorded, also Black-headed Gull (<1) foraging. No other target species recorded.

February 11th, 2023

Sunrise- 07.52hrs/Sunset 17.27hrs. Weather – Wind F2 Southwest, Cloud 8/8, Dry, 11c, Excellent visibility. On-site 11.00hrs – 17.00hrs.

Species recorded – Woodcock, Herring Gull, Black-headed Gull, Common Gull, Woodpigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Stonechat, Song Thrush, Redwing, Mistle Thrush, Blackbird, Goldcrest, Wren, Blue Tit, Long-tailed Tit, Magpie, Jackdaw, Rook, Hooded Crow, Starling, Chaffinch, Linnet, Goldfinch, Greenfinch, Siskin, Bullfinch.

08.00hrs-17.00hrs – Area traversed from northwest to east, **Woodcock** (<2) flushed from the northeast field adjacent M1 at 14.00hrs. Black-headed Gull (<3) foraging on the playing fields at the west side of the site intermittently during the afternoon. Also recorded around the site Mistle Thrush (<4 on playing fields), Goldfinch (<30), Chaffinch (<10), Blackbird (<8), Starling (<15), Stonechat (<1 at south end of the site), Redwing (<4 foraging on the playing fields), Meadow Pipit (<15 including 10 together foraging at south end of site at 13.30hrs). Herring Gull (<2) foraging on playing fields from 13.00hrs-15.00hrs, Woodpigeon (<10 around site), Long-tailed Tit (<5), Blue Tit (<3), Goldcrest (<3 foraging in trees at north end of the site), Pied Wagtail (<2 on playing fields), Dunnock (<4), Siskin (<2 foraging at the north end of site). Greenfinch (<2 in center of site at 14.10hrs). No other target species recorded.

At the secondary site at the west side of the Airport - Skylark (<1), Linnet (<5), Dunnock (<2), Jackdaw (<6), Blackbird (<2), Chaffinch (<8) and Goldfinch (<5) were recorded.

February 26th, 2023

Sunrise- 07.20hrs/Sunset 17.56hrs. Weather – Wind F2 East, Cloud 6/8, Dry, 6c, Excellent visibility. On-site 07.30hrs – 14.00hrs.

Species recorded – Sparrowhawk, Oystercatcher, Woodcock, Snipe, Herring Gull, Black-headed Gull, Woodpigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Stonechat, Song Thrush, Redwing, Mistle Thrush, Blackbird, Goldcrest, Wren, Great Tit, Coal Tit, Blue Tit, Long-tailed Tit, Magpie, Jackdaw, Rook, Hooded Crow, Starling, Chaffinch, Redpoll, Linnet, Goldfinch, Bullfinch.

07.30hrs-12.00hrs – Area traversed from northwest to east, **Snipe** (<3) flushed from the two fields in northeast corner of site adjacent the stream at 09.45hrs. A **Woodcock** (<1) was flushed field at the northeast of site at 10.20hrs. **Oystercatcher** (<8), Herring Gull (<6) and Black-headed Gull (<3) noted foraging on the playing fields at the west side from 10.30hrs-11.15hrs, birds then flushed by walkers. Other species recorded Goldfinch (<20), Chaffinch (<15), Redpoll (<4) and Bullfinch (<2) all recorded foraging in hedgerows adjacent the playing fields. Blackbird (<8), Redwing (<15), Mistle Thrush (<2), Song Thrush (<5), Meadow Pipit (<7), Goldcrest (<2), Wren (<10), Robin (<5), Long-tailed Tit (<12), Blue Tit (<5) and Stonechat (<1) were all recorded around the site.

12.00hrs-14.00hrs – **Oystercatcher** (<2) observed passing west over the south end of the site at 12.50hrs, not observed foraging on-site. A Sparrowhawk was observed hunting at the east side of the site at 13.15hrs. Black-headed Gull (<2) observed foraging on the rugby playing field at the northwest corner of the site from 12.55hrs-13.30hrs. Starling (<15), Mistle Thrush (<2), Blackbird (<5), Woodpigeon (<8) and Rook (<6) were the only species observed foraging on the playing fields.

At the secondary site at the west side of the Airport, Goldfinch (<3), Linnet (<8), Chaffinch (<2), Rook (<10) and Stonechat (<1) were the only species recorded.

March 6th, 2023

Sunrise- 07.01hrs/Sunset 18.11hrs. Weather – Wind F2 West, Cloud 4/8, Dry, 7c, Excellent visibility. On-site 11.30hrs – 17.30hrs.

Species recorded – Buzzard, Snipe, Herring Gull, Lesser black-backed Gull, Black-headed Gull, Woodpigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Stonechat, Song Thrush, Mistle Thrush, Blackbird, Goldcrest, Wren, Great Tit, Blue Tit, Long-tailed Tit, Magpie, Jackdaw, Rook, Hooded Crow, Starling, Chaffinch, Greenfinch, Linnet, Goldfinch, Bullfinch.

11.30hrs-17.30hrs – Area traversed from northwest to east, **Snipe** (<2) flushed from the two fields in northeast corner of site adjacent the stream at 12.50hrs. Herring Gull (<4), lesser black-backed Gull (<1) and Black-headed Gull (<6) noted foraging on the playing fields at the west side from 13.45hrs-16.15hrs intermittently. Buzzard (<3) observed soaring over the north and east side of site. Other species recorded Goldfinch (<15), Chaffinch (<8), Greenfinch (<2), Bullfinch (<6), Blackbird (<14), Mistle Thrush (<2), Song Thrush (<8), Meadow Pipit (<10), Goldcrest (<4), Wren (<8), Robin (<5), Long-tailed Tit (<8), Blue Tit (<9) Great Tit (<2) and Stonechat (<1) were all recorded around the site.

At the secondary site at the west side of the Airport, Goldfinch (<8), Linnet (<2), Dunnock (<2), Meadow Pipit (<6), Robin (<1) and Blackbird (<4) were the only species recorded.

March 23rd, 2023

Sunrise- 06.21hrs/Sunset 18.43hrs. Weather – Wind F3 Southwest, Cloud 4/8, Dry, 7c, Excellent visibility. On-site 07.30hrs – 13.30hrs.

Species recorded – Buzzard, Herring Gull, Lesser black-backed Gull, Black-headed Gull, Woodpigeon, Meadow Pipit, Pied Wagtail, Dunnock, Robin, Song Thrush, Mistle Thrush, Blackbird, Goldcrest, Wren, Great Tit, Blue Tit, Long-tailed Tit, Magpie, Jackdaw, Rook, Hooded Crow, Raven, Starling, Chaffinch, Linnet, Goldfinch, Bullfinch, Chiffchaff.

07.30hrs-13.30hrs – Area traversed from northwest to east and then south returning across site in reverse. Lesser black-backed Gull (<2) and Black-headed Gull (<4) noted foraging on the playing fields at the west side from 08.50hrs-10.15hrs intermittently. Buzzard (<2) observed soaring over the west and south side of site at 10.35hrs and 11.45hrs respectively. Other species recorded Goldfinch (<20), Chaffinch (<12), Bullfinch (<2), Blackbird (<10), Mistle Thrush (<1 seen nest building), Song Thrush (<6), Meadow Pipit (<15 mainly passing north over site), Goldcrest (<2), Wren (<10), Robin (<6), Long-tailed Tit (<7), Blue Tit (<10) Great Tit (<2), Chiffchaff (<1) and Raven (1< south over site at 09.45hrs) were all recorded around the site.

At the secondary site at the west side of the Airport, Goldfinch (<4), Linnet (<2), Robin (<2), Dunnock (<2), Meadow Pipit (<6), Starling (<8) and Blackbird (<4) were the only species recorded.

Comments and observations on survey results

In total 42 Bird species were recorded overall at the Dublin Airport site during 10 surveys over the course of the winter bird survey period 2022-2023. Species recorded that are red listed as a wintering species of conservation concern (Birdwatch Ireland's birds of conservation concern in Ireland 2020-2026) that were recorded on-site were **Snipe**, **Oystercatcher** and **Redwing**, each recorded in small numbers, a peak count of Snipe occurring on January 20th (six birds in wet area's near stream at northeast area of site), a maximum Oystercatcher count was eight birds on February 26th and a maximum count of 25 Redwing on January 20th. Amber-listed Gull species were noted to forage in small numbers on the playing fields at the west side of the site. The selection of passerine species recorded was typical of that which might be expected in a semi-urban Dublin setting.

Results suggest that the site is not significant ex-situ foraging or roosting site for species of qualifying interest from nearby Special protection areas (SPA's).

Appendix 9.2

Aquatic Walkover Survey Report

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October 2022

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Introduction

Background to the Assessment

The Cuckoo Stream is the primary stream that receives flows from within the airfield of Dublin Airport. The drainage network where aircraft are de-iced prior to departure, drains to the Cuckoo Catchment where an existing pollution control facility is in place. When triggered, by elevated levels of chemicals in the water, the pollution control facility discharges to the Ringsend Waste Water Treatment Plant.

The Airport Drainage Plan (ADP) proposes significant upgrades to the surface water management infrastructure at Dublin Airport. The ADP comprises a series of drainage system enhancement measures and infrastructure proposals, including the upgrade of existing drainage infrastructure and the construction of additional infrastructure to supplement the performance of the existing surface water management system.

A core objective of the ADP is to provide a nett improvement in the degree of protection afforded to the receiving waters by the surface water management system, in order to address the water quality objectives

It is proposed to achieve this through a series of drainage system enhancement measures and infrastructure proposals. These proposals include the implementation of a new Contamination Detection and Response (CD&R) System and the provision of additional pollution control facilities. The network enhancements also intend to intercept greenfield inflows, at points upstream of the airport campus, and convey them directly to the receiving waters. Some reconfigurations of existing networks will be necessary to achieve an integrated system with a consistent airfield-wide approach to flow segregation and pollution. This will include a diversion of the Cuckoo Stream within the airport and works to the lands east of the R132, proximate to the airport. This assessment is to assess the baseline condition of the Cuckoo Stream proximate to Dublin Airport.

Statement of Authority

The proposed assessment was carried out by Prof. Joe Caffrey. Joe Caffrey has a PhD from UCD in aquatic plant biology, ecology and management. He has worked with Inland Fisheries Ireland (IFI) and its predecessors for 39 years where he carried out and managed extensive freshwater and riparian surveys throughout his career in IFI. Altemar and Prof. Caffrey have a long working relationship and have worked together for many years including the running of the CAISIE LIFE project, electrofishing projects for clients including NPWS and are currently working together on the WFD canal monitoring programme for Waterways Ireland.

Methodology

The aquatic assessment involved a walkover and instream assessment of the Cuckoo Stream. This involved an initial assessment of the stream within the airport (from the R132) and a visual instream inspection from the R132 to where it enters a culvert under the M1 motorway. Species were identified in situ.

Results

When sampled in October 2022, the Cuckoo stream supported a brisk flow of water, although water levels were close to normal judging by the debris along the banksides. The water in the upstream section of the stream, close to the airport, had a greyish colour, although there was no malodour from it. With progress

downstream, towards the M1, the colour improved and the water was reasonably clear at the culvert that brought the stream under the M1 motorway.

The following assessment was carried out on the 17th October 2022. The stream is narrow, to 2 metres wide and supported a maximum depth of 1 metre. The river alternated between fast flowing riffles, glides and slow-flowing pools. The substrate comprised of gravels that were often deeply consolidated or covered in a deposition that was grey and somewhat marl-like. This material was also present within Dublin Airport and appeared to be a dense bacterial mat (Bryan Deegan pers comms). When loosened by hand, the gravels were deep and would provide ideal spawning gravel for *Salmo trutta* (Brown Trout) or *Salmo salar* (Atlantic Salmon).

The margins of the stream were well vegetated and few exposed bankside areas were present. The principal species to occupy this normally wetted area of the stream included *Apium nodiflorum* (Fool's water-cress), *Nasturtium aquaticum* (Watercress) and *Juncus effusus* (Soft Rush). The higher banks were densely vegetated and often overgrown with low-growing shrubbery, brambles, nettles and Buddleja. These commonly tunnelled the narrow channel.

The aquatic flora in the stream was very reduced and it is estimated that the overall percentage ground cover occupied by submerged macrophytes over the section sampled was < 1%. The only species recorded were angiosperm *Callitrich platycarpa* (Various-leaved Water-starwort), the bryophyte *Fontinalis antipyretica* (Greater Water-moss) and the filamentous green alga *Cladophora* sp. (cf. *glomerata*). The former species was represented as a small number of stands that occupied the more slow-flowing water in the glides and pools (see Plate 1 (right)). Only very small stands of *F. antipyretica* and *Cladophora* sp., were recorded, clinging to rocks and gravel in the more fast-flowing sections of the stream.

Table 1. Flora Species.

Species Present	**Conservation value.**
Apium nodiflorum (Fool's water-cress)	Common Species (not protected)
Nasturtium aquaticum (Watercress)	Common Species (not protected)
Juncus effusus (Soft Rush).	Common Species (not protected)
Callitrich platycarpa (Various-leaved Water-starwort),	Common Species (not protected)
Fontinalis antipyretica (Greater Water-moss)	Common Species (not protected)
Green alga *Cladophora sp. (cf. glomerata)*	Common Species (not protected)

The biodiversity of macrophytes recorded in the section of Cuckoo stream surveyed was low (Table 1) and significantly lower than might be expected for a stream of this size elsewhere in the country. The reason for this was not apparent during sampling but could be related to the maintenance activities conducted in the airport, particularly during the winter months. As discussed with Bryan Deegan (Pers comms) the presence of bacterial biofilm within the bed of the stream could potentially impact on the oxygen availability for roots of macrophytes within the stream. As outlined in Nott et al (2020) *'Prolific heterotrophic biofilm growth is a common occurrence in airport receiving streams containing deicers and anti-icers, which are composed of low-molecular weight organic compounds.'* In addition the *'Additional investigations identified the isolate as a new strain of Sphaerotilus montanus (strain KMKE) able to use deicer components as carbon sources and found that stream dissolved oxygen concentrations related inversely to biofilm volume as well as to antecedent temperature and chemical oxygen demand. The airport setting provides insight into potential consequences of widescale adoption of organic deicers for roadway deicing.'*

Plate 1. The Cuckoo stream showing dense marginal stands of Apium nodiflorum and Nasturtium aquaticum (left) and very occasional submerged stands of Callitriche platycarpa (right) in October 2022.

As with the macrophytes, the abundance and diversity of aquatic invertebrates was lower than would be expected in such a stream. The dominant organism recorded, with only moderate abundance, was *Asellus aquaticus* (Water Louse). There was a distinct paucity of Gastropods on the plentiful rocks and gravel in the stream, suggesting that their populations or their capacity to survive in this stream is impacted by factors that were not apparent on the occasion of sampling. The stream is directly downstream from Dublin Airport and during winter months receives quantities of de-icer which, as it has a high Chemical Oxygen Demand (COD) would have a negative impact on oxygen levels within the watercourse.

One frog (*Rana temporaria*) was observed during sampling but no fishes were seen, even though the bulk of the survey was conducted from within the stream rather than from the banksides. Outward appearance would indicate that this stream should play host to plentiful shoals of *Gasterosteus aculeatus* (Stickleback), to populations of *Anguilla anguilla* (European Eel) and to salmonid species that might include *Salmo trutta* and *Salmo salar*. The fact that not a single fish was observed in the stream during the survey is strongly suggestive of some external impact that has rendered the habitat unsuitable for their survival here.

Conclusion

A stream of this size and nature should play host to a far greater diversity of macrophyte and aquatic invertebrate species than were recorded here during the current survey. In addition, the good flow regime, hydromorphology and the plentiful gravel beds (although now compacted) suggest that it should also be an excellent trout spawning stream.

The current survey was conducted in October, at a time of year when no deicing in the airport has taken place for months. It might, therefore, be expected that the biodiversity in the Cuckoo stream, which receives the outflow from the deicing process, should be relatively high at this time of year, prior to the commencment of de-icing operations.. This clearly was not the case as the biodiversity of macrophyte species, aquatic invertebrates and fishes was very low and indicative of a system that is adversely impacted by some external agent(s). It would be expected that the biodiversity value would improve if the levels of de-icer reduce. However, it would be important to note that not only is the loading of the overall deicer loading in the watercourse important but the elevated levels of de-icer in first flush events would have a negative impact on biodiversity improvement in the watercourse.

Plate 2. Long riffle and glide section showing the densely vegetated marginal and riparian sections of the Cuckoo stream in October 2022.

Prof Joe Caffrey

Director

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Appendix 9.3

Bat Fauna Assessment

23rd January 2023

Prepared by: Bryan Deegan (MCIEEM) of Altemar Ltd.

On behalf of: daa plc.

Altemar Ltd., 50 Templecarrig Upper, Delgany, Co. Wicklow. 00-353-1-2010713. info@altemar.ie

Directors: Bryan Deegan and Sara Corcoran

Company No.427560 VAT No. 9649832U

www.altemar.ie

SUMMARY

Structure: The site consists of a greenfield site, built land brownfield site and an airfield

Location: Dublin Airport, Co. Dublin.

Bat species present: Minor foraging was noted within the proposed site during this survey. Minor foraging and transiting were noted during the 2022 survey.

Proposed work: Drainage infrastructure development.

Impact on bats: No confirmed bat roosts will be lost. No trees of bat roosting potential are noted on site. The proposed development will change the local environment as several hedgerows will be lost. The development is likely to displace bats from foraging at the site during construction. Based on the small number of common species found using the site the displacement from this site it will not have any significant effect on local bat populations, and that any such effect will only be short term. The proposed development is not in proximity to sensitive bat areas. The potential for collision risk and impact on flight paths in relation to bats is considered low due to the low level of bat activity on site.

Survey by: Bryan Deegan MCIEEM

Survey date: 20th August 2022

Receiving Environment

Background

The ADP proposes significant upgrades to the surface water management infrastructure at Dublin Airport. The ADP comprises a series of drainage system enhancement measures and infrastructure proposals, including the upgrade of existing drainage infrastructure and the construction of additional infrastructure to supplement the performance of the existing surface water management system.

A core objective of the ADP is to provide a nett improvement in the degree of protection afforded to the receiving waters by the surface water management system, in order to address the water quality objectives

It is proposed to achieve this through a series of drainage system enhancement measures and infrastructure proposals. These proposals include the implementation of a new Contamination Detection and Response (CD&R) System and the provision of additional pollution control facilities. The network enhancements also intend to intercept greenfield inflows, at points upstream of the airport campus, and convey them directly to the receiving waters. Some reconfigurations of existing networks will be necessary to achieve an integrated system with a consistent airfield-wide approach to flow segregation and pollution. These proposals are designed to provide robust protection to receiving waters and to improve their ecological quality in accordance with the Surface Water Regulations.

It is also proposed to provide hydraulic upgrades to the network. This will provide the network connectivity needed to facilitate the proposed flow segregation system, as well as increasing the hydraulic capacity in the network and alleviating historic capacity issues.

The design of the ADP also includes safeguarding measures to facilitate future developments at Dublin Airport. The inclusion of safeguarding measures is designed to uphold the principles of sustainable and coordinated development, avoiding the need for repeat work or abortive work, which can arise from individual ad-hoc developments.

The ADP drainage system enhancements and infrastructure proposals have been informed by the Drainage Masterplan (DMP), which is a long-term masterplan for drainage infrastructure at Dublin Airport. The DMP outlines a long-term phased and coherent approach to improvements in surface water and foul drainage infrastructure. The DMP considered hydraulic and surface water quality requirements having regard to EU Water Framework Directive (transposed into Irish law in the Surface Waters Regulations 2009).

Figure Error! No text of specified style in document..**1** – Proposed ADP Site Outline (red)

Competency of Assessor

This report has been prepared by Bryan Deegan MSc, BSc (MCIEEM). Bryan has over 26 years of experience providing ecological consultancy services in Ireland. He has extensive experience in carrying out a wide range of bat surveys including dusk emergence, dawn re-entry and static detector surveys. He also has extensive experience reducing the potential impact of projects that involve external lighting on Bats. Bryan trained with Conor Kelleher author of the Bat Mitigation Guidelines for Ireland (Kelleher and Marnell (2022)) and Bryan is currently providing bat ecology (impact assessment and enhancement) services to Dun Laoghaire Rathdown County Council primarily on the Shanganagh Park Masterplan. The desk and field surveys were carried out having regard to the guidance: Bat Surveys for Professional Ecologists – Good Practice Guidelines 3rd Edition (Collins, J. (Ed.) 2016) and Marnell, Kelleher and Mullen (2022), Bat Mitigation Guidelines for Ireland V2 (which update and replace the Bat Mitigation Guidelines for Ireland published in 2006).

Legislative Context

Wildlife Act 1976 (as amended by, inter alia, the Wildlife (Amendment) Act 2000).

Bats in Ireland are protected by the Wildlife (Amendment) Act 2000. Based on this legislation it is an offence to wilfully interfere with or destroy the breeding or resting place of any species of bat. Under this legislation it is an offence to "*Intentionally kill, injure or take a bat, possess or control any live or dead specimen or anything derived from a bat, wilfully interfere with any structure or place used for breeding or resting by a bat, wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose.* "

Habitats Directive- Council Directive 92/43/EEC 1992 on the conservation of natural habitats and of wild fauna and flora has been transposed into Irish Law, including, via, *inter alia*, the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended). See Art.73 of the 2011 Regulations which revokes the 1997 Regulations.

Annex II of the Council Directive 92/43/EEC 1992 on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive) lists animal and plant species of Community interest, the conservation of which requires the designation of Special Areas of Conservation (SACs); Annex IV lists animal and plant species of Community interest in need of strict protection. All bat species in Ireland are listed on Annex IV of the Directive, while the Lesser Horseshoe Bat (*Rhinolophus hipposideros*) is protected under Annex II which is related to the designation of SACs for a species.

Under the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), all bat species are listed under the First Schedule and, pursuant to, *inter alia*, Part 6 and Regulation 51, it is an offence to:

Deliberately capture or kill a bat;

Deliberately disturb a bat particularly during the period of breeding, hibernating or migrating;

Damage or destroy a breeding site or resting place of a bat;

Keep, sell, transport, exchange, offer for sale or offer for exchange any bat taken in the wild.

Bat survey

On site trees were inspected for bats and/or their signs using a powerful torch (141 Lumens) – Petzl MYO RXP. The site survey was supplemented by a review of Bat Conservation Ireland's (BCIreland) National Bat

Records Database. A bat detector and emergence survey was carried out by Bryan Deegan on the 20th August 2022.

Survey methodology

As outlined in Marnell et al. 2022 *'The presence of a large maternity roost can normally be determined on a single visit at any time of year, provided that the entire structure is accessible and that any signs of bats have not been removed by others. However, most roosts are less obvious. A visit during the summer or autumn has the advantage that bats may be seen or heard. Buildings (which for this definition exclude cellars and other underground structures) are rarely used for hibernation alone, so droppings deposited by active bats provide the best clues. Roosts of species which habitually enter roof voids are probably the easiest to detect as the droppings will normally be readily visible. Roosts of crevice-dwelling species may require careful searching and, in some situations, the opening up of otherwise inaccessible areas. If this is not possible, best judgement might have to be used and a precautionary approach adopted. Roosts used by a small number of bats, as opposed to large maternity sites, can be particularly difficult to detect and may require extensive searching backed up by bat detector surveys (including static detectors) or emergence counts.'* In relation to the factors influencing survey results the guidelines outlines the following *'During the winter, bats will move around to find sites that present the optimum environmental conditions for their age, sex and bodyweight and some species will only be found in underground sites when the weather is particularly cold. During the summer, bats may be reluctant to leave their roost during heavy rain or when the temperature is unseasonably low, so exit counts should record the conditions under which they were made. Similarly, there may be times when females with young do not emerge at all or emerge only briefly and return while other bats are still emerging thus confusing the count. Within roosts, bats will move around according to the temperature and may or may not be visible on any particular visit. Bats also react to disturbance, so a survey the day after a disturbance event, may give a misleading picture of roost usage.'*

The survey involved the methodologies outlined in Collins (2016) which included the roost inspection methodologies i.e. external methodology outlined in section 5.2.4.1 and the internal survey outlines in section 5.2.4.2 of the guidelines. In addition, the methodologies for Presence absence surveys (Section 7) was carried out for dusk emergent surveys.'

As outlined in Collins (2016) 'The bat active period is generally considered to be between April and October inclusive (although the season is likely to be shorter in northern latitudes). However, because bats wake up during mild conditions, bat activity can also be recorded during winter months.'

Survey Results

Trees as potential bat roosts.

A ground level roost assessment was carried out and used to examine the trees on site for features that could form bat roosts. Potential roosting features include heavy ivy growth, broken limbs, areas of decay, vertical or horizontal cracks, cracks in bark etc. No buildings are on site. No trees of bat roosting potential are noted on site. No roosting bats were noted on site. No bats were noted emerging from any of the onsite trees.

Emergent/detector surveys.

Emergent/detector surveys were carried out by Bryan Deegan on the 20th August 2022 from 8pm-12am. The detector survey was undertaken within the active bat season and the transects covered the entire site multiple times during the night. Weather conditions were good with mild temperatures of greater than 10°C after sunset. Winds were light and there was no rainfall. Insects were observed in flight during both surveys.

As outlined in Collins (2016) in relation to weather conditions *'The aim should be to carry out surveys in conditions that are close to optimal (sunset temperature 10°C or above, no rain or strong wind.), particularly when only one survey is planned.... Where surveys are carried out when the temperature at sunset is below 10°C should be justified by the ecologist and the effect on bat behaviour considered.'* There were no constraints in relation to the surveys carried out. All areas of the site were accessible and weather conditions were optimal for bat assessments.

At dusk, bat detector surveys were carried out onsite using a*n Echo meter touch 2 Pro* detector to determine bat activity. Bats were identified by their ultrasonic calls coupled with behavioural and flight observations.

Foraging activity of three bat species (Soprano Pipistrelle (*Pipistrellus pygmaeus*), Common Pipistrelle (*Pipistrellus pipistrellus*) and Lesser Noctule (*Nyctalus leisleri*) were noted along the southern side of the site. No foraging was noted in other areas of the site. No buildings are on site (with the exception of the active construction compound). No trees of bat roosting potential are noted on site. No roosting bats were noted on site.

Bat assessment findings

Review of local bat records

The review of existing bat records (sourced from Bat Conservation Ireland's National Bat Records Database) within two 2km^2 grids (Reference grids O14L & O14R) encompassing the study area reveals that three of the nine known Irish species have been observed locally (Table 1). The National Biodiversity Data Centre's online viewer was consulted in order to determine whether there have been recorded bat sightings in the wider area. This is visually represented in Figures 2 & 3. The following species were noted in the wider area: Brown Long-eared Bat (*Myotis daubentonii*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), and Lesser Noctule (*Nyctalus leisleri*) (Figures 2 & 3).

Table 1: *Status of bat species within 2km^2 grids encompassing the subject site (Reference nos. O14L & O14R)*

Species Name	Record Count	Date of Last Record	Note
O14L			
Pipistrelle (*Pipistrellus pipistrellus sensu lato*)	1	31/07/2008	National Bat Database of Ireland
Lesser Noctule (*Nyctalus leisleri*)	4	31/07/2008	National Bat Database of Ireland
O14R			
Lesser Noctule (*Nyctalus leisleri*)	2	16/07/2008	National Bat Database of Ireland

Figure 2. *Brown Long-eared Bat (Plecotus auritus) (yellow), Lesser Noctule (Nyctalus leisleri) (purple) and both Brown Long-eared Bat and Lesser Noctule (orange)(Source NBDC) (Site location – red circle)*

Figure 3. *Soprano Pipistrelle (Pipistrellus pygmaeus) (purple) (Source NBDC) (Site location – red circle)*

Specifically, NBDC records show sightings of bat species in locations that are in close proximity to the subject site:

Table 2: *Sightings of bat species in locations that are in close proximity to the subject site (NBDC)*

Species Name	Grid Reference	Date of Record	Distance from Site
Lesser Noctule (*Nyctalus leisleri)*	O1543	16/07/2008	within the subject site
Lesser Noctule (*Nyctalus leisleri)*	O1643	16/07/2008	within the subject site
Lesser Noctule (*Nyctalus leisleri)*	O1542	31/07/2008	within the subject site
Lesser Noctule (*Nyctalus leisleri)*	O1642	16/07/2008	within the subject site
Lesser Noctule (*Nyctalus leisleri)*	O150440	14/09/2002	100m East of the subject site
Lesser Noctule (*Nyctalus leisleri)*	O140440	14/09/2002	300m West of the subject site
Lesser Noctule (*Nyctalus leisleri)*	O171417	31/05/2011	470m South of the subject site
Lesser Noctule (*Nyctalus leisleri)*	O189428	Oct. 2010	500m West of the subject site
Soprano Pipistrelle (*Pipistrellus pygmaeus*)	O150440	14/09/2002	100m East of the subject site
Soprano Pipistrelle (*Pipistrellus pygmaeus*)	O140440	14/09/2002	300m West of the subject site
Soprano Pipistrelle (*Pipistrellus pygmaeus*)	O171417	31/05/2011	470m South of the subject site
Soprano Pipistrelle (*Pipistrellus pygmaeus*)	O189428	Oct. 2010	500m West of the subject site
Brown Long-eared Bat (*Plecotus auritus*)	O150440	14/09/2002	100m East of the subject site
Brown Long-eared Bat (*Plecotus auritus*)	O140440	14/09/2002	300m West of the subject site

Evaluation of Results

The bat surveys comply with bat survey guidance documentation including Marnell *et al.*, (2022) and Collins (2016). Foraging activity of three bat species (Soprano Pipistrelle (*Pipistrellus pygmaeus*), Lesser Noctule (*Nyctalus leisleri*) and Common Pipistrelle (*Pipistrellus pipistrellus*) were noted along the eastern area of the site. No buildings are on site. No trees of bat roosting potential are noted on site. No roosting bats were noted on site. The site is of relatively low importance to the local bat population.

Potential Impact of the development on Bats

Minor foraging and transiting were noted during the 2022 survey. The proposed development will change the local environment in the short term and some of the existing vegetation will be removed. The development is likely to displace bats from foraging in the vicinity of removed vegetation. Based on the fact that a small number of common species were found using the site, the temporary displacement from this site is unlikely to have any significant effect on local bat populations, and that any such effect will be only negative at the site level. No bat roosts or potential bat roosts will be lost due to this development and the species noted to occur on site should persist in the area. However, foraging activity on site may be reduced in the short-medium term. The proposed development is not in proximity to sensitive bat areas. The potential for collision risk and impact on flight paths in relation to bats is considered low due to the low level of bat activity on site.

Mitigation Measures

As outlined in Marnell *et al.* (2022) "*Mitigation should be proportionate. The level of mitigation required depends on the size and type of impact, and the importance of the population affected.*" In addition, as outlined in Marnell *et. al* (2022) '*Mitigation for bats normally comprises the following elements:*

Avoidance of deliberate, killing, injury or disturbance – taking all reasonable steps to ensure works do not harm individuals by altering working methods or timing to avoid bats. The seasonal occupation of most roosts provides good opportunities for this

Roost creation, restoration or enhancement – to provide appropriate replacements for roosts to be lost or damaged

Long-term habitat management and maintenance – to ensure the population will persist

Post-development population monitoring – to assess the success of the scheme and to inform management or remedial operations.'

No trees of bat roosting potential are noted on site. The level of activity on site is low with common bat species foraging on site. As a result, the following mitigation will be implemented:

Lighting at all construction stages will be done sensitively on site with no direct lighting of site boundaries and lands to the south of the proposed development

Lighting during operation will be controlled and bat sensitive lighting in place.

Predicted Residual Impact of Planned Development on Bats

Foraging activity of three common bat species (soprano pipistrelle (*Pipistrellus pygmaeus*), Lesser Noctule (*Nyctalus leisleri*) and common pipistrelle (*Pipistrellus pipistrellus*) were noted along the eastern portion of the site. No buildings are to be demolished on site. No trees of bat roosting potential are noted on site. No bat roosts were noted on site. Therefore, based on the survey findings, it is expected that the proposed development will not result in the loss of any bat roost given that no bats were detected roosting on site. The proposed development will change the local environment. There would be expected to be a short to medium term reduction in foraging in the vicinity of hedgerow clearance. Based on the small number of

common species found using the site the displacement from this site will not have any significant effect on local bat populations, and that any such effect will be only negative at the site level. Additional foraging habitat is located to the south and north of the proposed development site. It should be noted that the proposed development is within a noisy environment beneath the existing flight beside the airport.

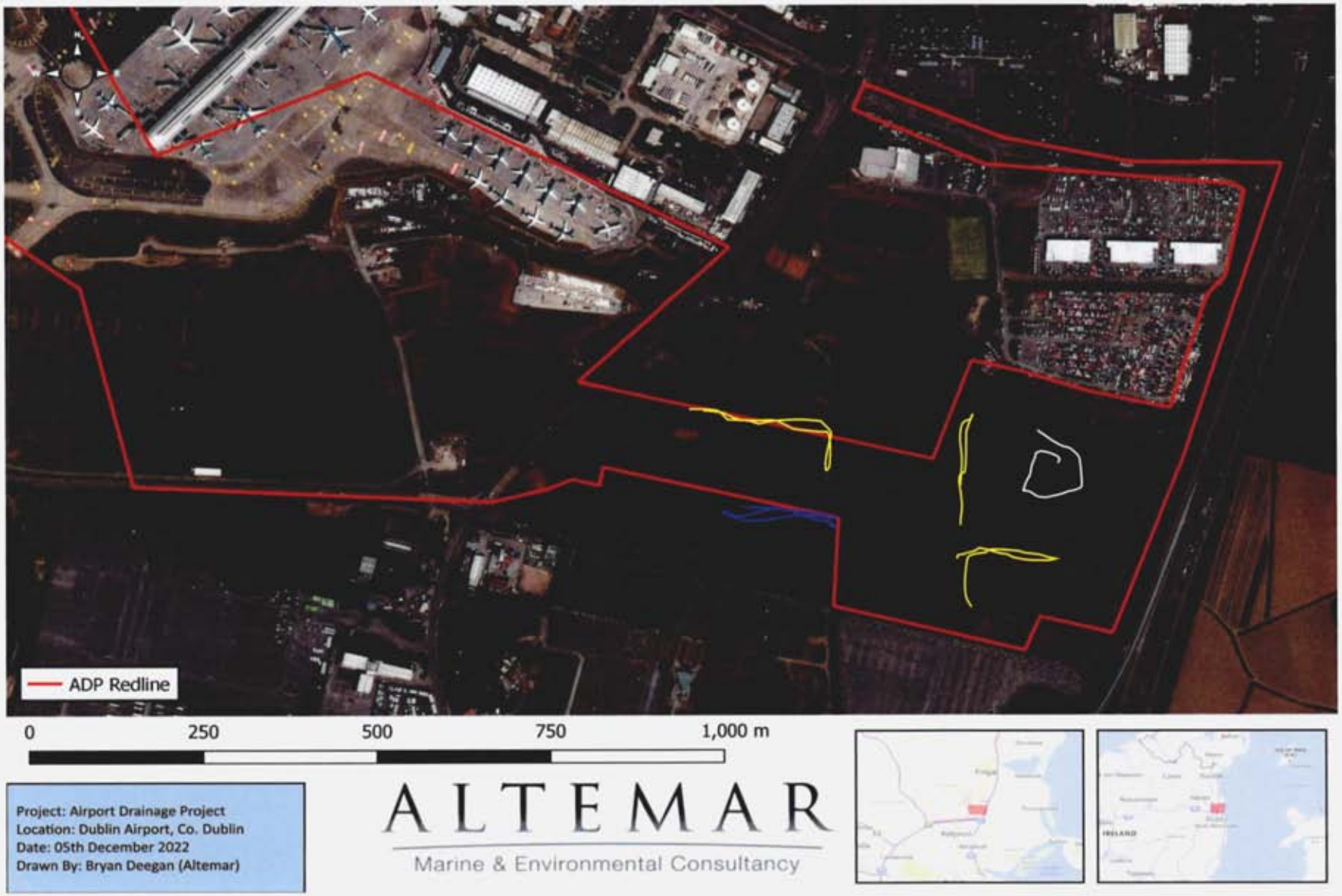

Figure 4. *Bat foraging on site. Soprano pipistrelle (yellow), Lesser Noctule (Nyctalus leisleri)(white) and Common pipistrelle (blue).*

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Technical Appendix 11 – Land, Soil, Geology, Hydrogeology

NICHOLAS O'DWYER

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Appendix 11.1

Historical Site Investigation Borehole Logs

NICHOLAS O'DWYER

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BH6 (38m)
BH5 (28.5m)
TP30
TP86 (3.8m)
BH8 (25m)
TP29
TP82 (2.4m)
TP81 (2.3m)
TP80 (2.8m)
TP79 (2.2m)
TP78 (3m)
BHX88
TP77 (2.8m)
TP75 (1.8m)
TP76 (2.3m)
TP87 (2.8m)
BH9 (25.5m)
TP28
BH10 (18.2m)
TP27
BH11 (25.2m)
BH3 (22.5m)
TP26
RC1 (15m)
BH7 (4.85m)
RC2 (4.5m)
BH4 (32.7m)
BH10 (4.7m)
BH12 (4.3m)
TP25
BH13 (4.7m)
BH11 (4.67m)
BH9 (4.8m)
BH8 (4.65m)
BH3 (5.25m)
TP24
TP22
BH4 (5.25m)
BH2 (4.3m)
BH2 (7m)
BH2A (33.5m)
TP23
BH1 (5.4m)
BH1 (32.7m)
BH4 (25.3m)
TP21
TP12
BH5 (25m)
TP20
BH008
BH3
TP13
TP15
TP14
BH01 (17m)
BH6 (12.6m)
BH7 (25m)
TP16
BH001 (11.6m)
TP14 (2m)
TP19
TP18
TP17
BH004 (4m)
TP15 (2m)
TP01
TP02
BH005 (4m)
TP13 (2m)
BH006 (5.8m)
BH002 (5.2m)
TP03
TP10 (2m)
BH003 (12m)
TP04
BH007 (5.3m)
TP08 (2m)
TP09 (2m)
TP11 (2m)
TP12 (2m)

N

NOTES

LEGEND

SITE INVESTIGATION RECORDS ARE COLOUR CODED TO REPORT / PROJECT

TP01 (2m) : TRIAL PIT

BH01 (14m) : BOREHOLE

- DEPTH OF BOREHOLE
- REPORT REFERENCE
- LOCATION

- RPS : CUCKOO & FOREST LITTLE (2008)
- URS : APRON EVALUATION (2014)
- FUEL FARM & HYDRANT REDEVELOPMENT (2015)
- SI Ltd. : WEST APRON NORTH PERIMETER ROAD (2016)
- IDOM : APRON REHABILITATION (2016)
- CAUSEWAY SURVEY REPORT (2018)
- AMD : ADDITIONAL AIRFIELD BOREHOLES (2018)

REV	DATE	DESCRIPTION	D	C	A

SKETCH

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CLIENT: daa

PROJECT: DUBLIN AIRPORT DRAINAGE MASTER PLAN

TITLE: HISTORICAL S.I. DATA

SCALES	DRAWN	CHECKED	APPROVED
N.T.S. 1: 20,000 (A3)	D.Smithers	F.Bray	S.Cosgrove
	DATE 15.10.2020	DATE 15.10.2020	DATE 15.10.2020

DRAWING No. 20771-SK-234

REV -

URS: Apron Evaluation (2014)

NICHOLAS O'DWYER

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CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

UKAS TESTING 4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 01
Coring Operator : MB
Date Cored : 10-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 3a, AT.4S

Irish National Grid: 316564.4, 242873
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT:CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	385	385	Concrete	Yes	n/a	Cement	32	Crushed Rock
				Plastic Membrane					
2	385	544	159	Concrete	Yes	n/a	Cement	32	Crushed Rock
				Loose Granular Material					

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker
The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e. Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder
The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size
The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

URS

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS In House Procedures

UKAS TESTING 4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 02
Coring Operator : MB
Date Cored : 10-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 3a, AT,4S

Irish National Grid: 316623.6, 242912.5
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT/CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	285	285	Concrete	Yes	n/a	Cement	32	Crushed Rock
				Plastic Membrane					
2	285	430	145	Concrete (damage to face)	No	n/a	Cement	32	Crushed Rock

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker
The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder
The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size
The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

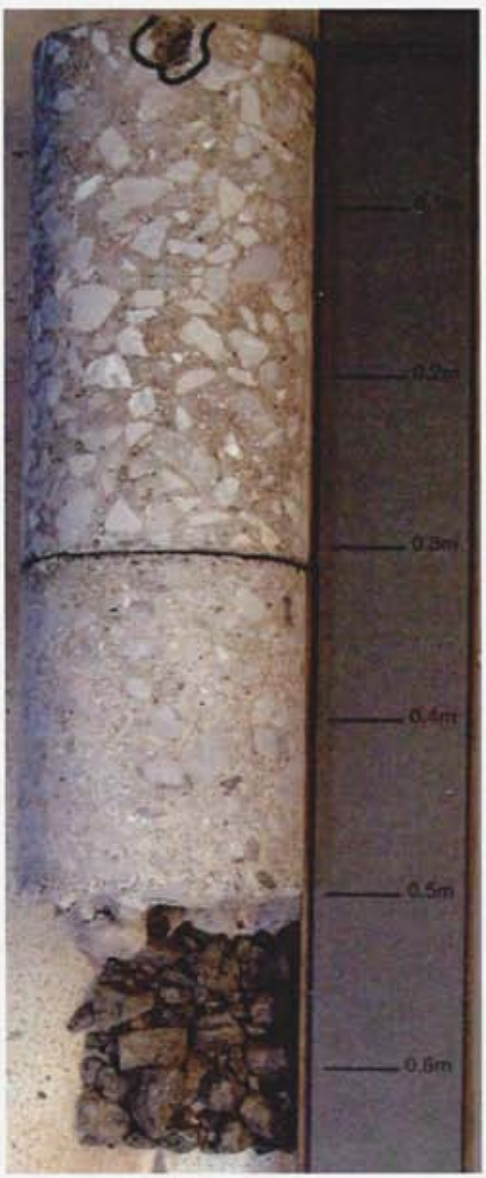
4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 03
Coring Operator : MB
Date Cored : 11-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 3b, AT.4S

Irish National Grid: 316557.7, 242964.5
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT:CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	300	300	Concrete (damage to face)	**No**	**n/a**	Cement	20	Crushed Rock
				Layers 1 & 2 not bonded					
2	300	525	225	Concrete	**Yes**	**n/a**	Cement	32	Crushed Rock
				Loose Granular Material					



The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker

The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder

The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size

The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

URS

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

UKAS TESTING 4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 04
Coring Operator : MB
Date Cored : 11-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 3b, AT.4S

Irish National Grid: 316594.9, 242961
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT/CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	372	372	Concrete	Yes	n/a	Cement	32	Crushed Rock
				Plastic Membrane					
2	372	525	153	Concrete	Yes	n/a	Cement	32	Crushed Rock

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker

The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder

The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size

The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 07
Coring Operator : MB
Date Cored : 10-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 3c, ATL3/4

Irish National Grid: 316825.8, 243124.7
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT/CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	315	315	Concrete	**Yes**	**n/a**	Cement	32	Crushed Rock
				Plastic Membrane					
				Plastic Membrane					
2	315	485	170	Concrete	**Yes**	**n/a**	Cement	20	Crushed Rock/Flint
				Loose Granular Material					

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker
The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder
The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size
The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

URS

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

UKAS TESTING 4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 08
Coring Operator : MB
Date Cored : 09-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 3d, ATL3/4

Irish National Grid: 316628, 243001.4
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT/CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	280	280	Concrete	Yes	n/a	Cement	32	Crushed Rock
				Layers 1 & 2 debonded after extraction					
2	280	465	185	Concrete (delaminated @ a depth of 22mm)	Yes	n/a	Cement	32	Crushed Rock/Flint

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker

The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder

The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size

The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 09
Coring Operator : MB
Date Cored : 10-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 3d, ATL3/4

Irish National Grid: 316683.4, 243024.8
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT/CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	305	305	Concrete	Yes	n/a	Cement	32	Crushed Rock/Flint
				Layers 1 & 2 debonded after extraction					
2	305	480	175	Concrete	Yes	n/a	Cement	32	Crushed Rock/Flint
				Loose Granular Material					

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker
The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder
The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size
The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

URS

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

UKAS TESTING 4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 10
Coring Operator : MB
Date Cored : 10-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 3d, ATL3/4

Irish National Grid: 316772.3, 243093.8
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT/CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	306	306	Concrete	Yes	n/a	Cement	32	Crushed Rock/Flint
				Layers 1 & 2 not bonded					
2	306	470	164	Concrete (damage to face)	No	n/a	Cement	32	Crushed Rock/Flint

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker

The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder

The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size

The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

URS

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

UKAS TESTING 4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 11
Coring Operator : MB
Date Cored : 09-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 4, AT.4S

Irish National Grid: 316609.2, 243022.8
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT:CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y:N)	(+ve/-ve or n/a)		Size	Type
1	0	320	320	Concrete (damage to face)	Yes	n/a	Cement	32	Crushed Rock:Flint
				Layers 1 & 2 not bonded					
2	320	467	147	Concrete (damage to face)	No	n/a	Cement	32	Crushed Rock:Flint
				Loose Granular Material					

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker
The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder
The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size
The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

URS

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

UKAS TESTING 4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 12
Coring Operator : MB
Date Cored : 10-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 4, AT.4S - S304

Irish National Grid: 316564.1, 243088.8
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT/CS testing (Y/N)	PAK-Marker Result (+ve/-ve or n/a)	Binder	Aggregate	
	From	To	(mm)					Size	Type
1	0	325	325	Concrete	Yes	n/a	Cement	32	Crushed Rock/Flint
				Layers 1 & 2 not bonded					
2	325	430	105	Concrete (damage to face & voided)	No	n/a	Cement	32	Crushed Rock/Flint

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker
The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder
The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size
The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

CORE LOGGING OF PAVEMENT MATERIAL

In Accordance with URS in House Procedures

UKAS TESTING 4410

Job Number : 47069009
Sample Number : CR0135
Core Number : 13
Coring Operator : MB
Date Cored : 09-Apr-14
Log Prepared By : LM
Date Logged : 22-Apr-14
Nominal Diameter : 150mm

Location : Dublin Airport - Apron Evaluation
Area 5a, S305

Irish National Grid: 316649.5, 243064
Notes: N/A

Layer	Depth		Thickness	Material description	Suitable for NAT/CS testing	PAK-Marker Result	Binder	Aggregate	
	From	To	(mm)		(Y/N)	(+ve/-ve or n/a)		Size	Type
1	0	298	298	Concrete	Yes	n/a	Cement	32	Crushed Rock/Flint
				Layers 1 & 2 not bonded					
2	298	470	172	Concrete	Yes	n/a	Cement	32	Crushed Rock/Flint
				Loose Granular Material					

The material description given (such as hot rolled asphalt or asphalt concrete) is generic only and is based upon a visual assessment of the material. Similarly, use of additional descriptive (such as voided) is based on visual assessment only and the relationship between air voids visually to the naked eye and degree of compaction is complex and materials specific.

Binder and aggregate sizes/types have been similarly assessed, using best engineering judgement.

PAK-Marker

The Tar Spray Test is a rapid, qualitative indicator of the presence of polyaromatic compounds (PACs) typically found in tar. PACs also exist in other road construction materials (e.g. bitumen and cutbacks like kerosene), but at low concentrations. The probability of obtaining a false positive result in the tar spray test with such materials is low, and a positive result in the tar spray test is a strong (but not definitive) indicator of the presence of tar. For quantitative results, this test should be considered in conjunction with the results from other tests (i.e., Total Polynuclear Aromatic Hydrocarbons (PAH) by Gas Chromatography - Flame Ionisation Detection (GC-FID)).

Binder

The binder type is assessed based on visual and aromatic inspection. The PAK-Marker result is also considered.

Aggregate Size

The sizes indicated (40, 32, 20, 14, 10, 6mm) are given as the best estimate of the nominal size of the material.

Notes : 1. The scale is for guidance only. It does not necessarily reflect the actual thicknesses of individual layer(s).

URS: Apron Evaluation (2014)

NICHOLAS O'DWYER

daa

Ground Investigations Ireland Ltd
www.gii.ie

Site Dublin Airport			**Borehole Number** BH01
Machine : Dando 2000 & Bretta T44	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number** 5921-05-16
Method : Cable Percussion & Rotary Core Follow On	**Location**	**Dates** 16/06/2016-20/06/2016	**Engineer** Kilwex	**Sheet** 1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.50)	CONCRETE			
0.50	B					0.50				
						(0.40)	MADE GROUND consisting of grey/brown fine to coarse angular crushed rock Fill			
1.00	B					0.90				
1.00-1.45	SPT(C) N=14			2,3/3,3,5,3			Firm becoming stiff below 4.0m BGL, brown sandy gravelly CLAY with occasional cobbles			
2.00	B									
2.00-2.45	SPT(C) N=9			1,2/2,3,2,2						
						(3.90)				
3.00	B									
3.00-3.45	SPT(C) N=7			1,2/1,2,2,2						
4.00	B									
4.00-4.45	SPT(C) N=18			2,2/3,5,4,6						
						4.80				
5.00	B						Stiff dark grey/black slightly sandy gravelly CLAY with cobbles and boulders			
5.00-5.45	SPT(C) N=42			1,4/10,11,9,12						
6.00	B									
6.00-6.20	SPT(C) 50/50			9,14/50						
7.00	B									
7.00-7.18	SPT(C) 50/30			10,15/50						

TCR	SCR	RQD	FI
7.20			
47			
8.20			
73			
9.70			

Remarks
Chiselling from 5.80m to 5.90m for 0.5 hours. Chiselling from 6.30m to 6.60m for 0.7 hours. Chiselling from 7.20m to 7.30m for 1 hour.

Scale (approx)	Logged By
1:50	S. Connolly

Figure No. 5921-05-16.BH01

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Ground Investigations Ireland Ltd
www.gii.ie

Site Dublin Airport			**Borehole Number** BH01
Machine : Dando 2000 & Bretta T44 **Flush :** **Core Dia:** mm **Method :** Cable Percussion & Rotary Core Follow On	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number** 5921-05-16
	Location	**Dates** 16/06/2016-20/06/2016	**Engineer** Kilwex	**Sheet** 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	93						(10.20)				
11.20	29										
12.70	100										
14.20	100										
15.00							15.00	Complete at 15.00m			

Remarks

Scale (approx)	Logged By
1:50	S. Connolly

Figure No. 5921-05-16.BH01

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Ground Investigations Ireland Ltd
www.gii.ie

Site Dublin Airport			**Borehole Number** BH02
Machine : Dando 2000 **Method** : Cable Percussion	**Casing Diameter**	**Ground Level (mOD)**	**Client**
	Location	**Dates** 20/06/2016-21/06/2016	**Engineer** Kilwex

Job Number 5921-05-16

Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
						(0.50) 0.50	TARMACADAM			
						(0.70) 1.20	MADE GROUND consisting of grey/brown fine to coarse angular crushed rock Fill			
1.00-1.45 1.00	SPT(C) N=15 B			3,7/8,2,3,2			Firm to stiff brown sandy gravelly CLAY with occasional cobbles			
2.00-2.45 2.00	SPT(C) N=10 B			1,1/2,2,3,3		(2.60)				
3.00-3.45 3.00	SPT(C) N=15 B			2,1/2,4,4,5						
						3.80				
4.00-4.45 4.00	SPT(C) N=48 B			6,5/8,10,13,17		(0.70) 4.50	Stiff dark grey/black slightly sandy gravelly CLAY with cobbles and boulders			
							Complete at 4.50m			

Remarks
Chiselling from 0.50m to 0.90m for 0.5 hours.

Scale (approx)	Logged By
1:50	S. Connolly

Figure No. 5921-05-16.BH01

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Fuel Farm & Hydrant Redevelopment (2015)

NICHOLAS O'DWYER

daa

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:**	12	**Co-ords:** E:	317535.711
	Reference:	TP12	N:	242804.215
	Date:	10/06/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By:	Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:**	James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

Testing
Analysing
Consulting

www.bhp.ie

Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium brown, cohesive topsoil. Organics present.
0.2 - 1.1			Loose, medium brown. Gravelly, Silty, SAND. Frequent cobbles and gravel (angular to sub-angular).
1.1 - 1.6			Firm, medium to dark brown. Sandy, Silty, GRAVEL Frequent cobbles and gravel (angular to sub-angular).
1.6 - 3.0			Soft, dark brown to dark grey. Gravelly, Sandy, SILT Frequent cobbles and gravel (angular to sub-angular).

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	3 Samples taken from 600mm, 1200mm & 2800mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
54%
46%
56%

Remarks
Nil.

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP12
Date:	10/06/2015
Sheet:	2 of 2

Testing
Analysing
Consulting

BHP

www.bhp.ie

Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:**	13	**Co-ords:** E:	317466.911
	Reference:	TP13	N:	242674.629
	Date:	09/06/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By:	James Purcell	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:**	James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

Testing
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Consulting

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.1			Sandy, medium to dark brown, cohesive topsoil. Organics present.
0.1 - 1.0			Soft to firm in places, light to medium brown. Sandy, Silty, GRAVEL Frequent cobbles and gravel (angular to sub-angular). Presence of construction materials (bricks, blocks, reinforcement bars, etc).
1.1	Services Identified		Red 5" ESB duct. Surrounded by sand.
1.0 - 3.0			Firm (soft in places), dark brown. Silty, Sandy, GRAVEL Frequent cobbles and gravel (angular to sub-angular). Presence of construction materials (bricks, blocks, reinforcement bars, etc).

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	2 Samples taken from 500mm & 2700mm.
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
36%
49%

Remarks

Nil.

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP13
Date:	09/06/2015
Sheet:	2 of 2

Testing
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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 14	**Co-ords:** E: 317278.480	Testing Analysing Consulting
	Reference: TP14	N: 242652.869	
	Date: 09/06/2015	**Dimensions:** **Depth:** 3.0 m	
	Logged By: James Purcell	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet 1 of 2		

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.4			Firm, light to medium brown. Silty, Sandy, GRAVEL
0.4 - 1.5			Firm, dark to very dark brown. Silty, Sandy, GRAVEL Occasional cobbles and gravel (angular to sub-angular).
1.5 - 3.0			Firm, dark brown. Clayey, GRAVEL Occasional cobbles and gravel (angular to sub-angular).

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	3 Samples taken from 0-400, 400-1500 & 1500-3000mm.
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
47%
42%
48%

Remarks

Nil.

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP14
Date:	09/06/2015
Sheet:	2 of 2

Testing
Analysing
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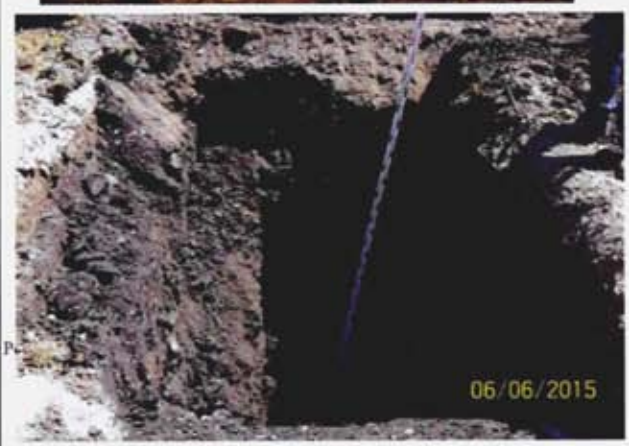
Photographs



Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 15	**Co-ords:** **E:**	317215.286	Testing Analysing Consulting
	Reference: TP15	**N:**	242668.296	
	Date: 09/06/2015	**Dimensions:**	**Depth:** 3.0 m	
	Logged By: James Purcell	**Width:** 1.0m		
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m		
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

Trial Pit Log

Depth (m)			Stratum Description
0 - 0.03			Gravel surface of track
0.03 - 0.65			Firm, light to medium brown. Silty, Sandy, GRAVEL Occasional cobbles and gravel (angular to sub-angular).
0.65 - 0.71			Old road surface (60mm layer of asphalt)
0.71 - 3.0			Construction rubble. A mixture of large concrete boulders / sections, tar, soil and other associated waste. Some sections of cover are over 1m long.

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	1 Sample taken from 0-650mm.
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
41%

Remarks
Nil.

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP15
Date:	09/06/2015
Sheet:	2 of 2

Testing
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Photographs

Project Name:	**Trial Pit No.:**	16	**Co-ords: E:**	317083.302
Fuel Farm,	**Reference:**	TP16	**N:**	242628.165
Site Investigation,	**Date:**	15/05/2015	**Dimensions:**	**Depth:** 3.0 m
Dublin Airport	**Logged By:**	Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:**	James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.4			Sandy, medium brown, cohesive topsoil. Organics present.
0.4 - 1.4			Soft to firm, light to medium brown. Sandy, Silty, GRAVEL Frequent cobbles and gravel (combination of angular and rounded). Infrequent boulders. Presence of building materials.
1.4 - 3.0			Firm to very firm, medium brown to dark grey in places. Gravelly, Sandy, SILT Frequent cobbles and gravel (combination of angular and rounded). Presence of building materials.

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	2 Samples taken from 1000mm & 2500mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
46%
59%

Remarks

The presence of building materials indicates that the area may be 'made ground'.

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP16
Date:	15/05/2015
Sheet:	**2** of 2

Testing
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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 17	**Co-ords:** **E:** 316957.072		
	Reference: TP17		**N:** 242618.286	
	Date: 10/06/2015	**Dimensions:**	**Depth:** 3.0 m	
	Logged By: Enda Quinlan	**Width:** 1.0m		
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m		
Contact: Mr. Justin Mulligan	Sheet **1** of 2			

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium to dark brown, cohesive topsoil. Organics present.
0.2 - 0.8			Soft to firm, medium brown. Sandy, Silty, GRAVEL Frequent cobbles and gravel (combination of angular and rounded).
0.8 - 1.4			Soft to firm, medium to dark brown. Gravelly, Sandy, SILT Frequent cobbles and gravel (combination of angular and rounded).
1.4 - 3.0			Old layer of grass at 1.4m Soft to firm, dark brown to dark grey. Silty, Sandy, GRAVEL Frequent cobbles and gravel (combination of angular and rounded). Two old copper insulated wires at 1.7m

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	3 Samples taken from 500mm, 1000 & 2500mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
44%
60%
42%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP17
Date:	10/06/2015
Sheet:	2 of 2

Testing
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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 18	**Co-ords:** **E:** 316826.088		
	Reference: TP18		**N:** 242609.130	
	Date: 10/06/2015	**Dimensions:**	**Depth:** 3.0 m	
	Logged By: Enda Quinlan	**Width:** 1.0m		
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m		
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.3			Sandy, medium to dark brown, cohesive topsoil. Organics present. Frequent cobbles present.
0.3 - 0.45			Old layer of asphalt.
0.45 - 1.3			Soft to firm, light to medium brown. Sandy, Silty, GRAVEL Frequent gravel. Occassional cobbles.
1.3 - 3.0			Soft to firm, medium to dark brown. Sandy, Gravelly, SILT Frequent gravel. Occassional cobbles.

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	2 Samples taken from 450mm & 2600mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
54%
53%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport	
Client:	Kilwex Ltd	242609.130
F.T.A.O.:	Mr. Justin Mulligan	
Reference:	TP18	
Date:	10/06/2015	
Sheet:	**2** of 2	

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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 19	**Co-ords:** **E:** 316727.600		
	Reference: TP19		**N:** 242608.754	
	Date: 10/06/2015	**Dimensions:**	**Depth:** 3.0 m	
	Logged By: Enda Quinlan	**Width:** 1.0m		
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m		
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.3			Sandy, medium brown, cohesive topsoil. Organics present. Frequent cobbles present.
0.3 - 0.75			Firm, dark grey. Silty, Sandy, GRAVEL Frequent cobbles and gravel. Occassional boulders. (Angular to sub angular predominately)
0.75 - 1.5			Soft to firm, dark brown. Sandy, Silty, GRAVEL Frequent cobbles and gravel.
1.5 - 2.0			Soft to firm, light to medium brown. Clayey, Gravelly, Silty, SAND Frequent gravel with infrequent cobbles.
2.0 - 3.0			Firm, medium brown Sandy, Silty, GRAVEL Frequent gravel with infrequent cobbles.

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	4 Samples taken from 500, 1000, 1750 & 2500mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
27%
44%
60%
49%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP19
Date:	10/06/2015
Sheet:	2 of 2

Testing
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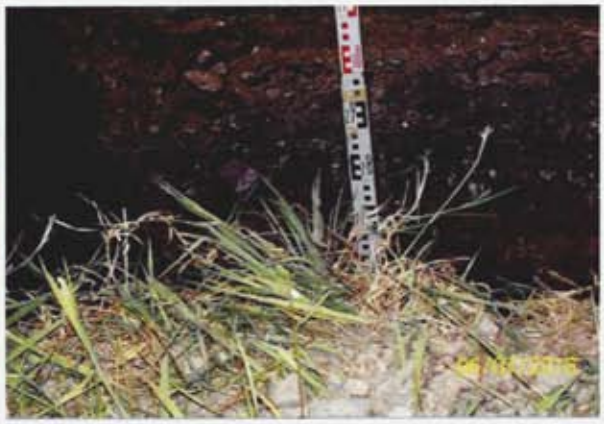
Photographs



Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:**	20	**Co-ords: E:**	316700.860
	Reference:	TP20	**N:**	242760.380
	Date:	04/06/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By:	James Purcell	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:**	James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet **1** of 2			

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium to dark brown, cohesive topsoil. Organics present.
0.2 - 0.9			Stiff, Dark grey. Sandy, GRAVEL. Predominantly cobbles and gravel (Angular to sub-angular). Classified as Class 6F2 general fill, well compacted.
0.9			A layer of terram was found at this depth.
0.9 - 2.2			Firm to stiff, medium to dark brown. Silty, Sandy, GRAVEL. Frequent cobbles and gravel (combination of angular and rounded). Trial pit was dug to a depth of 2.2m.
1.3	Rock (running transverse to the trial pit)		A two-step layer of rock was identified. It was possible to move the rock. However, once this was attempted, a number of cables were found. It was not possible to move the rock without breaking the cables.
2.1			In the north east corner of the pit, some pipe bedding was identifed. This was hand-dug. No pipe/duct was found. Slight ground water was identifed at this location.

Required Information	Result
Presence of ground water	Slight at 2.1m.
Presence of rock / hard material	Yes, running transverse to the pit.
Classification sampels taken from	4 Samples taken from 500, 1000, 1750 & 2500mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 2.2m

Percentage passing 425um sieve
7%
50%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP20
Date:	04/06/2015
Sheet:	2 of 2

Testing
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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 21	**Co-ords:** **E:** 316580.171	Testing Analysing Consulting
	Reference: TP21	**N:** 242794.331	
	Date: 12/06/2015	**Dimensions:** **Depth:** 3.0 m	
	Logged By: Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet 1 of 2		

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium brown, cohesive topsoil. Organics present.
0.2 - 1.2			Firm, medium to dark brown. Sandy, Silty, GRAVEL Frequent cobbles and gravel (angular to sub-angular).
1.2 - 2.0			Soft to firm, dark brown. Silty, Sandy, GRAVEL Occasional cobbles and gravel (angular to sub-angular).
2.0 - 3.0			Soft to very soft, dark grey. Sandy, Silty, GRAVEL Occasional cobbles and gravel (angular to sub-angular).

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	3 Samples taken from 1000, 1500 & 2500mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
47%
46%
51%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP21
Date:	12/06/2015
Sheet:	2 of 2

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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 22	**Co-ords:** **E:** 316476.700		
	Reference: TP22		**N:** 242999.870	
	Date: 04/06/2015	**Dimensions:**	**Depth:** 3.0 m	
	Logged By: James Purcell		**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:** James Purcell		**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.3			Sandy, dark brown, cohesive topsoil. Organics present.
0.3 - 2.4			Firm, medium brown. Silty, Sandy, GRAVEL Frequent cobbles and gravel (angular to sub-angular). Much of the material at this location appears to be construction waste. There is evidence of blocks, wood and other associated waste.
2.4 - 3.0			Stiff to firm in places, dark brown to dark grey. Silty, Sandy, GRAVEL Occassional cobbles to (angular sub-angular) with frequent gravel.

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	2 Samples taken from 300-2400 & 2400-3000mm.
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
53%
52%

Remarks

Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP22
Date:	04/06/2015
Sheet:	2 of 2

Testing
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Consulting

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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 23	**Co-ords:** **E:** 316339.886		
	Reference: TP23		**N:** 242904.316	
	Date: 10/06/2015	**Dimensions:**	**Depth:** 3.0 m	
	Logged By: Enda Quinlan	**Width:** 1.0m		
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m		
Contact: Mr. Justin Mulligan	Sheet **1** of 2			

Testing
Analysing

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium brown, cohesive topsoil. Organics present.
0.2 - 1.6			Firm, medium brown. Silty, Sandy, GRAVEL Frequent cobbles and gravel.
1.6 - 3.0			Firm to stiff, dark grey. Sandy, Silty, GRAVEL Frequent boulders, cobbles and gravel. Larger material is angular to sub-angular.

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	2 Samples taken from 1000 & 2000mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
34%
49%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP23
Date:	10/06/2015
Sheet:	**2** of 2

Testing
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Consulting

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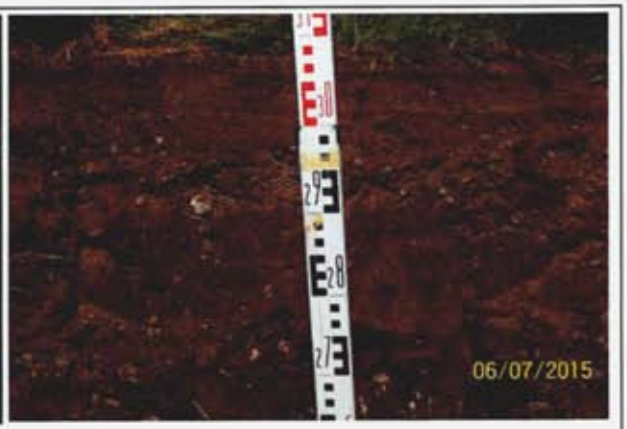
Photographs



Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 24	**Co-ords:** E:	316299.330	Testing Analysing Consulting
	Reference: TP24	N:	242994.583	
	Date: 11/05/2015	**Dimensions:**	**Depth:** 3.0 m	
	Logged By: Enda Quinlan	**Width:** 1.0m		
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m		
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.4			Sandy, dark brown, cohesive topsoil. Organics present.
0.4 - 1.8			Soft to firm, light to medium brown. Gravelly, Sandy, SILT Frequent cobbles and gravel.
1.8 - 3.0			Firm to stiff, dark grey. Sandy, Silty, GRAVEL Frequent cobbles and gravel. Infrequent boulders. Larger material is angular to sub-angular.

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	2 Samples taken from 1000 & 2500mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
53%
43%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP24
Date:	11/05/2015
Sheet:	**2** of 2

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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 25	**Co-ords:** **E:** 316256.259	
	Reference: TP25	**N:** 243090.054	
	Date: 11/05/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By: Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet **1** of 2		

Testing
Analysing
Consulting

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium brown, cohesive topsoil. Organics present.
0.2 - 1.0			Soft, light to medium brown. Silty, Sandy, GRAVEL Occasional cobbles and gravel.
1.0 - 2.5			Soft, light to dark grey. Silty, Sandy, GRAVEL. Occasional cobbles and gravel.
2.5 - 3.0			Soft to very soft, dark grey. Cobbley, Gravelly, Silty, SAND Frequent cobbles and gravel (angular to sub-angular).

Required Information	Result
Presence of ground water	Yes. pH result = 7.34
Presence of rock / hard material	No
Classification sampels taken from	3 Samples taken from 1000, 2000 & 2900mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
53%
55%
40%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP25
Date:	11/05/2015
Sheet:	2 of 2

Testing
Analysing
Consulting

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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:**	26	**Co-ords: E:**	316215.300
	Reference:	TP26	**N:**	243173.669
	Date:	11/05/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By:	Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:**	James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet **1** of 2			

Testing
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Consulting

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium to dark brown, cohesive topsoil. Organics present.
0.2 - 1.7			Firm, light to medium brown. Sandy, Silty, GRAVEL. Frequent cobbles and gravel (angular to sub-angular)
1.7 - 3.0			Firm, dark grey. Silty, Sandy, GRAVEL. Very frequent cobbles and gravel (angular to sub-angular).

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	2 Samples taken from 1000 & 2000mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
45%
32%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP26
Date:	11/05/2015
Sheet:	**2** of 2

Testing
Analysing
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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 27	**Co-ords:** E: 316171.060	
	Reference: TP27	N: 243263.835	
	Date: 12/05/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By: Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet 1 of 2		

Testing
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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.3			Sandy, light to medium brown, cohesive topsoil. Organics present.
0.3 - 0.8			Firm, light to medium brown. Gravelly, Silty, SAND Occasional cobbles and gravel (angular to sub-angular)
0.8 - 2.0			Firm to soft in places, dark grey. Silty, Sandy, GRAVEL Frequent cobbles and gravel (angular to sub-angular). Occasional boulders.
2.0 - 3.0			Soft, dark grey. Silty, Sandy, GRAVEL Frequent cobbles and gravel (angular to sub-angular). Occasional boulders.

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	3 Samples taken from 800, 1500 & 2500mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
50%
54%
41%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP27
Date:	12/05/2015
Sheet:	2 of 2

Testing
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Consulting

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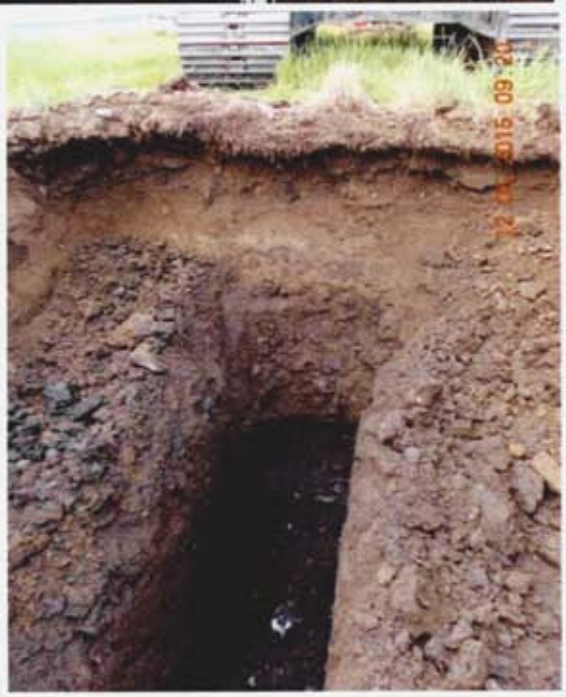
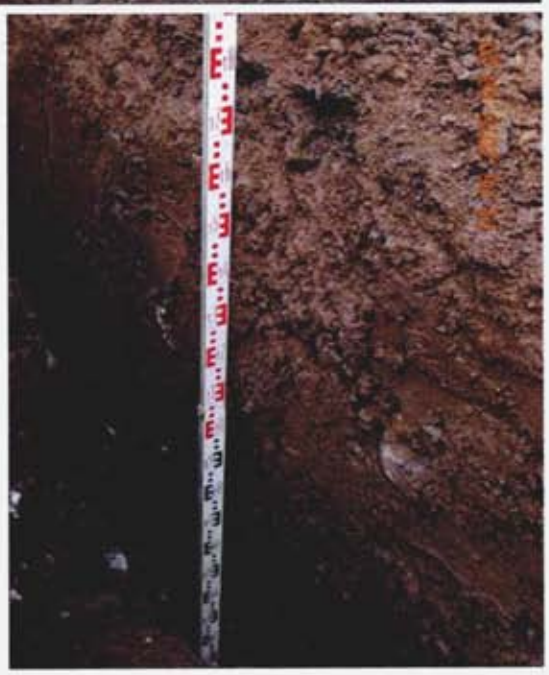
Photographs





Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:** 28	**Co-ords:** **E:** 316115.198	
	Reference: TP28	**N:** 243410.306	
	Date: 11/06/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By: Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:** James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet **1** of 2		

Testing
Analysing
Consulting

www.bhp.ie

Trial Pit Log

Depth (m)			Stratum Description
0 - 0.4			Sandy, light to medium brown, cohesive topsoil. Organics present.
0.4 - 1.7			Firm to soft, light to medium brown. Gravelly, Silty, SAND Occasional cobbles and gravel (angular to sub-angular)
1.7 - 3.0			Soft, dark grey. Clayey, Silty, SAND Occasional cobbles and gravel (angular to sub-angular)

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	2 Samples taken from 1000 & 2300mm.
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
57%
74%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP28
Date:	11/06/2015
Sheet:	2 of 2

Testing
Analysing
Consulting

BHP

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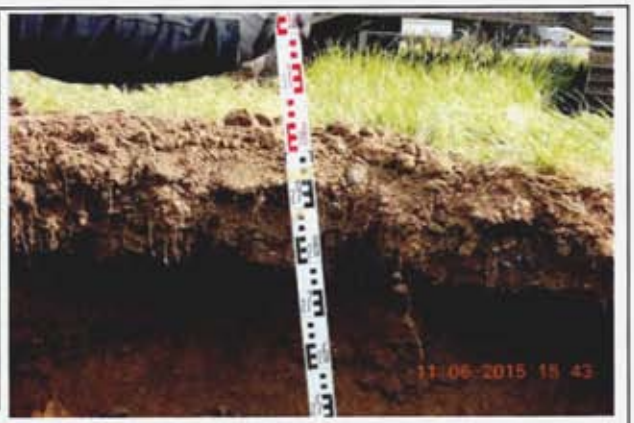
Photographs



Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:**	29	**Co-ords:** **E:**	316049.478
	Reference:	TP29	**N:**	243521.013
	Date:	11/05/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By:	Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:**	James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet 1 of 2			

Testing
Analysing
Consulting

BHP

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium to dark brown, cohesive topsoil. Organics present.
0.2 - 1.6			Firm, light to medium brown. Sandy, Silty, CLAY Occasional gravel or small cobbles.
1.6 - 2.3			Soft, medium to dark drown. Sandy, Silty, CLAY Occasional gravel or small cobbles.
2.3 - 3.0			Soft to very soft in places, dark brown to medium grey. Gravelly, Silty, SAND Occasional cobbles and gravel (angular to sub-angular)

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	3 Samples taken from 1000, 2000 & 2500mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
73%
88%
57%

Remarks

Nil

BHP Consultants Limited, New Road, Clondalkin, Dublin 22, Ireland. T: 01-4593700

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP29
Date:	11/05/2015
Sheet:	2 of 2

Testing
Analysing
Consulting

BHP

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Photographs

Project Name: Fuel Farm, Site Investigation, Dublin Airport	**Trial Pit No.:**	30	**Co-ords:** **E:**	316057.138
	Reference:	TP30	**N:**	243589.686
	Date:	11/06/2015	**Dimensions:**	**Depth:** 3.0 m
	Logged By:	Enda Quinlan	**Width:** 1.0m	
Client: Kilwex Ltd	**Reviewed By:**	James Purcell	**Lenth:** 3.0m	
Contact: Mr. Justin Mulligan	Sheet **1** of 2			

Testing
Analysing
Consulting

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Trial Pit Log

Depth (m)			Stratum Description
0 - 0.2			Sandy, medium brown, cohesive topsoil. Organics present.
0.2 - 0.8			Firm, medium/dark brown. Sandy, Silty, Cobbley, GRAVEL Frequent gravel or small cobbles (angular to sub-angular)
0.8 - 1.0			Sandy, medium brown, cohesive topsoil. Organics present. This is at level as beside the trial pit.
1.0 - 1.8			Soft to firm in places, light to medium brown. Gravelly, Silty, SAND Occasional gravel or small cobbles.
1.8 - 3.0			Soft to firm, light/medium brown to dark grey in places. Silty, Sandy, GRAVEL Frequent gravel or small cobbles (angular to sub-angular)

Required Information	Result
Presence of ground water	No
Presence of rock / hard material	No
Classification sampels taken from	3 Samples taken from 500, 1200 & 2200mm
Contamination sampels taken from	3 Samples taken from 1.0m, 2.0m & 3.0m

Percentage passing 425um sieve
23%
61%
45%

Remarks
Nil

Project Name:	Fuel Farm Site Investigation, Dublin Airport
Client:	Kilwex Ltd
F.T.A.O.:	Mr. Justin Mulligan
Reference:	TP30
Date:	11/06/2015
Sheet:	2 of 2

Testing
Analysing
Consulting

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Photographs

Ground Investigations Ireland Ltd
www.gii.ie

Site: Dublin Airport Rotary Core Airside			Borehole Number: BH04
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 03/08/2017-04/08/2017	Engineer: FCC Sheet: 1/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	50						(2.10)	Recovery consists of brown slightly sandy gravelly silty CLAY with cobble fragments (Very stiff)		
2.00 2.10-2.33	66				19,6/50 SPT(C) 50/75		2.10	Recovery consists of black sandy gravelly CLAY with cobble fragments (Very stiff)		
3.50	100									
5.00 6.00-6.30	86				17,8/15,15,16,4 SPT(C) 50/150		(5.90)			
6.50	86									
8.00	40						8.00	Recovery consists of brown sandy gravelly CLAY with cobble fragments (Very stiff)		
9.50										

Remarks
Installation: Slotted Pipe 24.0m - 1.00m, Plain Pipe 1.00m to 0.00m

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH04

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH04
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 03/08/2017-04/08/2017	Engineer: FCC Sheet: 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	93									
11.00										
	100				19,6/20,24,6 SPT(C) 50/225					
12.00-12.38										
12.50										
	100									
14.10							(12.50)			
	100				19,6/30,20 SPT(C) 50/150					
15.00-15.30										
15.70										
	100									
17.20										
	100				25/50 SPT(C) 25*/75 50/75					
18.00-18.15										
18.70										
	100									

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH04

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH04
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 03/08/2017-04/08/2017	Engineer: FCC Sheet: 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.20							20.50			
	86						(1.70)	Recovery consists of black sandy gravelly CLAY with cobble fragments (Very stiff)		
21.70							22.20			
	100							Recovery consists of brown slightly gravelly slightly silty CLAY with cobble fragments (Very stiff)		
23.30							(3.10)			
	93									
24.80										
	100									
25.30							25.30	Complete at 25.30m		

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH04

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH05
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 08/08/2017-09/08/2017	Engineer: FCC Sheet: 1/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00	54	-					(2.40)	Recovery consists of brown slightly sandy gravelly silty CLAY with cobble fragments (Very stiff)		
2.20 2.20-2.65	55	-			3,4/4,7,10,15 SPT(C) N=36		2.40	Recovery consists of black sandy gravelly CLAY with cobble fragments (Very stiff)		
3.70	100	-								
5.20	91	-								
6.70	87	-								
8.20	100	-								
9.70										

Remarks

Scale (approx)	Logged By
1:50	S. Worth

Figure No.: 6734-04-17.BH05

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH05
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 08/08/2017-09/08/2017	Engineer: FCC Sheet: 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	80	-								
11.20	80	-					(19.10)			
12.70	97	-								
14.20	100	-								
15.70	100	-								
17.20	100	-								
18.70	100	-								

Remarks

Scale (approx)	Logged By
1:50	S. Worth

Figure No. 6734-04-17.BH05

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Site Dublin Airport Rotary Core Airside			**Borehole Number** BH05
Machine : T44 **Flush :** **Core Dia:** mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client** DAA **Job Number** 6734-04-17
	Location	**Dates** 08/08/2017-09/08/2017	**Engineer** FCC **Sheet** 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.20	87	-					21.50	Recovery consists of dark brown/grey slightly sandy slightly gravelly CLAY (Very stiff)		
21.70	100	-					(3.50)			
23.20	67	-								
24.70	67	-					25.00	Complete at 25.00m		
25.00										

Remarks

Scale (approx)	Logged By
1:50	S. Worth

Figure No. 6734-04-17.BH05

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH06
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location: Dublin Airport	Dates: 15/08/2017-16/08/2017	Engineer: FCC Sheet: 1/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00								Recovery consists of brown slightly sandy gravelly silty CLAY with cobble fragments (Very stiff)		
	18	-					(2.40)			
2.10 2.10-2.55					4,8/8,11,31 SPT N=50		2.40			
	21	-						Recovery consists of dark brown sandy gravelly silty CLAY with cobble fragments (Very stiff)		
3.60							(1.70)			
	87	-					4.10 (0.50)	Recovery consists of brown sandy clayey fine to coarse GRAVEL		
5.10 5.10-5.25					17,8/50 SPT 50/0		4.60	Recovery consists of black sandy gravelly CLAY with cobble fragments (Very stiff)		
	100	-								
6.50										
	94	-								
8.10							(6.85)			
	60	-								
9.60 9.60-9.75					19,6/50 SPT 50/0					

Remarks

Scale (approx)	Logged By
1:50	GK

Figure No. 6734-04-17.BH05

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH06
Machine: T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location: Dublin Airport	Dates: 15/08/2017-16/08/2017	Engineer: FCC Sheet: 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	93	-								
11.10	43	-					11.45 (1.15)	Recovery consists of brown grey slightly sandy fine to coarse sub rounded GRAVEL		
12.60							12.60	Complete at 12.60m		

Remarks

Scale (approx)	Logged By
1:50	GK

Figure No. 6734-04-17.BH05

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Site Dublin Airport Rotary Core Airside			**Borehole Number** BH07
Machine : T44	**Casing Diameter**	**Ground Level (mOD)**	**Client** DAA	**Job Number** 6734-04-17
Core Dia: mm	**Location** Dublin Airport	**Dates** 06/09/2017-07/10/2017	**Engineer** FCC	**Sheet** 1/3
Method : Rotary Cored				

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	12						(2.10)	Recovery consists of grey slightly sandy gravelly CLAY with cobble fragments (Firm)		
2.10 2.10-2.55	20	-			2,2/3,2,2,5 SPT(C) N=12		2.10	Recovery consists of black sandy gravelly CLAY with cobble fragments (Very Stiff)		
3.60	53	-								
5.10 5.10-5.55	26	-			6,7/7,6,9,11 SPT(C) N=33		(6.00)			
6.60	16	-								
8.10 8.10-8.33	20	-			32/50 SPT(C) 50/75		8.10	Recovery consists of brown sandy clayey GRAVEL with cobble fragments (Dense)		
9.60										

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH07

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Site Dublin Airport Rotary Core Airside			**Borehole Number** BH07
Machine : T44 **Flush :** **Core Dia:** mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client** DAA **Job Number** 6734-04-17
	Location Dublin Airport	**Dates** 06/09/2017-07/10/2017	**Engineer** FCC **Sheet** 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	26	-					(4.50)			
11.10 11.60-11.83	26	-			21,14/50 SPT(C) 50/75					
12.60	33	-					12.60	Recoverey consists of brown grey sandy gravelly silty CLAY with cobble fragments (Very Stiff)		
14.10 14.10-14.48	33	-			7,9/14,19,17 SPT(C) 50/225		(3.00)			
14.60	80	-								
15.60	46	-					15.60	Recovery consists of brown sandy gravelly CLAY with cobble fragments (Very Stiff)		
17.10 17.10-17.33	40	-			18,14/50 SPT(C) 50/75					
18.60	53	-								

Remarks

Scale (approx)	Logged By
1:50	ROT

Figure No. 6734-04-17.BH07

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH07
Machine: T44	Casing Diameter:	Ground Level (mOD):	Client: DAA
Job Number: 6734-04-17			
Core Dia: mm	Location: Dublin Airport	Dates: 06/09/2017-07/10/2017	Engineer: FCC
Sheet: 3/3			
Method: Rotary Cored			

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.10 20.10-20.33	20				27/50 SPT(C) 50/75		(9.40)			
21.60	16	-								
23.10 23.10-23.33					17,13/50 SPT(C) 50/75					
							25.00	Complete at 25.00m		

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH07

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Site Dublin Airport Rotary Core Airside			**Borehole Number** BH08
Machine : T44 **Flush :** **Core Dia:** mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client** DAA **Job Number** 6734-04-17
	Location	**Dates** 02/08/2017	**Engineer** FCC **Sheet** 1/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	33						(2.10)	Recovery consists of brown slightly sandy gravelly silty CLAY with cobble fragments (Very stiff)		
2.10 2.10-2.55	28				4,5/7,9,12,10 SPT(C) N=38		2.10	Recovery consists of black sandy gravelly CLAY with cobble fragments (Very stiff)		
3.20	80									
4.70	100						(5.90)			
6.00-6.45					7,8/10,11,11,12 SPT(C) N=44					
6.30	100									
8.00	100						8.00	Recovery consists of brown sandy gravelly CLAY with cobble fragments (Very stiff)		
9.00-9.45					10,11/12,12,13,13 SPT(C) N=50					
9.60										

Remarks
Installation: Slotted Pipe 24.0m - 1.00m, Plain Pipe 1.00m to 0.00m

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH08

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH08
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 02/08/2017	Engineer: FCC Sheet: 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100						(3.80)			
11.20	93	53	26				11.80	Medium strong to strong grey fine to medium grained LIMESTONE with interbedded mudstone. Unweathered to partially weathered with some quartz veins penetrating FRACTURES: Two sets of fracture sets, F1: Very closely spaced, dipping between 70degrees to 50degrees, rough to smooth, plannar, stepped wih some sandy gravelly clay infill, tight to open. F2: Six horizontal fracture between 13.40 - 13.60m, 14.00 - 14.40m, 14.80 - 14.90m, 16.90 - 17.30m, 19.50 - 19.60m, 21.70 - 21.80m very closely to closely spaced, undulating, rough to smooth, stepped, tight to open with some clay infil		
12.70	100	93	71							
14.30	100	93	63							
15.80	100	100	63							
17.30	100	93	46	12			(13.20)			
18.80	100	93	65							

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH08

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH08
Machine: T44	Casing Diameter	Ground Level (mOD)	Client: DAA
Flush :			Job Number: 6734-04-17
Core Dia: mm	Location	Dates: 02/08/2017	Engineer: FCC
Method : Rotary Cored			Sheet: 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.40										
	100	86	73							
22.00										
	100	100	65							
23.50										
	100	100	93							
25.00							25.00	Complete at 25.00m		

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH08

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH09
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 10/08/2017-11/08/2017	Engineer: FCC Sheet: 1/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00								Recovery consists of brown slightly sandy gravelly silty CLAY with cobble fragments (Very stiff)		
	14	-								
2.20 2.20-2.65					2,4/4,6,9,15 SPT(C) N=34		(5.20)			
	14	-								
3.70 3.70-4.15					7,8/9,11,13,16 SPT(C) N=49					
	66	-								
5.20 5.20-5.58					8,10/11,16,23 SPT(C) 50/225		5.20 (0.70)	Recovery consists of brown clayey GRAVEL		
	15	-					5.90	Recovery consists of brown slightly sandy gravelly silty CLAY with cobble fragments (Very stiff)		
6.70										
	100	-								
8.20							(5.30)			
	73	-								
9.20-9.40 9.30					6,8/50 SPT(C) 50/50					

Remarks

Scale (approx)	Logged By
1:50	S. Worth

Figure No. 6734-04-17.BH09

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH09
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 10/08/2017-11/08/2017	Engineer: FCC Sheet: 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100	-								
10.80										
11.20	97	31	31	NI			11.20 (0.40) 11.60	Medium strong to strong grey fine to medium grained LIMESTONE interbedded with Mudstone. Destructured weathering 11.20-11.60 - Non intact		
11.60								Medium strong to strong grey fine to medium grained LIMESTONE interbedded with Mudstone. Partially weathered with some quartz veins penetrating		
12.30	100	80	76	7				11.60-13.30 - Two fracture sets. F1: Close to medium spaced, sub-horizontal to 15 degrees, rough to smooth, plannar, tight to open. F2: Widely spaced, sub-vertical to 30 degrees, rough to smooth, tight to open		
13.30										
13.80	100	97	95	3				13.30-15.10 - Two fracture sets. F1: Medium to widely spaced, sub-horizontal to 10 degrees, rough to smooth, plannar, stepped, tight to open. F2: Widely spaced, sub-vertical to 10 degrees, rough to smooth, tight to open		
15.10										
15.30	100	79	76	5				15.10-16.80 - Two fracture sets. F1: Close to medium spaced, sub-horizontal to 15degrees, rough to smooth, plannar, tight to open. F2: Widely spaced, sub-vertical to 20 degrees, rough to smooth, stepped, tight to open		
16.80	100	94	94	9				16.80-20.45 - Two fracture sets. F1: Closely spaced, sub-horizontal to 20 degrees, rough to smooth, plannar, stepped, tight to open. F2: Widely spaced, sub-vertical to 30 degrees, rough to smooth, tight to open		
18.30	100	99	96				(13.90)			
19.80										

Remarks

Scale (approx)	Logged By
1:50	S. Worth

Figure No. 6734-04-17.BH09

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH09
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 10/08/2017-11/08/2017	Engineer: FCC Sheet: 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.45	100	69	49	3				20.45-21.70 - Two fracture sets. F1: Medium spaced, sub-horizontal to 10 degrees, rough to smooth, plannar, tight to open. F2: Widely spaced, sub-vertical to 10 degrees, rough to smooth, tight to open		
21.30										
21.70	99	94	91	1				21.70-22.40 - Very widely spaced, sub-horizontal to 10 degrees, rough to smooth, plannar, tight to open		
22.40										
22.80				4				22.40-23.40 - Medium spaced, sub-horizontal tp 10 degrees, rough to smooth, plannar, tight to open		
23.40	100	100	100	1				23.40-24.30 - Very widely spaced, sub-horizontal to 10 degrees, rough to smooth, plannar, tight to open		
24.30	100	92	86	5				24.30-25.50 - Two fracture sets. F1: Medium spaced, sub-horizontal to 10 degrees, rough to smooth, plannar, tight to open. F2: Widely spaced, sub-vertical to 30 degrees, rough to smooth, tight to open		
25.50							25.50	Complete at 25.50m		

Remarks

Scale (approx)	Logged By
1:50	S. Worth

Figure No. 6734-04-17.BH09

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Site Dublin Airport Rotary Core Airside			**Borehole Number** BH10
Machine : T44	**Casing Diameter**	**Ground Level (mOD)**	**Client** DAA	**Job Number** 6734-04-17
Flush :				
Core Dia: mm	**Location**	**Dates** 31/07/2017-31/08/2017	**Engineer** FCC	**Sheet** 1/2
Method : Rotary Cored				

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	42						(2.10)	Recovery consists of brown sandy gravelly CLAY with cobble fragments (Stiff)		
2.10 2.10-2.55	31				2,4/3,4,6,7 SPT(C) N=20		2.10	Recovery consists of black slightly sandy gravelly CLAY with cobble fragments (Stiff to very stiff)		
3.20	100						(5.90)			
5.20 6.00-6.45	100				5,4/3,5,8,8 SPT(C) N=24					
6.70	66						8.00	Recovery consists of brown sandy gravelly CLAY with cobble fragments (Very stiff)		
8.20 9.00-9.38	93				15,10/20,25,5 SPT(C) 50/225					
9.70										

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH10

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH10
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter Location	Ground Level (mOD) Dates: 31/07/2017-31/08/2017	Client: DAA Engineer: FCC	Job Number: 6734-04-17 Sheet: 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100				17,8/37,13 SPT(C) 50/150		(4.70)			
10.90 12.00-12.30	92									
12.70	12						12.70 (2.00)	Recovery consists of cobble fragments and gravels		
14.20	86						14.70 (1.50)	Recovery consists of brown grey sandy gravelly CLAY with cobble fragments (Very stiff)		
15.70	86	36	20	24			16.20 (2.00)	Medium strong to strong grey fine to coarse grained LIMESTONE, Unweathered to partially weathered with some clay staining and sandy infill. FRACTURES: Two sets of fracture sets, F1: Very closely spaced, dipping between 70degrees to 30degrees, rough to smooth, plannar, undulating wih some clayey sandy infill, tight to open. F2: One horizontal fracture between 17.90 - 18.20, very closely spaced, undulating, plannar, smooth, tight to open with some clay infil		
17.20	100	100	10							
18.20							18.20	Complete at 18.20m		

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH10

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Site Dublin Airport Rotary Core Airside			**Borehole Number** BH11
Machine : T44 **Flush :** **Core Dia:** mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client** DAA **Job Number** 6734-04-17
	Location	**Dates** 01/08/2017	**Engineer** FCC **Sheet** 1/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	38						(2.10)	Recovery consists of brown slightly sandy gravelly silty CLAY with cobble fragments (Very stiff)		
2.10 2.10-2.55	100				7,10/9,11,14,14 SPT(C) N=48		2.10	Recovery consists of black sandy gravelly CLAY with cobble fragments (Very stiff)		
3.60	100									
5.10 6.00-6.45	100				12,11/11,10,11,10 SPT(C) N=42		(6.10)			
6.70	26									
8.20 9.00-9.45	100				15,10/12,12,14,12 SPT(C) N=50		8.20	Recovery consists of brown sandy gravelly CLAY with cobble fragments (Very stiff)		
9.70										

Remarks
Installation: Slotted Pipe 24.0m - 1.00m, Plain Pipe 1.00m to 0.00m

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH10

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH11
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 01/08/2017	Engineer: FCC Sheet: 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100									
11.20 12.00-12.38	93				18,7/15,16,19 SPT(C) 50/225					
12.70	100						(10.50)			
14.20	53									
15.70	80									
17.20 18.00-18.30	66				20,5/20,30 SPT(C) 50/150					
18.70	33						18.70	Recovery consists of black sandy gravelly CLAY with cobble fragments (Very stiff)		

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH10

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Site: Dublin Airport Rotary Core Airside			Borehole Number: BH11
Machine : T44 Flush : Core Dia: mm Method : Rotary Cored	Casing Diameter	Ground Level (mOD)	Client: DAA Job Number: 6734-04-17
	Location	Dates: 01/08/2017	Engineer: FCC Sheet: 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.20							(4.20)			
	45				25/23,27					
21.00-21.23					SPT(C) 25*/75					
21.30					50/150					
	93									
22.90							22.90			
	100	64	34	26			(2.30)	Strong to very strong grey fine to medium grained LIMESTONE with interbedded mudstone. Unweathered to partially weathered with some clay staining and sandy infill. FRACTURES: Two sets of fracture sets, F1: Very closely spaced, dipping between 70degrees to 50degrees, rough to smooth, plannar, stepped wih some sandy gravelly clay infill, tight to open. F2: Three horizontal fracture between 23.0 - 23.2m, 23.7 - 23.8m, 24.4 - 24.5m very closely spaced, undulating, rough to smooth, stepped, tight to open with some clay infil		
24.60	100	100	33	11			25.20			
25.20								Complete at 25.20m		

Remarks

Scale (approx)	Logged By
1:50	RO'T

Figure No. 6734-04-17.BH10

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AMD: Additional Airfield Boreholes (2018)

NICHOLAS O'DWYER

daa

Ground Investigations Ireland Ltd
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Site Additional Airfield Boreholes			**Borehole Number** BH01
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia:** 102 mm **Method :** Cable Percussion & Geobore S	**Casing Diameter** 200mm cased to 3.50m 102mm cased to 32.70m	**Ground Level (mOD)** 64.02	**Client** DAA	**Job Number** 7687-04-18
	Location 315950.6 E 242860.5 N	**Dates** 21/05/2018	**Engineer** Balfour Beatty	**Sheet** 1/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.20)	Open Hole - Air Excavation		
1.20-1.65 1.20-1.20					1,1/1,2,2,2 SPT(C) N=7 B	62.82	1.20 (0.60)	Stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
2.00-2.45 2.00-2.00					3,6/7,7,7,8 SPT(C) N=29 B	62.22	1.80 (1.20)	Stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
3.00-3.30 3.00-3.00					1,8/13,11,26 SPT(C) 50/150 B	61.02	3.00 (0.50)	Very stiff black slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
3.50	100					60.52	3.50	Very stiff dark grey/brown slightly sandy gravelly CLAY with frequent sub-rounded cobbles and occasional boulders. Gravel is fine to coarse sub-angular to sub-rounded		
4.30 4.30-4.45	100				16,17/50 SPT(C) 50/0					
5.80 5.80-5.95	100				19,25/50 SPT(C) 50/0		(5.90)			
7.30 7.30-7.45	100				20,25/50 SPT(C) 50/0					
8.80 8.80-85.00	100				27,25/50 SPT(C) 50/0	54.62	9.40	Very stiff brown slightly sandy gravelly CLAY with frequent sub-rounded cobbles and occasional boulders. Gravel is fine to coarse sub-angular to sub-rounded		

Remarks
Cable Percussion borehole terminated due to Obstrction - Presumed Boulder
Geobore S techniques carried out from 3.50m to 32.70m BGL
Borehole backfilled upon completion with bentonite grout
Chiselling from 3.30m to 3.50m for 1 hour.

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH01

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Site Additional Airfield Boreholes			**Borehole Number** BH01
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia :** 102 mm **Method :** Cable Percussion & Geobore S	**Casing Diameter** 200mm cased to 3.50m 102mm cased to 32.70m	**Ground Level (mOD)** 64.02	**Client** DAA	**Job Number** 7687-04-18
	Location 315950.6 E 242860.5 N	**Dates** 21/05/2018	**Engineer** Balfour Beatty	**Sheet** 2/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.30 10.30-10.45	93				19,25/50 SPT(C) 50/0					
11.80 11.80-11.95	100				22,25/50 SPT(C) 50/0		(6.10)			
13.30 13.30-13.45	100				25,25/50 SPT(C) 50/0					
14.80 14.80-14.95	100				27,25/50 SPT(C) 50/0	48.52	15.50	Very stiff dark grey/brown slightly sandy gravelly CLAY with frequent sub-rounded cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded		
16.30 16.30-16.45	100				24,25/50 SPT(C) 50/0					
17.80 17.80-17.95	100				25,25/50 SPT(C) 50/0		(5.30)	.....Lense of brown sandy clayey fine to coarse sub-angular to sub-rounded GRAVEL occurs between 17.85m to 18.35m BGL		
19.30 19.30-19.45					25,25/50 SPT(C) 50/0					

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH01

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Site Additional Airfield Boreholes			**Borehole Number** BH01
Machine : Dando 2000 & Beretta T44 **Flush** : Polymer **Core Dia** : 102 mm **Method** : Cable Percussion & Geobore S	**Casing Diameter** 200mm cased to 3.50m 102mm cased to 32.70m	**Ground Level (mOD)** 64.02	**Client** DAA	**Job Number** 7687-04-18
	Location 315950.6 E 242860.5 N	**Dates** 21/05/2018	**Engineer** Balfour Beatty	**Sheet** 3/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100									
20.80 20.80-20.95	100				25,25/50 SPT(C) 50/0	43.22	20.80	Very stiff dark grey/black slightly sandy gravelly CLAY with frequent sub-rounded cobbles and occasional boulders. Gravel is fine to coarse sub-angular to sub-rounded		
22.30 22.30-22.45	100				25,25/50 SPT(C) 50/0					
23.80 23.80-23.95	100				25,25/50 SPT(C) 50/0		(7.50)			
25.30 25.30-25.45	100				25,25/50 SPT(C) 50/0					
26.80 26.80-26.95	100				25,25/50 SPT(C) 50/0					
28.30	100	87	18			35.72	28.30	Medium strong thinly bedded grey fine to medium LIMESTONE partially to distinctly weathered with calcite veins. Interbedded with a weak to medium strong thickly laminated MUDSTONE partially to distinctly weathered Sequence contains one set of fratures. F1 are very close to closely spaced, dipping between 10-30 degrees, planar to stepped rough with some surface staining and clay infilling		
29.80				16			(3.00)			

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH01

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Site Additional Airfield Boreholes			**Borehole Number** BH01
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia :** 102 mm **Method :** Cable Percussion & Geobore S	**Casing Diameter** 200mm cased to 3.50m 102mm cased to 32.70m	**Ground Level (mOD)** 64.02	**Client** DAA	**Job Number** 7687-04-18
	Location 315950.6 E 242860.5 N	**Dates** 21/05/2018	**Engineer** Balfour Beatty	**Sheet** 4/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100	88	26							
31.30	100	52	7	NI		32.72	31.30 (1.40)	Medium strong thinly bedded grey fine to medium LIMESTONE partially to distinctly weathered with calcite veins. Interbedded with a weak to medium strong thickly laminated MUDSTONE partially to distinctly weathered Non Intact		
32.70						31.32	32.70	Complete at 32.70m		

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH01

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Site Additional Airfield Boreholes			**Borehole Number** BH02
Machine : Dando 2000 **Method :** Cable Percussion	**Casing Diameter** 200mm cased to 5.40m	**Ground Level (mOD)** 62.30	**Client** DAA	**Job Number** 7687-04-18
	Location 316328.6 E 242937.8 N	**Dates** 16/05/2018-21/05/2018	**Engineer** Balfour Beatty	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						(1.20)	OPEN HOLE - Air Excavation		
					61.10	1.20			
1.50-1.95 1.50	SPT(C) N=5 B			1,1/1,1,1,2		(0.70)	Soft to firm brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
					60.40	1.90			
2.50-2.95 2.50	SPT(C) N=38 B			3,5/5,9,10,14		(1.60)	Very stiff brown slightly sandy gravelly CLAY with ocasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
3.50-3.88 3.50	SPT(C) 50/225 B			6,7/9,12,21,8	58.80	3.50			
						(1.50)	Very stiff brown slightly sandy gravelly CLAY with ocasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
4.50-4.65 4.50	SPT(C) 50/0 B			25,25/50					
					57.30	5.00			
5.40-5.85 5.40	SPT(C) N=50 B			25,25/50		(2.00)	Very stiff black slightly sandy gravelly CLAY with ocasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
					55.30	7.00			
							Complete at 7.00m		

Remarks
Air excavations carried out to 1.20m BGL
Borehole terminated due to Obstrction - Presumed Boulder
Bailing from 5.20m to 5.40m for 1 hour.

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH02

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Site Additional Airfield Boreholes			**Borehole Number** BH02A
Machine : Beretta T44 **Flush :** Polymer **Core Dia:** 102&64 mm **Method :** Rotary Cored	**Casing Diameter** 102mm cased to 28.70m 64mm cased to 33.50m	**Ground Level (mOD)** 62.27	**Client** DAA	**Job Number** 7687-04-18
	Location 316329 E 242933.5 N	**Dates** 25/05/2018-29/05/2018	**Engineer** Balfour Beatty	**Sheet** 1/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.00)	OPEN HOLE		
1.00	40					61.27	1.00 (0.70)	Firm brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
1.70	93					60.57	1.70 (1.50)	Firm brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded .....Lense of brown sandy clayey fine to coarse sub-angular to sub-rounded GRAVEL occurs between 1.70m to 2.40m BGL		
3.20 3.20-3.35	100				19,25/50 SPT(C) 50/0	59.07	3.20 (1.50)	Very stiff dark brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
4.70 5.20-5.35	86				25,25/50 SPT(C) 50/0	57.57	4.70	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
6.20 6.20-6.35	100				25,25/50 SPT(C) 50/0					
7.70 7.70-7.85	100				25,25/50 SPT(C) 50/0		(6.00)			
9.20 9.20-9.35	100				25,25/50 SPT(C) 50/0					

Remarks
Borehole carried out from ground level
Air excavtion carried out to 1.0m BGL to avoid serivces
Geobore S techniques carried out to 28.70m BGL and Conventional HQ Rotary techniques carried out 33.50m BGL
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH02A

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Site Additional Airfield Boreholes			**Borehole Number** BH02A
Machine : Beretta T44 **Flush :** Polymer **Core Dia:** 102&64 mm **Method :** Rotary Cored	**Casing Diameter** 102mm cased to 28.70m 64mm cased to 33.50m	**Ground Level (mOD)** 62.27	**Client** DAA	**Job Number** 7687-04-18
	Location 316329 E 242933.5 N	**Dates** 25/05/2018-29/05/2018	**Engineer** Balfour Beatty	**Sheet** 2/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.70 10.70-10.85	100				25,25/50 SPT(C) 50/0	51.57	10.70	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
12.20 12.20-12.35	70				25,25/50 SPT(C) 50/0		(3.00)	....Brown slightly clayey sandy fine to coarse GRAVEL between 12.95m - 13.25m BGL		
13.70 13.70-13.85	96				25,25/50 SPT(C) 50/0	48.57	13.70	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded		
15.20 15.20-15.35	100				25,25/50 SPT(C) 50/0		(1.48)			
16.70 16.70-16.85	100				25,25/50 SPT(C) 50/0	47.09	15.18	Very stiff dark brown/grey sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
18.00 18.20-18.35	100				25,25/50 SPT(C) 50/0		(6.92)			
19.70 19.70-19.85					25,25/50 SPT(C) 50/0					

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH02A

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Site Additional Airfield Boreholes			**Borehole Number** BH02A
Machine : Beretta T44 **Flush :** Polymer **Core Dia:** 102&64 mm **Method :** Rotary Cored	**Casing Diameter** 102mm cased to 28.70m 64mm cased to 33.50m	**Ground Level (mOD)** 62.27	**Client** DAA	**Job Number** 7687-04-18
	Location 316329 E 242933.5 N	**Dates** 25/05/2018-29/05/2018	**Engineer** Balfour Beatty	**Sheet** 3/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	95									
21.20	95					40.17	22.10	Very stiff thinly laminated dark brown slightly gravelly CLAY interlaiminated with a brown fine SAND		
							(0.60)			
22.70	100					39.57	22.70	Very stiff dark brown/grey sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
24.20	100						(4.00)			
25.70	100					35.57	26.70	Very stiff dark brown/grey sandy gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded		
							(0.50)			
27.20	96					35.07	27.20	Very stiff dark brown/grey sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
							(1.50)			
28.70	100	66	50			33.57	28.70	Medium strong to strong thinly bedded grey fine to medium grained LIMESTONE partially weathered. Interbedded with a black thickly laminated fine grained MUDSTONE		
30.00										

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH02A

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Site Additional Airfield Boreholes			**Borehole Number** BH02A
Machine : Beretta T44 **Flush :** Polymer **Core Dia:** 102&64 mm **Method :** Rotary Cored	**Casing Diameter** 102mm cased to 28.70m 64mm cased to 33.50m	**Ground Level (mOD)** 62.27	**Client** DAA	**Job Number** 7687-04-18
	Location 316329 E 242933.5 N	**Dates** 25/05/2018-29/05/2018	**Engineer** Balfour Beatty	**Sheet** 4/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	93	68	36	7			(2.80)	Sequence contains two sets of fractures. F1 are very close to closely spaced dipping between 10-20 degrees, undulating to planar smooth with some clay infilling. F2 are close to medium spaced, dipping between 60-70 degrees, undulating to stepped rough with some clay smearing. Non Intact Zone between 29.45m - 29.70m BGL		
31.50						30.77	31.50			
31.70	97	71	52	7			(2.00)	Medium strong to strong thinly bedded grey fine to medium grained LIMESTONE partially weathered. Interbedded with a black thickly laminated fine grained MUDSTONE Sequence contains two sets of fractures. F1 are very close to mediumspaced dipping between 10-20 degrees, undulating to planar smooth with some clay infilling. F2 are widely spaced, dipping between 60-70 degrees, undulating to stepped rough with some clay smearing. Non Intact Zone between 31.70m to 31.80m BGL		
33.50						28.77	33.50	Complete at 33.50m		

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH02A

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Site Additional Airfield Boreholes			**Borehole Number** BH03
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia:** 102 mm **Method :** Cable Percussion & Geobore S	**Casing Diameter** 200mm cased to 3.10m 102mm cased to 22.50m	**Ground Level (mOD)**	**Client** DAA	**Job Number** 7687-04-18
	Location 315805.4 E 243177.1 N	**Dates** 15/05/2018-19/06/2018	**Engineer** Balfour Beatty	**Sheet** 1/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.20)	OPEN HOLE - Air Excavation		
1.20					B		1.20			
1.50-1.95					4,4/3,3,3,3 SPT(C) N=12		(0.90)	Firm brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
1.50					B		2.10			
	100							Very stiff dark brown/grey slightly sandy gravelly CLAY with ocasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
2.50-2.80					7,8/11,12,27 SPT(C) 50/150		(1.00)			
2.50					B		3.10			
								Very stiff dark brown slightly sandy gravelly CLAY with ocasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
4.50										
4.50-4.80					5,7/12,14,24 SPT(C) 50/150					
	100									
							(5.50)			
6.00										
6.20-6.35					21,25/50 SPT(C) 50/0					
	100									
7.50										
7.50-7.65					25,25/50 SPT(C) 50/0					
	88									
							8.60	Very dense brown slightly silty fine to coare SAND		
9.00										
9.00-9.45					5,6/7,6,7,8 SPT(C) N=28		(1.65)			
	97									

Remarks
Air excavations carried out to 1.20m BGL
Cable percsuuion borehole terminated due to Obstrction - Presumed Boulder
Borehlole backfilled with bentonite upon completion
Chiselling from 3.00m to 3.10m for 1 hour.

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH03

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Site Additional Airfield Boreholes			**Borehole Number** BH03
Machine : Dando 2000 & Beretta T44 **Flush** : Polymer **Core Dia**: 102 mm **Method** : Cable Percussion & Geobore S	**Casing Diameter** 200mm cased to 3.10m 102mm cased to 22.50m **Location** 315805.4 E 243177.1 N	**Ground Level (mOD)** **Dates** 15/05/2018-19/06/2018	**Client** DAA **Engineer** Balfour Beatty	**Job Number** 7687-04-18 **Sheet** 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							10.25			
10.50							(0.65)	Very stiff brown sandy gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded		
10.50-10.88	94				8,11/11,12,14,13 SPT(C) 50/225		10.90			
							(0.70)	Very stiff brown laminated CLAY with lenses of brown fine to medium SAND		
							11.60			
12.00							(0.55)	Very dense brown slightly silty fine to coarse SAND		
12.00-12.38	93				10,11/12,14,14,10 SPT(C) 50/225		12.15			
							(0.35)	Very stiff dark brown gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
							12.50			
							(0.90)	Very stiff dark brown slightly gravelly CLAY with lenses of brown fine SAND		
							13.40			
13.50							13.50	Very dense brown fine to caorse SAND		
13.50-13.65	85				14,21/50 SPT(C) 50/0		(0.30)	Very stiff brown slightly sandy gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded		
							13.80			
							13.90	Very dense brown fine to medium SAND		
							(1.10)	Very stiff brown very sandy slightly gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded		
15.00							15.00			
15.00-15.15	100				24,25/50 SPT(C) 50/0			Very stiff brown sandy gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded		
							(2.35)			
16.50-16.65	100	30	17		21,25/50 SPT(C) 50/0		17.35	Medium strong thinly bedded grey/dark grey fine grained LIMESTONE partially to distinctly weathered		
17.35										
18.00	97	66	38					Sequnce contains two sets of fractures. F1 are close to medium spaced, dipping between 10-30 degrees, undulating to planar rough with some surface staining and clay infilling. F2 are widely spaced, dipping between 50-70 degress, planar smooth with some surface staining and Clay infilling		
19.50				5						

Remarks

Scale (approx)	Logged By
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Site Additional Airfield Boreholes			**Borehole Number** BH03
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia:** 102 mm **Method :** Cable Percussion & Geobore S	**Casing Diameter** 200mm cased to 3.10m 102mm cased to 22.50m **Location** 315805.4 E 243177.1 N	**Ground Level (mOD)** **Dates** 15/05/2018-19/06/2018	**Client** DAA **Engineer** Balfour Beatty	**Job Number** 7687-04-18 **Sheet** 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	98	92	6				(5.15)			
21.00	100	81	63				22.50	Complete at 22.50m		
22.50										

Remarks

Scale (approx)	Logged By
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Figure No. 7687-04-18.BH03

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Site Additional Airfield Boreholes			**Borehole Number** BH04
Machine : Dando 2000 & Beretta T44 **Flush** : Polymer **Core Dia:** 102&64 mm **Method** : Cable Percsussion & Geobre S	**Casing Diameter** 200mm cased to 7.00m 102mm cased to 20.00m 64mm cased to 32.70m	**Ground Level (mOD)** 62.73	**Client** DAA	**Job Number** 7687-04-18
	Location 316249 E 243108.1 N	**Dates** 16/05/2018-24/05/2018	**Engineer** Balfour Beatty	**Sheet** 1/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.20)	OPEN HOLE - Air Excavation		
1.30-1.75 1.30					1,1/1,2,1,2 SPT(C) N=6 B	61.53	1.20 (0.80)	MADE GROUND consisting of brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
[illegible]-2.95 2.50					1,3/4,6,6,11 SPT(C) N=27 B	60.73	2.00 (1.50)	Stiff dark brown/grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
3.50-3.95 3.50					4,7/8,10,15,18 SPT(C) N=51 B	59.23	3.50 (1.00)	Very stiff dark brown/grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
4.50-4.80 4.50					7,10/17,25,8 SPT(C) 50/150 B	58.23	4.50 (2.50)	Very stiff black slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
5.50-5.60 5.50					25,25/50 SPT(C) B					
[illegible]-6.65 6.50					25,25/50 SPT(C) 50/0 B					
7.00	100					55.73	7.00	Very stiff brown/grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded		
8.50 8.50-8.65	100				20,25/50 SPT(C) 50/0					
10.00										

Remarks
Air excavations carried out to 1.20m BGL
[illegible]le percussion borehole terminated due to Obstrction - Presumed Boulder
[illegible]ple disturbance from 4.50m to 6.50m BGL due to borehole collapse
Geobore S techniques carried out from 4.50m BGL to 20.0m BGL and Conventionla HQ rotary coring carried out from 20.0m BGL to 32.70m BGL
Borehole backfilled with bentonite upon completion
Chiselling from 6.90m to 7.00m for 1 hour.

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH04

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Site Additional Airfield Boreholes			**Borehole Number** BH04
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia :** 102&64 mm **Method :** Cable Percsussion & Geobre S	**Casing Diameter** 200mm cased to 7.00m 102mm cased to 20.00m 64mm cased to 32.70m	**Ground Level (mOD)** 62.73	**Client** DAA
	Location 316249 E 243108.1 N	**Dates** 16/05/2018-24/05/2018	**Engineer** Balfour Beatty
			Job Number 7687-04-18
			Sheet 2/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
10.00-10.15	97				22,25/50 SPT(C) 50/0		(6.00)			
11.50 11.50-11.65	100				19,25/50 SPT(C) 50/0			.....Lense of brown sandy clayey sub-angular to sub-rounded fine to coarse GRAVEL occurs between 11.40m - 11.90m BGL		
13.00 13.00-13.15	97				25,25/50 SPT(C) 50/0	49.73	13.00	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded		
14.50 14.50-14.65	96				22,25/50 SPT(C) 50/0		(3.85)			
16.00 16.00-16.15	60				19,25/50 SPT(C) 50/0	45.88	16.85	Poor Recovery - Driller notes gravelly CLAY. Recovery consists grey fine to coarse angular to sub-angular Gravel with Clay washed away		
17.40 17.40-17.55	100				22,25/50 SPT(C) 50/0		(1.15)			
18.00 18.00-18.15	0				25,25/50 SPT(C) 50/0	44.73	18.00	Core Loss - Driller notes silty sandy CLAY		
19.00 19.00-19.23	0				11,14/15 SPT(C) 15/75		(2.00)			
20.00										

Remarks

Scale (approx)	Logged By
1:50	S Kealy

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Site Additional Airfield Boreholes			**Borehole Number** BH04
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia :** 102&64 mm **Method :** Cable Percsussion & Geobre S	**Casing Diameter** 200mm cased to 7.00m 102mm cased to 20.00m 64mm cased to 32.70m **Location** 316249 E 243108.1 N	**Ground Level (mOD)** 62.73 **Dates** 16/05/2018-24/05/2018	**Client** DAA **Engineer** Balfour Beatty	**Job Number** 7687-04-18 **Sheet** 3/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
20.00-20.15	60				22,25/ SPT(C)	42.73	20.00	Very stiff dark brown/grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles and boulders. Gravel is fine to coarse sub-angular to sub-rounded		
21.20	60						(4.20)			
22.70	80									
24.20	100					38.53	24.20	Very stiff grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded .....Lense of brown sandy clayey sub-angular to sub-rounded fine to coarse GRAVEL occurs between 24.35m - 24.50m BGL		
25.70	86						(3.35)			
27.20										
27.55	100	75	98			35.18	27.55	Medium strong thinly bedded dark grey fine grained LIMESTONE partially to distinctly weathered interbedded with a dark grey black thickly laminated MUDSTONE		
28.70	100	91	63	7			(4.15)	The sequence contains two sets of fractures. F1 are close to medium spaced, dipping 5-25 degrees, undulating rough with some clay surface staining. F2 are widely spaced, dipping between 45-80 degrees, undulating rough with some surface staining		

Remarks

Scale (approx)	Logged By
1:50	S Kealy

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Site Additional Airfield Boreholes			**Borehole Number** BH04
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia:** 102&64 mm **Method :** Cable Percsussion & Geobre S	**Casing Diameter** 200mm cased to 7.00m 102mm cased to 20.00m 64mm cased to 32.70m	**Ground Level (mOD)** 62.73	**Client** DAA	**Job Number** 7687-04-18
	Location 316249 E 243108.1 N	**Dates** 16/05/2018-24/05/2018	**Engineer** Balfour Beatty	**Sheet** 4/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
30.20	93	86	57							
31.70	95	94	32	5		31.03	31.70 (1.00)	Medium strong thinly bedded dark grey fine grained LIMESTONE partially to distinctly weathered interbedded with a dark grey black thickly laminated MUDSTONE The sequence contains one set of fractures. F1 are close to medium spaced, dipping 5-25 degrees, undulating rough with some clay surface staining		
32.70						30.03	32.70	Complete at 32.70m		

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH04

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Site Additional Airfield Boreholes			**Borehole Number** BH05
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia:** 102 mm **Method :** Cable Percussion & Geobore S Rotary Cored	**Casing Diameter** 200mm cased to 4.70m 102mm cased to 28.50m	**Ground Level (mOD)** 65.10	**Client** DAA	**Job Number** 7687-04-18
	Location 316004.1 E 243983.1 N	**Dates** 17/05/2018-01/06/2018	**Engineer** Balfour Beatty	**Sheet** 1/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.20)	OPEN HOLE - Air Excavation		
1.20					B 4,4/3,3,3,3 SPT(C) N=12	63.90	1.20	Firm brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
1.50-1.95							(0.90)			
2.00					B	63.00	2.10	Stiff dark brown/grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
-2.80					7,8/11,12,27 SPT(C) 50/150		(0.90)			
3.00					B	62.10	3.00	Very stiff black slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
4.00					B		(1.70)			
4.70	100					60.40	4.70	Very stiff dark brown/grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded .....Lense of brown sandy clayey sub-angular to sub-rounded fine to coarse GRAVEL occurs between 4.70m - 4.90m BGL		
6.20 -6.35	100				19,25/50 SPT(C) 50/0	58.90	6.20	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
7.50 7.50-7.65	96				21,25/50 SPT(C) 50/0		(2.80)			
9.00 9.00-9.15	100				19,25/50 SPT(C) 50/0	56.10	9.00	Very stiff dark brown/grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		

Remarks
Air excavations carried out to 1.20m BGL
Cable Percussion borehole terminated at 4.20m BGL due to Obstrction
Geobore S Rotary techniques carried out from 4.20m to 28.50m BGL
Borehole backfilled with bentonite upon completion
Chiselling from 4.10m to 4.20m for 1 hour.

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH05

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Site Additional Airfield Boreholes			**Borehole Number** BH05
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia :** 102 mm **Method :** Cable Percussion & Geobore S Rotary Cored	**Casing Diameter** 200mm cased to 4.70m 102mm cased to 28.50m	**Ground Level (mOD)** 65.10	**Client** DAA	**Job Number** 7687-04-18
	Location 316004.1 E 243983.1 N	**Dates** 17/05/2018-01/06/2018	**Engineer** Balfour Beatty	**Sheet** 2/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(2.05)			
10.50 10.50-10.65	100				22,25/50 SPT(C) 50/0	54.05	11.05	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
							(1.30)			
12.00 12.00-12.15	100				22,25/50 SPT(C) 50/0	52.75	12.35	Very stiff dark brown/grey slightly sandy gravelly CLAY with frequent sub-rounded cobbles and occasional boulders. Gravel is fine to coarse sub-angular to sub-rounded		
							(1.15)			
13.50 13.50-13.65	100				25,25/50 SPT(C) 50/0	51.60 51.40	13.50 (0.20) 13.70	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
								Very stiff dark brown/grey slightly sandy gravelly CLAY with frequent sub-rounded cobbles and occasional boulders. Gravel is fine to coarse sub-angular to sub-rounded		
							(1.30)			
15.00 15.00-15.15	100				22,25/50 SPT(C) 50/0	50.10	15.00	Very dense brown sandy clayey sub-angular to sub-rounded fine to coarse GRAVEL with occasional sub-rounded cobbles		
							(2.30)			
16.50 16.50-16.65	100				25,25/50 SPT(C) 50/0	47.80	17.30	Very stiff black slightly sandy gravelly CLAY with frequent sub-rounded cobbles and occasional boulders. Gravel is fine to coarse sub-angular to sub-rounded		
18.00 18.00-18.15	100				25,25/50 SPT(C) 50/0					
19.50 19.50-19.65					25,25/50 SPT(C) 50/0			.....Lense of brown sandy clayey sub-angular to sub-rounded fine to coarse GRAVEL occurs between 19.50m - 19.90m BGL		

Remarks

Scale (approx)	Logged By
1:50	S Kealy

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Site Additional Airfield Boreholes			**Borehole Number** BH05
Machine : Dando 2000 & Beretta T44 **Flush :** Polymer **Core Dia:** 102 mm **Method :** Cable Percussion & Geobore S Rotary Cored	**Casing Diameter** 200mm cased to 4.70m 102mm cased to 28.50m	**Ground Level (mOD)** 65.10	**Client** DAA	**Job Number** 7687-04-18
	Location 316004.1 E 243983.1 N	**Dates** 17/05/2018-01/06/2018	**Engineer** Balfour Beatty	**Sheet** 3/3

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	100						(6.50)			
21.00 21.00-21.15	100				25,25/50 SPT(C) 50/0					
	100									
24.00						41.30	23.80 (0.40)	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
24.20	100	80	53			40.90	24.20	Medium strong thickly laminated to thinly bedded dark grey fine grained LIMESTONE with calcite veins partially to distinctly weathered. Interbedded with a weak thickly laminated brown/black MUDSTONE partially to distinctly weathered Sequence contains one set of fractures. F1 is medium spaced, dipping between 20-30 degrees, planar rough with some Clay smearing		
25.50	100	73	63	5			(2.70)			
26.90 27.00	100	36	16	6		38.20	26.90 (1.60)	Medium strong thickly laminated to thinly bedded dark grey fine grained LIMESTONE with calcite veins partially to distinctly weathered. Interbedded with a weak thickly laminated brown/black MUDSTONE partially to distinctly weathered Sequence contains two sets of fractures. F1 is very close to closely spaced, dipping between 20-30 degrees, undulating rough with clay infilling. F2 are widely spaced , dipping between 75-85 degrees, planar smooth with sme clay smearing ....Residual rock recovered as a brown sandy slightly gravelly CLAY with relic bedding betweeen 28.0 - 28.40m BGL		
28.50						36.60	28.50	Complete at 28.50m		

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH05

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Site Additional Airfield Boreholes			**Borehole Number** BH06
Machine : Dando 2000 Beretta T44 **Flush :** Polymer **Core Dia :** 102&64 mm **Method :** Geobore S & HQ Rotary Coring	**Casing Diameter** 200mm cased to 3.60m 102mm cased to 27.50m 64mm cased to 38.00m	**Ground Level (mOD)** 67.81	**Client** DAA **Job Number** 7687-04-18
	Location 315504.6 E 244020.6 N	**Dates** 18/05/2018-11/06/2018	**Engineer** Balfour Beatty **Sheet** 1/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
							(1.20)	OPEN HOLE		
1.20-1.65 1.20					1,1/3,2,2,3 SPT(C) N=10 B	66.61	1.20 (0.80)	Firm brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
2.00-2.45 2.00					3,9/9,10,14,17 SPT(C) N=50 B	65.81 65.51	2.00 (0.30) 2.30	Stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
							(0.70)	Very stiff brown slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
3.00-3.15 3.00					25,25/50 SPT(C) 50/0 B	64.81	3.00 (0.90)	Very stiff black slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to sub-rounded		
3.60	86					63.91	3.90	Very stiff brown/grey slightly sandy gravelly CLAY with occasional sub-rounded cobbles. Gravel is fine to coarse sub-angular to subrounded .....Lense of brown sandy clayey sub-angular to sub-rounded fine to coarse GRAVEL occurs between 4.60m - 4.90m BGL		
4.70 4.70-4.85	100				14,19/50 SPT(C) 50/0					
6.20 6.20-6.35	100				23,25/50 SPT(C) 50/0		(5.60)			
7.70 7.70-7.85	100				22,25/50 SPT(C) 50/0					
9.20 9.20-9.35	100				25,25/50 SPT(C) 50/0	58.31	9.50 (0.70)	Residual Rock - Recovered as very stiff brown slightly sandy gravelly CLAY with relic bedding fabric throughout and lenses of fine brown Sand		

Remarks
Air excavations carried out to 1.20m BGL
Cable percsussion terminated at 3.60m BGL due to Obstrction - Presumed Boulder
Geobore S techniques carried out from 3.60m to 27.50m BGL
Conventional HQ Rotary Techniques carried out from 27.50m to 31.50m BGL
Borehole backfilled with bentonite upon completion
Chiselling from 3.30m to 3.60m for 1 hour.

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH06

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Site Additional Airfield Boreholes			**Borehole Number** BH06
Machine : Dando 2000 Beretta T44 **Flush :** Polymer **Core Dia:** 102&64 mm **Method :** Geobore S & HQ Rotary Coring	**Casing Diameter** 200mm cased to 3.60m 102mm cased to 27.50m 64mm cased to 38.00m	**Ground Level (mOD)** 67.81	**Client** DAA	**Job Number** 7687-04-18
	Location 315504.6 E 244020.6 N	**Dates** 18/05/2018-11/06/2018	**Engineer** Balfour Beatty	**Sheet** 2/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						57.61	10.20	Residual Rock - Recovered as very stiff brown with orange and black mottling slightly sandy CLAY with relic bedding and occasional angular cobbles		
10.70 10.70-10.85	100				24,25/50 SPT(C) 50/0		(3.50)			
12.20 12.20-12.35	100				25,25/50 SPT(C) 50/0					
13.70 13.70-13.85	100				25,25/50 SPT(C) 50/0	54.11	13.70	Residual Rock - Recovered as angular cobbles and boulders in a brown sandy CLAY matrix		
15.20	100						(4.50)			
16.70	100									
18.20	93					49.61	18.20	Residual Rock - Recovered as brown/grey with orange and black mottling CLAY with relic bedding and lenses of Sand		
19.70							(3.00)			

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH06

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Site Additional Airfield Boreholes			**Borehole Number** BH06
Machine : Dando 2000 Beretta T44 **Flush :** Polymer **Core Dia :** 102&64 mm **Method :** Geobore S & HQ Rotary Coring	**Casing Diameter** 200mm cased to 3.60m 102mm cased to 27.50m 64mm cased to 38.00m	**Ground Level (mOD)** 67.81	**Client** DAA
	Location 315504.6 E 244020.6 N	**Dates** 18/05/2018-11/06/2018	**Engineer** Balfour Beatty
			Job Number 7687-04-18
			Sheet 3/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
	96									
						46.61	21.20	Weathered Rock - Recovered as medium strong laminated grey fine grained LIMESTONE distinctly weathered		
21.20	100						(1.50)			
22.70	91.3					45.11	22.70	Residual Rock - Residual Rock - Recovered as angular cobbles and boulders in a brown sandy CLAY matrix with relic bedding		
23.00	100						(1.10)			
						44.01	23.80	Weathered Rock - Recovered as medium strong laminated grey fine grained LIMESTONE distinctly weathered		
24.50	53						(0.70)			
						43.31	24.50	Residual Rock - Recovered as angular cobbles and boulders in a brown sandy CLAY matrix with relic bedding		
26.00	100						(1.50)			
						41.81	26.00	Residual Rock - Recovered as light brown with grey/black mottling CLAY with occasional lenses of Sand		
27.50	56						(1.50)			
						40.31	27.50	Weathered Rock - Recovered as angular cobbles of Limestone in a brown sandy Clay matrix		
29.00	80	43	43			38.81	29.00	Medium strong to strong laminated grey fine grained LIMESTONE partially to distinctly weatheredwith clay seams		

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH06

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Site Additional Airfield Boreholes			**Borehole Number** BH06
Machine : Dando 2000 Beretta T44 **Flush** : Polymer **Core Dia**: 102&64 mm **Method** : Geobore S & HQ Rotary Coring	**Casing Diameter** 200mm cased to 3.60m 102mm cased to 27.50m 64mm cased to 38.00m **Location** 315504.6 E 244020.6 N	**Ground Level (mOD)** 67.81 **Dates** 18/05/2018-11/06/2018	**Client** DAA **Engineer** Balfour Beatty	**Job Number** 7687-04-18 **Sheet** 4/4

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				7			(2.50)	The sequence contains two sets of fractures F(1) are closely spaced, dipping between 10-20 degrees, planar to stepped rough with Clay smearing. F(2) are closely spaced, dipping between 70-90 degrees, planar to stepped rough with some Clay infilling		
30.50	93	59	50							
31.50						36.31	31.50	Medium strong to strong laminated grey fine grained LIMESTONE partially to distinctly weatheredwith clay seams		
32.00	73	73	39							
33.50	83	50	20					The sequence contains two sets of fractures F(1) are closely spaced, dipping between 10-20 degrees, planar to stepped rough with Clay smearing. F(2) are closely spaced, dipping between 60-80 degrees, undulating to stepped rough with some surface staining and clay infilling		
							(6.50)			
35.00	80	40	55					Zones of non-intact between 32.0m to 32.05m BGL and 35.90m and 36.60m BGL		
38.00	22	20	20			29.81	38.00	Complete at 38.00m		

Remarks

Scale (approx)	Logged By
1:50	S Kealy

Figure No. 7687-04-18.BH06

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Causeway Survey Report (2018)

NICHOLAS O'DWYER

daa

CAUSEWAY GEOTECH

Project No.:	Project Name:	Borehole No.:
18-0577	DAA Surveys and Investigations	BH01

Coordinates:	Client:	Sheet 1 of 2
317564.27 E	Dublin Airport Authority	
242624.23 N	Client's Representative: Balfour Beatty	Scale: 1:50
Ground Level: 54.60 mOD	Dates: 10/08/2018 - 23/08/2018	Driller: BM
		Logger: CH+MMC

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	5.45
Rotary Coring	Hanjin 8D	5.45	17.00

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
						(0.30)		TOPSOIL: Firm brown slightly sandy slightly gravelly organic CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse and of limestone.		
					54.30	0.30		Firm brownish grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse and of limestone.		
0.50	B1									
						(1.10)				
1.00	B2									
1.20 - 1.65	U10	1.20		Ublow=50 90%						
					53.20	1.40		Stiff becoming very stiff black slightly sandy slightly gravelly CLAY with low cobble and boulder content. Sand is fine to coarse. Gravel is subangular to subrounded, fine to medium and predominantly of limestone. Cobbles and boulders are subangular to subrounded and a range of sizes.		
2.00	B3 D7									
2.00 - 2.45	SPT (S) N=30	2.00		N=30 (5,6/7,7,7,9)						
3.00	B4 D8									
3.00 - 3.45	SPT (S) N=37	3.00		N=37 (8,8/8,9,10,10)		(3.60)				
4.00	B5									
4.00 - 4.45	U11	4.00		Ublow=100 50%						
5.00	B6 D9				49.60	5.00		Stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded, fine to coarse and predominantly of limestone. Cobbles are subrounded of limestone		
5.00 - 5.45	SPT (S) ~~N=50~~	5.00		N=50 (9,10/12,12,16,10)						
5.15 - 5.60	C									
	100	0	0			(1.50)				
6.50					48.10	6.50		Firm becoming stiff light brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subrounded, fine to coarse and predominantly of limestone. Cobbles are subrounded predominantly of limestone		
- 7.36				C						
	100	0	0							
8.00						(3.00)				
8.70 - 9.15	100	0	0	C						
9.50					45.10	9.50		Greyish brown sandy slightly silty subangular fine to coarse GRAVEL, predominantly of limestone. Sand is fine to coarse.		
	55	0	0			(1.50)				
	TCR	SCR	RQD	FI						

Remarks
Hand dug inspection pit excavated.
No groundwater encountered

Terminated at scheduled depth

Core Barrel	Water Strikes				Chiselling Details		
	Struck at (m)	Casing to (m)	Time (min)	Rose to (m)	From (m)	To (m)	Time (hh:mm)
SK6L							

Flush Type	Water Added		Casing Details	
	From (m)	To (m)	To (m)	Diam (mm)
Polymer			5.00	200

CAUSEWAY GEOTECH

Method	Plant Used	Top	Base
Cable Percussion	Dando 2000	0.00	5.45
Rotary Coring	Hanjin 8D	5.45	17.00

Project No.: 18-0577

Project Name: DAA Surveys and Investigations

Borehole No.: BH01

Coordinates: 317564.27 E, 242624.23 N

Client: Dublin Airport Authority

Sheet 2 of 2

Client's Representative: Balfour Beatty

Scale: 1:50

Driller: BM

Ground Level: 54.60 mOD

Dates: 10/08/2018 - 23/08/2018

Logger: CH+MMC

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water	Backfill
									Greyish brown sandy slightly silty subangular fine to coarse GRAVEL, predominantly of limestone. Sand is fine to coarse.		
11.00						43.60	11.00		Stiff dark brownish grey slightly sandy gravelly CLAY with low to medium cobble content. Sand is fine to coarse. Gravel is subangular, fine to coarse and predominantly of limestone. Cobbles are subangular, predominantly of limestone and a range of sizes.		
11.80 - 12.30	100	0	0	C							
12.50											
13.00 - 13.50	100	0	0	C							
14.00							(6.00)				
14.25 - 14.60	100	0	0	C							
15.50											
16.30 - 16.70	100	0	0	C							
17.00						37.60	17.00		End of Borehole at 17.00m		

TCR	SCR	RQD	FI

Remarks

Hand dug inspection pit excavated.

No groundwater encountered

Terminated at scheduled depth

Core Barrel: SK6L

Water Strikes

Struck at (m)	Casing to (m)	Time (min)	Rose to (m)

Chiselling Details

From (m)	To (m)	Time

Flush Type: Polymer

Water Added

From (m)	To (m)

Casing Details

To (m)	Diam (mm)
5.00	200

CAUSEWAY GEOTECH

Project No.: 18-0577	**Project Name:** DAA Surveys and Investigations		**Trial Pit No.:** TP08
Co-ordinates: 317622.88 E	**Client:** Dublin Airport Authority		Sheet 1 of 1
Method: Trial Pitting	242284.01 N	**Client's Representative:** Balfour Beatty	**Scale:** 1:25
Plant: 8T Tracked Excavator	**Ground Level:** 53.44 mOD	**Date:** 02/08/2018	**Logger:** MMC

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
0.00	ES3			(0.20)		TOPSOIL: Firm brown slightly sandy CLAY with rootlets. Sand is fine to coarse.	
			53.24	0.20		Stiff yellowish brown slightly sandy SILT. Sand is fine to coarse.	
0.50	B1			(0.60)			
0.50	D2						
			52.64	0.80		Stiff grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse Gravel is subrounded to rounded, fine to coarse and of limestone.	
				(1.20)			
1.50	B4						
1.50	D5						
1.50	ES6						
			51.44	2.00		End of trial pit at 2.00m	

Remarks
No groundwater encountered

Terminated at scheduled depth

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 1.00

Length: 3.00

CAUSEWAY GEOTECH

Project No.: 18-0577	**Project Name:** DAA Surveys and Investigations		**Trial Pit No.:** TP09
Co-ordinates: 317508.94 E	**Client:** Dublin Airport Authority		Sheet 1 of 1
Method: Trial Pitting	242176.73 N	**Client's Representative:** Balfour Beatty	**Scale:** 1:25
Plant: 8T Tracked Excavatir	**Ground Level:** 54.20 mOD	**Date:** 02/08/2018	**Logger:** MMC

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.20)		TOPSOIL	
			54.00	0.20		Stiff light yellowish brown slightly sandy SILT. Sand is fine to coarse.	
				(0.40)			
0.50	B1						
0.50	D2		53.60	0.60		Stiff yellowish brown slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of limestone.	
0.50	ES3			(0.70)			
			52.90	1.30		Stiff locally very stiff slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse and of limestone. Cobbles are subangular to subrounded of limestone.	
				(0.70)			
			52.20	2.00		End of trial pit at 2.00m	

Remarks
No groundwater encountered

Terminated at scheduled depth

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 1.00

Length: 3.00

CAUSEWAY GEOTECH

Project No.: 18-0577	**Project Name:** DAA Surveys and Investigations		**Trial Pit No.:** TP10
Co-ordinates: 317443.22 E	**Client:** Dublin Airport Authority		Sheet 1 of 1
Method: Trial Pitting	242380.91 N	**Client's Representative:** Balfour Beatty	**Scale:** 1:25
Plant: 8T Tracked Excavator	**Ground Level:** 55.05 mOD	**Date:** 02/08/2018	**Logger:** MMC

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		TOPSOIL: Firm light brown slightly sandy CLAY with rootlets. Sand is fine to coarse.	
			54.75	0.30		Stiff yellowish brown slightly sandy CLAY. Sand is fine to coarse.	
				(0.30)			
			54.45	0.60		Stiff light grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular, fine to medium and of limestone.	
0.70	B1						
0.70	D2						
				(1.40)			
1.60	B3						
1.60	D4						
			53.05	2.00		End of trial pit at 2.00m	

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

Remarks
No groundwater encountered

Terminated at scheduled depth

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 1.00
Length: 3.00

CAUSEWAY GEOTECH

Project No.: 18-0577	**Project Name:** DAA Surveys and Investigations		**Trial Pit No.:** TP11
Co-ordinates: 317809.53 E	**Client:** Dublin Airport Authority		Sheet 1 of 1
Method: Trial Pitting	242159.52 N	**Client's Representative:** Balfour Beatty	**Scale:** 1:25
Plant: 8T Tracked Excavator	**Ground Level:** 52.49 mOD	**Date:** 02/08/2018	**Logger:** MMC

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.20)		TOPSOIL	
			52.29	0.20		Stiff light brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular, fine to medium and of limestone.	
				(0.40)			
0.50	B1						
0.50	D2		51.89	0.60		Stiff grey mottled brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular, fine to coarse and of limestone. Cobbles are subangular to subrounded of limestone.	
0.50	ES3						
1.00	B4						
1.00	D5						
				(1.10)			
1.50	ES6						
			50.79	1.70		Firm locally stiff dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone.	
1.90	B7			(0.40)			
1.90	D8						
			50.39	2.10		End of trial pit at 2.10m	

Remarks
No groundwater encountered

Terminated at scheduled depth

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 1.00

Length: 3.00

CAUSEWAY GEOTECH

Project No.: 18-0577	**Project Name:** DAA Surveys and Investigations		**Trial Pit No.:** TP12
Co-ordinates: 318065.77 E 242094.05 N	**Client:** Dublin Airport Authority		Sheet 1 of 1
Method: Trial Pitting	**Client's Representative:** Balfour Beatty		**Scale:** 1:25
Plant: 8T Tracked Excavator	**Ground Level:** 51.48 mOD	**Date:** 02/08/2018	**Logger:** MMC

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.20)		TOPSOIL: Firm light brown slightly sandy CLAY with rootlets. Sand is fine to coarse.	
			51.28	0.20		Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular, fine to medium and of limestone.	
0.50	B1			(0.60)			
0.50	D2						
			50.68	0.80		Stiff grey mottled brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. cobbles are subangular of limestone.	
1.30	B3			(1.00)			
1.30	D4						
			49.68	1.80		Firm locally stiff greyish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse and of limestone. Cobbles are subrounded to subangular of limestone.	
2.00	B5			(0.30)			
2.00	D6		49.38	2.10		End of trial pit at 2.10m	

Remarks
No groundwater encountered

Terminated at scheduled depth

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 1.00

Length: 3.00

CAUSEWAY GEOTECH

Project No.: 18-0577	**Project Name:** DAA Surveys and Investigations		**Trial Pit No.:** TP13
Co-ordinates: 317534.01 E	**Client:** Dublin Airport Authority		Sheet 1 of 1
Method: Trial Pitting	242478.52 N	**Client's Representative:** Balfour Beatty	**Scale:** 1:25
Plant: 8T Tracked Excavator	**Ground Level:** 54.05 mOD	**Date:** 02/08/2018	**Logger:** MMC

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
			53.95	(0.10) 0.10		TOPSOIL	
				(0.70)		Very stiff brownish grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular, fine to medium and of limestone.	
0.60	B1						
0.60	D2						
			53.25	0.80		Very stiff brown slightly slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular, fine to medium and of limestone.	
				(0.50)			
			52.75	1.30		Stiff brown slightly sandy gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded, fine to coarse and of limestone. Cobbles are subrounded of limestone.	
1.60	B3						
1.60	D4			(0.70)			
			52.05	2.00		End of trial pit at 2.00m	

Remarks
No groundwater encountered

Terminated at scheduled depth

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 1.00

Length: 3.00

CAUSEWAY GEOTECH

Project No.: 18-0577	**Project Name:** DAA Surveys and Investigations		**Trial Pit No.:** TP14
Co-ordinates: 317663.23 E	**Client:** Dublin Airport Authority		Sheet 1 of 1
Method: Trial Pitting	242620.45 N	**Client's Representative:** Balfour Beatty	**Scale:** 1:25
Plant: 8T Tracked Excavator	**Ground Level:** 55.02 mOD	**Date:** 01/08/2018	**Logger:** MMC

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.30)		TOPSOIL	
			54.72	0.30		Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular, fine to medium and of limestone.	
0.50	B1			(0.30)			
0.50	D2						
0.50	ES3		54.42	0.60		Stiff greyish brown mottled grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular, fine to medium and of limestone.	
				(0.70)			
1.30	B4		53.72	1.30		End of trial pit at 1.30m	
1.30	D5						
1.30	ES6						

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Remarks
No groundwater encounterred

Terminated due to services

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 1.00
Length: 3.00

CAUSEWAY GEOTECH

Project No.: 18-0577	**Project Name:** DAA Surveys and Investigations	**Trial Pit No.:** TP15	
Co-ordinates: 317900.18 E, 242573.41 N	**Client:** Dublin Airport Authority	Sheet 1 of 1	
Method: Trial Pitting	**Client's Representative:** Balfour Beatty	**Scale:** 1:25	
Plant: 8T Tracked Excavator	**Ground Level:** 55.14 mOD	**Date:** 02/08/2018	**Logger:** MMC

Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Water
				(0.20)		TOPSOIL: Firm light brown slightly sandy CLAY with rootlets. Sand is fine to coarse.	
			54.94	0.20		Stiff light yellowish brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular, fine to medium and of limestone.	
0.50	B1						
0.50	D2			(0.90)			
			54.04	1.10		Stiff greyish brown slightly sandy slightly gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is subangular, fine to medium and of limestone. Cobbles are subangular to subrounded of limestone.	
1.30	B3						
1.30	D4			(0.90)			
			53.14	2.00		End of trial pit at 2.00m	

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

Remarks
No groundwater encountered

Terminated at scheduled depth

Water Strikes:	
Struck at (m):	Remarks:

Stability: Stable

Width: 1.00
Length: 3.00

SI Ltd: West Apron North Perimeter Road (2016)

NICHOLAS O'DWYER

daa

S.I. Ltd Contract No: 5249

Client:	DAA
Engineer:	Clare Civil
Contractor:	Site Investigations Ltd

West Apron and Northern Perimeter Road
Dublin Airport
Site Investigation

Prepared by:

Stephen Letch

Issue Date:	10/02/2016
Status	Final
Revision	1

CABLE PERCUSSIVE BOREHOLE RECORD

CONTRACT: South Apron Extension & West Apron **HOLE ID:** BHX88

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315666.075
Consultant:	Clare Civil		N:243444.672
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	63.76 m.O.D.
Boring Commenced:	05/01/2016	**Hole Diameter:**	200 mm
Boring Completed:	05/01/2016	**Drilled by:**	J. Moriarty
Rig Type:	Dando 150	**Logged by:**	S. Letch

Sheet 1 of 1

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Progress/Water Hole Depth (m)	Date	Water Depth (m)
TOPSOIL.	0.00		63.76						
Grey brown sandy slightly gravelly silty CLAY with low cobble content.	0.30		63.46						
Stiff brown slightly sandy gravelly silty CLAY with low cobble content.	1.00		62.76	B SPT(C)	1.00 1.00	JM55 N=22-(5,5,6,6)			
Very stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.	1.70		62.06	B SPT(C)	2.00 2.00	JM56 N=45- (8,10,13,14)			
Obstruction - possible boulder.	2.60		61.16						
Borehole terminated upon instruction.	**3.00**	**Hole End**	**60.76**	SPT(C)	3.00	N=50/10mm- (50/10mm)	3.00	05/01/2016	Dry(E)
	10.0								

Remarks: ***(Note: Stratum bands <200mm are not indicated pictorially)***
U100 attempted -1.50m - 50 blows, no recovery.
Chiselling: 2.60m to 3.00m: 1.0hr
Standpipe installed: Response zone: 1.00m to 3.00m.

Key to Symbols

B	Bulk Disturbed Sample	SPT(S)	Standard Penetration Test (Split Spoon)
D	Small disturbed sample	SPT(C)	Standard Penetration Test (Cone)
W	Water sample	▼	Waterstrike depth
U(9)	Undisturbed sample (drive blows)	▽	Water level depth 20mins after strike
		5.00(E)	Depth to water (E)nd of shift
		5.00(S)	Depth to water (S)tart of shift

Site Investigations Ltd

BOREHOLE SL 5249 BH.GPJ COREHOLE.GDT 01/02/16

Appendix 2

Trial Pit Logs and Photographs

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP75

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315664.674
Consultant:	Clare Civil		N:243427.795
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	63.88 m.O.D.
Date Completed:	09/12/2015	**Logged by:**	S. Letch
Excavator:	12T Tracked Excavator		

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL with trace of red brick and steel.	0.00		63.88					
Soft light brown sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to coarse of limestone.	0.30		63.58	CBR	0.50	SL30		
Firm brown slightly sandy gravelly silty CLAY with low cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded, fine to coarse of limestone (up to 300mm diameter).	1.00		62.88	B	1.20	SL31		
Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 450mm diameter).	1.70		62.18	B	1.80	SL32		
Pit terminated due to strength of soil and water ingress from land drain.	**1.90**	**Hole End**	**61.98**					

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Land drain encountered at 1.20mbgl across centre of pit.

Pit terminated due to strength of soil and ingress of water from land drain.

Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
	Waterstrike depth
	Water level depth 20mins after strike

Pit Orientation and Dimensions

C
B D
A () deg

Width: 1.
Length: 4.18m
Depth: 1.90m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP76

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315648.665
Consultant:	Clare Civil		N:243425.800
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	63.88 m.O.D.
Date Completed:	09/12/2015	**Logged by:**	S. Letch
Excavator:	12T Tracked Excavator		

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL with trace of red brick and steel.	0.00		63.88					
Soft light brown sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to coarse of limestone.	0.30		63.58	CBR	0.50	SL27		
Firm brown slightly sandy gravelly silty CLAY with low cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded, fine to coarse of limestone (up to 300mm diameter).	0.70		63.18	B	1.00	SL28		
Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 450mm diameter).	1.60		62.28	B	1.70	SL29		
Pit terminated due to strength of soil.	**2.30**	Hole End	**61.58**					

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼	Waterstrike depth
▽	Water level depth 20mins after strike

Pit Orientation and Dimensions

C
B D
A () deg

Width: 1.13m
Length: 4.18m
Depth: 2.30m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP77

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315614.900
Consultant:	Clare Civil		N:243424.928
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	64.50 m.O.D.
Date Completed:	09/12/2015	**Logged by:**	S. Letch
Excavator:	12T Tracked Excavator		

Sheet 1 of 1

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL.	0.0 0.00		64.50					
MADE GROUND: grey angular gravel (CL804) underlain by terram.	0.25		64.25					
MADE GROUND: brown sandy slightly gravelly silty clay with low cobble content and some red brick.	0.50		64.00	CBR	0.50	SL24		
Firm brown slightly sandy gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded, fine to coarse of limestone.	1.0 1.00		63.50	B	1.20	SL25		
Stiff black slightly sandy gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 400mm diameter).	2.30		62.20	B	2.50	SL26		
Pit terminated due to strength of soil.	**2.60**	**Hole End**	**61.90**					
	2.0							
	3.0							
	4.0							
	5.0							

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

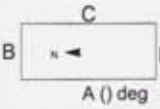
Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼	Waterstrike depth
▽	Water level depth 20mins after strike

Pit Orientation and Dimensions



Width: 1.
Length: 3.93m
Depth: 2.60m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP78

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315633.760
Consultant:	Clare Civil		N:243450.343
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	64.16 m.O.D.
Date Completed:	09/12/2015	**Logged by:**	S. Letch
Excavator:	12T Tracked Excavator		

Sheet 1 of 1

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL.	0.0 0.00		64.16					
MADE GROUND: grey angular gravel (CL804).	0.40		63.76				▼ 0.40	
Soft light brown sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to coarse of limestone.	0.50		63.66	CBR	0.50	SL33		
Firm brown slightly sandy gravelly silty CLAY with low cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded, fine to coarse of limestone (up to 350mm diameter).	0.90 1.0		63.26	B	1.00	SL34		
Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 400mm diameter).	1.90 2.0		62.26	B	2.00	SL35		
Pit terminated due to strength of soil.	3.0 **3.00** 4.0 5.0	**Hole End**	**61.16**					

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

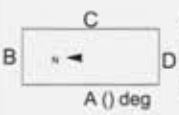
Pit walls stable.

Moderate ingress at 0.40m.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼ 0.40	Waterstrike depth
▽ 1.80	Water level depth 20mins after strike

Pit Orientation and Dimensions



Width: 1.29m
Length: 3.99m
Depth: 3.00m

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TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP79

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315663.298
Consultant:	Clare Civil		N:243467.158
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	63.62 m.O.D.
Date Completed:	09/12/2015	**Logged by:**	S. Letch
Excavator:	12T Tracked Excavator		

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL.	0.0 0.00		63.62					
Soft light brown sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to coarse of limestone.	0.30		63.32	CBR	0.50	SL36		
Firm brown slightly sandy gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded, fine to coarse of limestone.	0.60		63.02	B	1.00	SL37		
Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 400mm diameter).	1.80 2.0		61.82	B	2.00	SL38		
Pit terminated due to strength of soil.	**2.20**	**Hole End**	**61.42**					

3.0
4.0
5.0

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼	Waterstrike depth
▽	Water level depth 20mins after strike

Pit Orientation and Dimensions

C
B D
A () deg

Width: 0.
Length: 4.0
Depth: 2.20m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP80

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315635.026
Consultant:	Clare Civil		N:243473.242
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	63.92 m.O.D.
Date Completed:	10/12/2015	**Logged by:**	S. Letch
Excavator:	12T Tracked Excavator		

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL.	0.00		63.92					
Soft light brown sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to coarse of limestone.	0.30		63.62	CBR	0.50	SL45		
Firm brown slightly sandy gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded, fine to coarse of limestone.	0.60		63.32	B	1.00	SL46		
Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 500mm diameter).	1.90		62.02	B	2.00	SL47		
Pit terminated due to strength of soil.	**2.50**	Hole End	**61.42**					

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼	Waterstrike depth
▽	Water level depth 20mins after strike

Pit Orientation and Dimensions

C / B / D / A () deg

Width: 0.93m
Length: 4.33m
Depth: 2.50m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP81

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315653.269
Consultant:	Clare Civil		N:243495.775
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	63.52 m.O.D.
Date Completed:	09/12/2015	**Logged by:**	S. Letch
Excavator:	12T Tracked Excavator		

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL.	0.0 0.00		63.52					
Soft light brown sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to coarse of limestone.	0.30		63.22					
Firm brown slightly sandy gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded, fine to coarse of limestone.	0.50		63.02	CBR	0.50	SL39		
	1.0			B	1.00	SL40		
Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 500mm diameter).	1.80		61.72					
	2.0			B	2.00	SL41		
Pit terminated due to strength of soil.	**2.30**	**Hole End**	**61.22**					
	3.0							
	4.0							
	5.0							

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼	Waterstrike depth
▽	Water level depth 20mins after strike

Pit Orientation and Dimensions

C
B N D
A () deg

Width: 0.
Length: 3.9
Depth: 2.30m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP82

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315617.657
Consultant:	Clare Civil		N:243494.199
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	64.07 m.O.D.
Date Completed:	09/12/2015	**Logged by:**	S. Letch
Excavator:	12T Tracked Excavator		

Sheet 1 of 1

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL.	0.0 0.00		64.07					
Soft light brown sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to coarse of limestone.	0.30		63.77	CBR	0.50	SL42		
Firm brown slightly sandy gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded, fine to coarse of limestone.	0.70		63.37	B	1.00	SL43		
Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 500mm diameter).	2.10		61.97	B	2.20	SL44		
Pit terminated due to strength of soil.	**2.40**	**Hole End**	**61.67**					

1.0 2.0 3.0 4.0 5.0

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼	Waterstrike depth
▽	Water level depth 20mins after strike

Pit Orientation and Dimensions

C
B N D
A () deg

Width: 1.37m
Length: 3.94m
Depth: 2.40m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP86

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315546.799
Consultant:	Clare Civil		N:243557.572
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	64.30 m.O.D.
Date Completed:	22/12/2015	**Logged by:**	P. McGonagle
Excavator:	12T Wheeled Excavator		

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL.	0.0 0.00		64.30					
Soft light brown sandy slightly gravelly silty CLAY. Gravel is subangular to subrounded, fine to coarse of limestone.	0.20		64.10					
Firm brown grey slightly sandy slightly gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded, fine to coarse of limestone.	0.70		63.60	CBR	0.70	PM55		
	1.0			B	1.50	PM56		
	2.0							
Stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.	3.0 3.00		61.30	B	3.50	PM57		
Pit terminated due to strength of soil.	**3.90**	**Hole End**	**60.40**					
	4.0							
	5.0							

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼	Waterstrike depth
▽	Water level depth 20mins after strike

Pit Orientation and Dimensions

C
B D
A () deg

Width: 1.
Length: 4.0 m
Depth: 3.90m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

TRIAL PIT RECORD

Contract: South Apron Extension & West Apron — **Hole ID:** TP87

Client:	Dublin Airport Authority	**Co-ordinates:**	E:315675.975
Consultant:	Clare Civil		N:243391.823
Site Address:	Dublin Airport, Co. Dublin	**Elevation:**	63.61 m.O.D.
Date Completed:	17/12/2015	**Logged by:**	P. McGonagle
Excavator:	12T Wheeled Excavator		

Sheet 1 of 1

DESCRIPTION OF STRATA	Unit Depth (m)	Legend	Elevation (M.O.D.)	Samples/Tests Type	Depth (m)	Ref No.	Water Depth (m)	Date
TOPSOIL	0.00		63.61					
Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with low cobble content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles are subangular to subrounded of limestone.	0.20		63.41	CBR	0.50	PM52		
	1.0			B	1.00	PM53		
Stiff black slightly sandy gravelly silty CLAY with medium cobble and boulder content. Gravel is subangular to subrounded, fine to coarse of limestone. Cobbles and boulders are subangular to subrounded of limestone (up to 500mm diameter).	1.90		61.71	B	2.00	PM54		
Pit terminated due to strength of soil.	**2.50**	Hole End	**61.11**					
	3.0							
	4.0							
	5.0							

Note: If deemed necessary, pit face sketches are given on the last sheet.
Strata descriptions refer to all faces unless otherwise specified.

Remarks:
Pit terminated due to strength of soil.

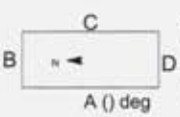
Pit walls stable.

No groundwater encountered.

Key to Symbols

B	Bulk disturbed sample
D	Small disturbed sample
U	Undisturbed sample
V(60)	In-situ hand shear vane test(kPa)
P	Hand Penetrometer Test(N value)
▼ 1.90	Waterstrike depth
▽ 1.90	Water level depth 20mins after strike

Pit Orientation and Dimensions



Width: 1.17m
Length: 4.51m
Depth: 2.50m

Site Investigations Ltd

TRIAL PIT 5249 TP.GPJ COREHOLE.GDT 01/02/16

RPS: Cuckoo & Forest Little (2006)

NICHOLAS O'DWYER

daa

Dublin Airport Authority
Phase 2 – Drainage Strategy Works

Volume 5
Ground Investigation Report
(Cuckoo Catchment)

Transforming
Dublin Airport

daa

March 2008

RPS

Borehole Log

Soil Mechanics

Drilled PA Logged PD Checked TR	Start 14/11/2006 End 21/11/2006	Equipment, Methods and Remarks Dando 175 Cable percussive boring.	Depth from 0.00m	to 11.60m	Diameter 200mm	Casing Depth 11.00m	Ground Level +55.41 mOD Coordinates E 317220.51 National Grid N 242624.85 Chainage

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.10-0.50	B 1			
0.50-1.00	B 2			
1.00-1.50	B 3			
1.20-1.65	SPT S	N=30 (16,7/7,7,8,8)		
1.20	D 4			
1.20	U NR	15 blows No recovery		
1.50-2.00	B 5			
2.00-2.45	U 6	45 blows		
2.50-3.00	B 7			
3.00-3.36	SPT S	50 (10,13/15,17,18 for 60mm)		
3.00	D 8			
3.00-3.50	B 9			
3.50-4.00	B 10			
4.00-4.45	U 11	120 blows		
4.45-4.55	D 12			
4.50-5.00	B 13			
5.00-5.26	SPT S	50 (15,10 for 45mm/ 21,29 for 60mm)		
5.00	D 14			
5.00-5.50	B 15			
5.50-6.00	B 16			
			14/11/2006 5.80	dry
6.00-6.24	SPT S	50 (12,13 for 40mm/ 24,26 for 50mm)		
6.00	D 17			
6.00-7.00	B 18			
6.00	U NR	10 blows No recovery		
7.00-7.12	SPT C	50 (15,10 for 10mm/ 50 for 30mm)		
7.00-7.50	B 19			
7.00	U NR	20 blows No recovery		
7.30-7.35	SPT C	(50 for 50mm)		
7.50-8.00	B 20			
8.00-8.26	SPT S	50 (12,13 for 50mm/ 25,25 for 60mm)		
8.00	D 21			
8.00-8.50	B 22			
8.50-9.00	B 23			
			16/11/2006 9.00	0.50
9.00-9.50	B 24			
9.50-10.00	B 25			

Strata

Description	Depth, Level (Thickness)	Legend	Backfill/ Instruments
MADE GROUND: grass over dark brown sandy gravelly clay with occasional rootlets. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.	(1.50)		
Stiff brown sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.	1.50 +53.91 (0.50)		
Very stiff dark grey sandy gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subangular of limestone.	2.00 +53.41 (5.00)		
Very dense dark grey sandy clayey subrounded to rounded fine to coarse GRAVEL of black limestone with frequent cobbles. Sand is fine to coarse. Cobbles are subrounded of limestone (Driller reports frequent boulders).	7.00 +48.41 (3.60)		
Stratum continues to 10.60 m			

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	4.10	Rose to 4.00 m after 20 minutes.	-
2	6.00	Rose to 5.80 m after 20 minutes.	-
3	6.90	Rose to 3.10 m after 20 minutes.	-

Depth Related Remarks *

From	to (m)	
8.30	10.00	SPT cancelled due to sand blowing up hole
9.00		Water added to assist boring

Chiselling

Depths (m)	Time	Tools used
1.20 -1.30	15 mins	Chisel
3.30 -3.40	15 mins	Chisel
4.00 -4.50	60 mins	Chisel
4.60 -4.60	30 mins	Chisel
6.00 -9.00	360 mins	Chisel
9.00 -11.00	270 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project: Cuckoo Catchment

Project No.: Y6041

Carried out for: Dublin Airport Authority

Borehole

BH001

Borehole Log

Soil Mechanics

Driller	Start	Equipment, Methods and Remarks	Depth from	to	Diameter	Casing Depth	Ground Level	+55.41 mOD
[redacted]PA	14/11/2006	Dando 175	0.00m	11.60m	200mm	11.00m	Coordinates	E 317220.51
Logged [redacted]PD	End	Cable percussive boring.					National Grid	N 242624.85
Checked TR	21/11/2006						Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
10.00	SPT S	(0 for 0mm)		
10.00-10.50	B 26			
			20/11/2006	
10.50-10.52	SPT S	50 (25 for 0mm/50 for 20mm)	10.60	0.50
10.50-11.00	B 27			
10.80-10.92	SPT C	50 (17.8 for 10mm/50 for 35mm)		
11.00-11.50	B 29	not available		
11.00-11.10	U NR	60 blows No recovery		
11.10-11.13	SPT S	(25 for 30mm)		
11.30-11.42	SPT C	50 (13.12 for 20mm/ 50 for 25mm)		
			21/11/2006	
			11.00	1.10

Strata

Description (Continued from Sheet 1)

Very dense dark grey sandy clayey subrounded to rounded fine to coarse GRAVEL of black limestone with frequent cobbles. Sand is fine to coarse. Cobbles are subrounded of limestone (Driller reports frequent boulders).

Depth, Level (Thickness)		Legend	Backfill/ Instruments
10.60	+44.81		
(0.90)			
11.50	+43.91		
11.60	+43.81		

Very stiff dark grey sandy very gravelly CLAY with frequent cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.Cobbles are subrounded of black limestone.

POSSIBLE BEDROCK : Driller reports possible limestone bedrock on refusal. No recovery.

EXPLORATORY HOLE ENDS AT 11.60 m

SPIE

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

Depth Related Remarks *

From to (m)

Chiselling

Depths (m)	Time	Tools used
11.00 -11.50	90 mins	Chisel
11.50 -11.60	60 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project	Cuckoo Catchment
Project No.	Y6041
Carried out for	Dublin Airport Authority

Borehole

BH001

Sheet 2 of 2

Borehole Log

Soil Mechanics

Drilled PA Logged PD Checked TR	Start 27/11/2006 End 27/11/2006	Equipment, Methods and Remarks Dando 2000 Cable Percussive Boring	Depth from 0.00m	to 5.20m	Diameter 200mm	Casing Depth 5.20m

Ground Level +55.71 mOD
Coordinates E 317258.59
National Grid N 242443.83
Chainage

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.50-0.95	U 1	16 blows 45 mm rec		
0.95-1.05	D 2			
1.00-1.50	B 3			
1.50-1.95	SPT S	N=43 (5,6/6,10,12,15)		
1.50-1.95	D 4			
1.70-2.00	B 5			
2.20-2.50	B 6			
2.50-2.95	U 7	45 blows 80 mm rec		
2.95-3.05	D 8			
3.00-3.50	B 9			
3.50-3.76	SPT S	50 (12,13 for 35mm/21,29)		
3.50-4.00	B 10			
3.76-3.81	SPT S	50 (25 for 20mm/50 for 25mm)		
4.00-4.50	B 11			
4.50-4.95	U 12	80 blows 40 mm rec		
4.95-5.05	D 13	not available	27/11/2006 5.00	dry

Depth	Type & No	Records	Date Casing	Time Water

Strata

Description	Depth, *Level* (Thickness)
MADE GROUND: driller reports grass over topsoil.	(0.30) 0.30 *+55.41*
MADE GROUND: orange brown mottled grey sandy gravelly clay with occasional small pockets of sandy grey clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of various lithologies.	(0.70) 1.00 *+54.71*
POSSIBLE MADE GROUND: dark brown sandy gravelly clay with occasional orange staining. Sand is fine to coarse. Gravel is angular to rounded fine to coarse of mixed lithologies including grey sandstone.	(0.50) 1.50 *+54.21* 1.70 *+54.01*
Plastic brown psuedofibrous PEAT with frequent rootlets and angular fine to coarse gravel of black limestone.	
Stiff dark grey sandy gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is angular to subrounded fine to coarse of mixed lithologies including black limestone. Cobbles are angular to subrounded of black limestone.	(3.00)
Recovered as dense sandy angular to subrounded fine to coarse GRAVEL of black limestone. Sand is fine to coarse (POSSIBLE BEDROCK)	4.70 *+51.01* (0.50) 5.20 *+50.51*
EXPLORATORY HOLE ENDS AT 5.20 m	

Legend

Backfill/ Instruments

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	4.70	Rose to 4.50 m after 20 minutes.	-

Depth Related Remarks *

From to (m)

Chiselling

Depths (m)	Time	Tools used
2.00 -2.20	30 mins	Chisel
3.20 -3.30	15 mins	Chisel
4.10 -4.20	15 mins	Chisel
5.00 -5.20	60 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project Cuckoo Catchment
Project No. Y6041
Carried out for Dublin Airport Authority

Borehole

BH002

Sheet 1 of 1

Borehole Log

Soil Mechanics

Driller [redacted] PA Logged [redacted] D Checked TR	Start 28/11/2006 End 29/11/2006	Equipment, Methods and Remarks Dando 20000 Cable percussive boring	Depth from 0.00m	to 12.00m	Diameter 200mm / Casing Depth 12.00m

Ground Level +56.61 mOD
Coordinates E 317117.21
National Grid N 242371.67
Chainage

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.50	D 1			
0.50-1.00	B 2			
0.50-0.90	U NR	35 blows No recovery		
1.00-1.45	U 3	23 blows 45 mm rec		
1.45-1.55	D 4			
1.50-2.00	B 5			
2.00-2.45	SPT S	N=32 (2,3/3,7,10,12)		
2.00-2.45	D 6			
2.00-2.30	B 7			
2.30-3.00	B 8			
[redacted]3.05	SPT S	50 (25 for 25mm/50 for 20mm)		
[redacted]00	C NR			
[redacted]00	U NR	25 blows No recovery		
3.10-3.55	U 9	60 blows 45 mm rec		
3.50-4.00	B 10			
4.00-4.27	SPT S	50 (19.6 for 35mm/ 21.21.8 for 10mm)		
4.00	D 11			
4.00-4.50	B 12			
4.20	W 13			
4.50-5.00	B 14			0.00
5.00-5.30	U 15	150 blows 30 mm rec		
5.50-6.00	U 16			
6.00-6.11	SPT S	50 (17,8 for 20mm)		
6.00-6.50	B 17			
6.00	C NR			
6.50-7.00	B 18			
[redacted]7.22	SPT S	50 (25/22,28 for 70mm)		
[redacted]7.50	B 19			
[redacted]00	C NR			
7.00	U NR	15 blows No recovery		
7.50-8.00	B 20			
8.00-8.45	U 21	90 blows 45 mm rec		
			28/11/2006	
8.45-8.55	D 22		8.50	dry
8.55-9.00	B 23			
9.00-9.30	SPT S	50 (17,18/23,27)		
9.00-9.50	B 24			
9.00	C NR			
9.50-10.00	B 25			

Depth	Type & No	Records	Date Casing	Time Water

Strata

Description	Depth, Level/ (Thickness)	Legend	Backfill/ Instruments
MADE GROUND: driller reports grass over topsoil.	(0.30) 0.30 +56.31		
MADE GROUND: brown mottled orange sandy gravelly clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.	0.50 +56.11		
Firm dark brown mottled grey sandy very gravelly CLAY with frequent cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. Cobbles are subangular of mixed lithologies.	(0.80) 1.30 +55.31		
Stiff dark grey sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies including black limestone.	(2.40)		
Very stiff dark grey sandy very gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subrounded of limestone.	3.70 +52.91		
Stratum continues to 11.30 m	(7.60)		

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	3.70	Rose to 3.50 m after 20 minutes.	4.00
2	4.20	Rose to 4.40 m after 20 minutes.	4.40

Depth Related Remarks *

From to (m)

Chiselling

Depths (m)	Time	Tools used
0.90 -1.00	15 mins	Chisel
3.00 -3.10	15 mins	Chisel
4.00 -5.90	120 mins	Chisel
5.30 -5.50	30 mins	Chisel
6.10 -6.30	30 mins	Chisel
9.50 -9.60	15 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project	Cuckoo Catchment
Project No.	Y6041
Carried out for	Dublin Airport Authority

Borehole

BH003

Borehole Log

Soil Mechanics

Drilled	PA	Start	28/11/2006	Equipment, Methods and Remarks	Depth from	to	Diameter	Casing Depth	Ground Level	+56.61 mOD
Logged	PD	End	29/11/2006	Dando 20000 Cable percussive boring	0.00m	12.00m	200mm	12.00m	Coordinates	E 317117.21
Checked	TR								National Grid	N 242371.67
									Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
10.00-10.45	B 26			
10.50	D 27			
10.50-11.00	B 28			
11.00-11.30	B 29			
11.30-11.80	B 30			
11.30	C NR			
11.50-11.68	SPT S	50 (12,12/50 for 25mm)		
11.50	W 31			
11.70	C NR			
11.80-12.00	D 32		29/11/2006 12.00	dry
12.00-12.03	SPT S	50 (35 for 10mm/50 for 15mm)		
12.00	C NR			

Strata

Depth, *Level* (Thickness)	Description (Continued from Sheet 1)	Legend	Backfill/ Instruments
	Very stiff dark grey sandy very gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subrounded of limestone.		
11.30 *+45.31*			
(0.50)	Very dense dark grey sandy clayey subangular to subrounded fine to coarse GRAVEL of black limestone with frequent cobbles. Sand is fine to coarse. Cobbles are subrounded of limestone.		
11.80 *+44.81*			
12.00 *+44.61*	Recovered as subangular to subrounded fine to coarse grained GRAVEL and cobbles of strong black fine grained limestone (POSSIBLE BEDROCK)		
	EXPLORATORY HOLE ENDS AT 12.00 m		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
3	11.50	Rose to 10.40 m after 20 minutes.	-

Depth Related Remarks *

From to (m)

Chiselling

Depths (m)	Time	Tools used
11.50 -11.70	30 mins	Chisel
11.80 -11.80	45 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project	Cuckoo Catchment
Project No.	Y6041
Carried out for	Dublin Airport Authority

Borehole

BH003

Sheet 2 of 2

Borehole Log

Soil Mechanics

Drilled PA	Start 22/11/2006	Equipment, Methods and Remarks	Depth from	to	Diameter	Casing Depth	Ground Level	+56.74 mOD
Logged FD	End 22/11/2006	Dando 2000 Cable percussive boring	0.00m	4.00m	200mm	3.80m	Coordinates	E 317135.73
Checked TR							National Grid	N 242609.45
							Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.50-0.95	SPT S	N=28 (4,4/5,6,12,5)		
0.50-0.95	D 1			
0.50-1.00	B 2			
1.00-1.50	B 3			
1.50-1.52	SPT S	50 (25 for 10mm/50 for 10mm)		
1.50	U NR	25 blows No recovery		
1.75-2.20	U 4	100 blows		
2.20-2.75	B 5			
2.75-3.00	SPT C	50 (18,7 for 35mm/ 23,27 for 65mm)		
[illegible].50	B 6			
3.50-3.95	U 7	105 blows		
			22/11/2006 3.80	dry

Strata

Description	Depth, Level (Thickness)	Legend	Backfill/ Instruments
MADE GROUND: driller reports grass over topsoil.	0.25 +56.49		
POSSIBLE MADE GROUND: dark brown sandy very gravelly clay with frequent cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies including black limestone. Cobbles are subrounded of limestone (Driller reports fill / made ground)	(1.25)		
Stiff dark grey sandy gravelly CLAY with frequent cobbles. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies including black limestone. Cobbles are subrounded of black limestone.	1.50 +55.24		
	(1.25)		
Very stiff dark grey sandy gravelly CLAY with frequent cobbles. Sand is fine to coarse. Gravel is subangular fine to coarse of mixed lithologies including black limestone. Cobbles are subrounded of black limestone.	2.75 +53.99		
	(1.25)		
EXPLORATORY HOLE ENDS AT 4.00 m	4.00 +52.74		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

None observed (see Key Sheet)

Depth Related Remarks *

From to (m)

Chiselling

Depths (m)	Time	Tools used
1.50 -1.75	30 mins	Chisel
2.20 -2.30	15 mins	Chisel
2.75 -3.00	30 mins	Chisel
3.30 -3.40	15 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project: Cuckoo Catchment

Project No.: Y6041

Carried out for: Dublin Airport Authority

Borehole

BH004

Sheet 1 of 1

Borehole Log

Soil Mechanics

Drilled	PA	Start	22/11/2006	Equipment, Methods and Remarks	Depth from	to	Diameter	Casing Depth	Ground Level	+55.71 mOD
Logged	PD	End	22/11/2006	Dando 2000 Cable percussive boring	0.00m	4.00m	200mm	3.80m	Coordinates	E 317295.31
Checked	TR								National Grid	N 242527.10
									Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.50-0.95	SPT S	N=21 (3,4/4,5,6,6)		
0.50-0.95	D 1			
0.50-1.00	B 2			
1.00-1.50	B 3			
1.50-1.95	U 4	55 blows not available		
1.95-2.05	D 5			
2.00-2.50	B 6			
2.50-2.80	SPT S	50 (16,9/-,20)		
2.50	D 7			
2.50-3.00	B 8			
3.00-3.50	B 9			
3.50-3.75	U 10	100 blows		
3.75-3.99	SPT S	50 (20,5 for 25mm/ 25,25 for 60mm)	22/11/2006	
3.75	D 11		3.80	dry

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
MADE GROUND: driller reports grass over topsoil.	(0.30) 0.30 *+55.41*		
POSSIBLE MADE GROUND: dark brown mottled brown grey and orange sandy gravelly clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of various lithologies. Occasional rootlets (Driller reports fill / made ground)	(1.35)		
Stiff dark grey sandy gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subangular of limestone.	1.65 *+54.06* (2.35)		
EXPLORATORY HOLE ENDS AT 4.00 m	4.00 *+51.71*		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)

None observed (see Key Sheet)

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used
2.00 -2.10	15 mins	Chisel
2.30 -2.50	30 mins	Chisel
3.40 -3.40	30 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project	Cuckoo Catchment
Project No.	Y6041
Carried out for	Dublin Airport Authority

Borehole

BH005

Sheet 1 of 1

Borehole Log

Soil Mechanics

Drilled	Start	Equipment, Methods and Remarks	Depth from	to	Diameter	Casing Depth	Ground Level	+56.44 mOD
[redacted]PA	23/11/2006	Dando 2000	0.00m	5.80m	200mm	5.70m	Coordinates	E 317122.78
Logged [redacted]D	End	Cable percussive boring					National Grid	N 242450.01
Checked TR	23/11/2006						Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.50-0.95	SPT S	N=20 (2,3/4,4,5,7)		
0.50-0.95	D 1			
0.50-1.00	B 2			
1.00-1.50	B 3			
1.50-1.95	U 4	30 blows		
1.95-2.05	D 5			
2.10-2.50	B 6			
2.50-2.95	SPT S	N=33 (3.5/5,6,11,11)		
2.50-2.95	D 7			
2.50-3.00	B 8			
[redacted].50	B 9			
3.50-4.00	B 10			
3.50	U NR	30 blows No recovery		
4.00-4.07	SPT C	50 (25 for 45mm/50 for 25mm)		
4.00	U NR	No recovery		
4.20-4.65	U 11	105 blows No recovery		
4.70-5.20	B 12			
5.20-5.46	SPT S	50 (12,13 for 50mm/ 23,27 for 55mm)		
5.20	D 13			
5.20-5.70	B 14			
			23/11/2006 5.70	dry

Strata

Description	Depth, Level/ (Thickness)	Legend	Backfill/ Instruments
MADE GROUND: driller reports grass over topsoil.	0.25 +56.19		
MADE GROUND: light brown mottled dark brown sandy gravelly clay with occasional cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies including black limestone. Cobbles are subrounded of black limestone.	(1.85)		
Firm (locally stiff) dark grey mottled dark brown sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies including black limestone.	2.10 +54.34 (0.90)		2 2
Stiff dark grey very sandy gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subrounded of limestone.	3.00 +53.44 (1.30)		3
Dark grey gravelly fine to coarse SAND with occasional cobbles. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subrounded of limestone. Frequent small pockets of very stiff dark grey clay.	4.30 +52.14 (0.90)		3
Stiff dark grey very sandy gravelly CLAY with frequent subangular cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subrounded of limestone.	5.20 +51.24 (0.60)		
EXPLORATORY HOLE ENDS AT 5.80 m	5.80 +50.64		

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
2	2.70	Rose to 2.30 m after 20 minutes.	-
3	4.40	Rose to 4.10 m after 20 minutes.	-

Depth Related Remarks *

From to (m)

Chiselling

Depths (m)	Time	Tools used
2.10 -2.20	15 mins	Chisel
3.50 -4.00	60 mins	Chisel
4.00 -4.20	30 mins	Chisel
5.20 -5.80	75 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project	Cuckoo Catchment
Project No.	Y6041
Carried out for	Dublin Airport Authority

Borehole

BH006

Sheet 1 of 1

Borehole Log

Soil Mechanics

Drilled	PA
Logged	PD
Checked	TR

Start 29/11/2006
End 29/11/2006

Equipment, Methods and Remarks
Dando 2000
Cable percussion borehole.

Depth from	to	Diameter	Casing Depth
0.00m	5.30m	200mm	5.30m

Ground Level	+56.20 mOD
Coordinates	E 317163.40
National Grid	N 242324.81
Chainage	

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.50-0.95	U 1			
0.95-1.05	D 2			
1.00-1.50	B 3			
1.50-1.95	SPT S	N=25 (3,6/4,5,7,9)		
1.50	D 4			
1.50-1.90	B 5			
2.00-2.50	B 6			
2.50-2.95	U 7	60 blows 45 mm rec		
3.00-3.50	B 8			
3.50-3.72	SPT S	50 (12,13 for 40mm/ 20,30 for 30mm)		
3.50-4.00	B 9			
3.50	C NR			
4.00-4.50	B 10			
4.50-4.95	U 11	120 blows 45 mm rec		
4.95-5.05	D 12			
			29/11/2006 5.30	dry
5.30-5.37	SPT S	50 (25 for 50mm/50 for 20mm)		
5.30	C NR			

Strata

Description	Depth, *Level* (Thickness)	Legend	Backfill/ Instruments
MADE GROUND: driller reports grass over topsoil.	(0.30) 0.30 +55.90		
POSSIBLE MADE GROUND: dark brown mottled brown grey and black sandy very gravelly clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies including black limestone. Occasional small pockets of fine orange sand.	(1.60) 1.90 +54.30		
Stiff dark grey mottled brown sandy gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subrounded of limestone.	(1.60) 3.50 +52.70		
Very stiff dark grey mottled brown sandy gravelly CLAY with occasional cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subangular to subrounded of limestone.	(1.80) 5.30 +50.90		
EXPLORATORY HOLE ENDS AT 5.30 m			

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	4.20	Rose to 4.10 m after 20 minutes.	-

Depth Related Remarks *

From	to (m)

Chiselling

Depths (m)	Time	Tools used
2.30 -2.30	15 mins	Chisel
3.85 -3.99	15 mins	Chisel
5.10 -5.10	30 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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Project	Cuckoo Catchment
Project No.	Y6041
Carried out for	Dublin Airport Authority

Borehole

BH007

Sheet 1 of 1

Borehole Log

Soil Mechanics

Drilled [redacted]PA Logged [redacted]D Checked TR	Start 30/11/2006 End 30/11/2006	Equipment, Methods and Remarks Dando 2000 Cable percussive boring Not surveyed. Survey data approximate. No ground level.	Depth from 0.00m to 4.65m	Diameter 200mm	Casing Depth 4.65m

Ground Level -
Coordinates E 317359.50
National Grid N 242681.87
Chainage

Samples and Tests

Depth	Type & No	Records	Date Casing	Time Water
0.50-0.95	SPT S	N=19 (2,3/6,4,3,6)		
0.50-0.95	D 1			
0.50	B 2			
1.00-1.50	B 3			
1.50-1.95	U 4	40 blows 45 mm rec		
1.95-2.05	D 5			
2.00-2.50	B 6			
2.50-2.59	SPT S	(75 for 85mm)		
2.50-2.75	D NR			
2.75-2.76	SPT S	(75 for 10mm)		
[redacted].62	SPT C	50 (15,10 for 120mm/ 17,18,15,-)		
[redacted]	D 7			
[redacted].50	B 8			
3.50-4.50	B 9			
4.00-4.06	SPT S	(25 for 55mm)		
4.00	C NR			
4.00	U NR	No recovery		
4.10-4.55	U 10	100 blows 45 mm rec		
			30/11/2006 4.20	dry

Strata

Description	Depth, Level (Thickness)
MADE GROUND: driller reports grass over topsoil.	(0.40)
	0.40
POSSIBLE MADE GROUND: dark brown mottled grey and orange slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies.	(1.40)
	1.80
Stiff dark grey sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone.	(1.20)
	3.00
Very stiff dark grey sandy gravelly CLAY with frequent cobbles. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of black limestone. Cobbles are subangular of black limestone.	(1.65)
	4.65
EXPLORATORY HOLE ENDS AT 4.65 m	

Legend

Backfill/ Instruments

Depth	Type & No	Records	Date Casing	Time Water

Groundwater Entries

No.	Struck (m)	Post strike behaviour	Depth sealed (m)
1	2.80	Rose to 2.50 m after 20 minutes. cut off at 3m	-

Depth Related Remarks *

From to (m)

Chiselling

Depths (m)	Time	Tools used
2.50 -2.75	30 mins	Chisel
2.75 -3.00	30 mins	Chisel
4.00 -4.10	15 mins	Chisel
4.55 -4.65	40 mins	Chisel

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:50

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AGS

Project Cuckoo Catchment
Project No. Y6041
Carried out for Dublin Airport Authority

Borehole

BH008A

Sheet 1 of 1

Trial Pit Log

Soil Mechanics

Logged	CD	Start	04/03/2008	Equipment, Methods and Remarks	Dimensions and Orientation	Ground Level	+55.53 mOD
Checked	TR	End	04/03/2008	Komatsu PC 138	Width 0.60 m Length 3.50 m	Coordinates	E 317151.31
						National Grid	N 242551.86
						Chainage	

Samples and Tests			Strata			
Depth	Type & No.	Date Records	Description	Depth, Level (Thickness)	Legend	Backfill/ Instruments
			TOPSOIL	(0.30)		
			MADEGROUND: brown slightly gravelly sandy clay. With fragments of pottery. Gravel is subangular to subrounded fine to coarse of mixed lithologies.	0.30 +55.23		
0.50	ES 1					
0.50	D 2					
0.50	B 3					
0.50	D 4			(1.20)		
1.50	B 5	*	EXPLORATORY HOLE ENDS AT 1.50 m	1.50 +54.03		1
Depth	Type & No.	Records Date				

Groundwater Entries

No.	Struck (m)	Post Strike Behaviour
1	1.50	Remained at 1.50 m after 20 minutes.

Depth Related Remarks *

From	to (m)	
1.50		Hole terminated on two concrete pipes. Instructed by DAA to abandoned hole.

Stability Stable

Shoring None

Weather Snow, Windy

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Project Cuckoo Catchment

Project No. Y6041

Carried out for Dublin Airport Authority

Trial Pit

TP 01

Sheet 1 of 1

Trial Pit Log

Soil Mechanics

Logged By	Start	Equipment, Methods and Remarks	Dimensions and Orientation	Ground Level	+55.51 mOD
CD	03/03/2008	Komatsu PC 138	Width 0.60 m	Coordinates	E 317181.12
Checked By	End		Length 4.50 m	National Grid	N 242557.09
TR	03/03/2008			Chainage	

Samples and Tests

Depth	Type & No.	Date Records
0.50	ES 1	
0.50	D 2	
0.50	B 3	
[illegible]50	D 4	
[illegible]0	B 5	
3.00	D 6	
3.00	B 7	
		03/03/2006
3.80	B 10	
3.80	D 9	

Strata

Description	Depth, Level (Thickness)	Legend	Backfill/ Instruments
TOPSOIL	(0.30)		
	0.30 +55.21		
MADEGROUND: light brown mottled grey gravelly clay. Gravel is subangular to subrounded fine to coarse with frequent cobbles subangular to subrounded of limstone.	(1.20)		
	1.50 +54.01		
Vert stiff friable dark grey slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of limestone. Occassional subrounded limestone cobbles.	(2.30)		
EXPLORATORY HOLE ENDS AT 3.80 m	3.80 +51.71		

Depth	Type & No.	Records Date

Groundwater Entries

No. Struck (m)	Post Strike Behaviour
None observed (see Key Sheet)	

Depth Related Remarks *

From to (m)

Stability Stable

Shoring None

Weather Dry

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Project Cuckoo Catchment

Project No. Y6041

Carried out for Dublin Airport Authority

Trial Pit

TP 02

Sheet 1 of 1

Trial Pit Log

Soil Mechanics

Logged	CD	Start	04/03/2008	Equipment, Methods and Remarks	Dimensions and Orientation	Ground Level	+56.72 mOD
Checked	TR	End	04/03/2008	Komatsu PC 138	Width 0.60 m Length 5.00 m	Coordinates	E 317137.37
						National Grid	N 242408.84
						Chainage	

Samples and Tests			Strata			
Depth	Type & No.	Date Records	Description	Depth, Level (Thickness)	Legend	Backfill/ Instruments
			TOPSOIL	(0.30)		
				0.30 +56.42		
0.50	ES 1		Firm brown slightly sandy gravelly CLAY. Gravel is subangular to subrounded fine to coarse of limestone. Occassional subangular to subrounded limestone cobbles.			
0.50	D 2					
0.50	B 3					
				(1.60)		
1.50	D 4					
1.50	B 5					
				1.90 +54.82		
2.00	D 6		Stiff to very stiff friable dark grey slightly sandy slightly gravelly CLAY. Gravel is subrounded fine to coarse of limestone. Occassional subrounded cobbles of limestone.			
2.00	B 7					
				(1.10)		
3.00	D 8	*		3.00 +53.72		
			EXPLORATORY HOLE ENDS AT 3.00 m			
Depth	Type & No.	Records Date				

Groundwater Entries

No.	Struck (m)	Post Strike Behaviour
None observed (see Key Sheet)		

Depth Related Remarks *

From	to (m)	
3.00		Hole terminated on very stiff stratum, machine not advancing.

Stability Stable

Shoring None

Weather Dry Sunny

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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AGS

Project Cuckoo Catchment

Project No. Y6041

Carried out for Dublin Airport Authority

Trial Pit

TP 03

Sheet 1 of 1

Trial Pit Log

Soil Mechanics

Logged CD	Start 04/03/2008	Equipment, Methods and Remarks	Dimensions and Orientation	Ground Level +56.22 mOD
Checked TR	End 04/03/2008	Komatsu PC 138	Width - Length -	Coordinates E 317176.33 N 242373.69
				National Grid
				Chainage

Samples and Tests

Depth	Type & No.	Date Records
0.50	ES 1	
0.50	D 2	
0.50	B 3	
1.60	D 4	
1.60	B 5	
2.00	D 6	
2.00	B 7	
3.00	D 8	
3.00	B 9	
		04/03/2008
3.80	B 10	
3.80	B 11	

Strata

Description	Depth, Level (Thickness)	Legend	Backfill/ Instruments
TOPSOIL	(0.40)		
	0.40 +55.82		
Firm light brown sandy gravelly CLAY. Gravel is subangular to subrounded of limestone.	(1.50)		
	1.90 +54.32		
Stiff grey friable slightly sandy gravelly CLAY. 3.00 m Occassional subrounded cobbles.	(1.90)		
EXPLORATORY HOLE ENDS AT 3.80 m	3.80 +52.42		

Depth	Type & No.	Records Date

Groundwater Entries

No.	Struck (m)	Post Strike Behaviour
1	1.90	Remained at 1.90 m after 20 minutes. Seepage

Depth Related Remarks *

From to (m)

Stability Stable

Shoring None

Weather Dry

Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column.

Scale 1:25

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Project Cuckoo Catchment

Project No. Y6041

Carried out for Dublin Airport Authority

Trial Pit

TP 04

Sheet 1 of 1

Appendix 11.2

Historical Soil Quality Results

NICHOLAS O'DWYER

daa

Appendix 4
Laboratory Test Results

Classification Tests

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 15
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email siltd@indigo.ie
Report Date	29th January 2016

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Bulk Density Mg/m^3	Dry Density Mg/m^3	Particle Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
BH42	2.00	JM42	16/001	B	18.7								
BH42	7.00	JM46	16/004	B	14.6								
BH43	5.50	JM21	16/006	B	16.2								
BH44	3.50	JM25	16/007	B	43.8								
BH44	6.50	JM27	16/009	B		33	21				60.6		CL
BH45	2.50	TT43	16/197	B	27.7								
BH46	4.00	TT23	16/013	B	25.1								
BH47	3.00	JM32	16/016	B		34	24				62.3		CL/ML
BH47	5.50	JM34	16/017	B	18.7								
BH48	6.00	JM40	16/020	B	19.3								
BH49	4.00	TT28	16/022	B		33	21				59.1		CL
BH50	3.50	TT03	16/024	B	20.2								
BH51	3.00	JM54	16/200	B	18.9								
BH52	3.00	TT33	16/025	B	21.2								
BH53	5.00	TT36	16/027	B	18.0								
BH53	7.00	TT37	16/028	B		33	20				57.4		CL
BH56	4.00	TT17	16/029	B		29	24				53.2		ML
BH56	7.00	TT19	16/031	B	17.5								
BH57	2.50	TT08	16/032	B	23.0								
BH57	5.50	TT12	16/034	B	14.2								
BH58	1.00	JM48	16/035	B	22.3								
BH59	4.00	JM04	16/038	B	34.1								
BH59	12.00	JM10	16/040	B	11.8								
BH60	3.00	JM14	16/042	B		32	21				58.4		CL
BH60	4.50	JM15	16/043	B	14.9								
BH61	4.00	TT40	16/203	B	17.6								

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Classification Tests

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 15
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email siltd@indigo.ie
Report Date	29th January 2016

Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Bulk Density Mg/m^3	Dry Density Mg/m^3	Particle Density Mg/m^3	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
TP18	2.50	PM03	16/124	B		34	21				59.4		CL
TP19	1.50	PM04	16/125	B	19.5	37	23				56.5		CI
TP19	2.00	PM05	16/126	B	*							Carlow	
TP19	2.50	PM07	16/128	B	9.9								
TP21	1.00	PM12	16/133	B	14.2	33	20						CL
TP22	1.50	SL18	16/137	B	*							Carlow	
TP22	3.50	SL20	16/139	B		38	22				68.6		CL
TP23	3.00	PM18	16/142	B	13.5								
TP24	1.50	PM19	16/143	B	*							Carlow	
TP24	3.00	PM20	16/144	B		35	22				54.3		CL/CI
TP25	2.50	SL23	16/147	B	19.4								
TP26	2.50	PM22	16/149	B		23	NP				24.3		
TP27	1.50	PM24	16/151	B	29.8								
TP28	2.50	PM28	16/155	B		31	20				58.3		CL
TP35	3.50	PM30	16/157	B		*	*				*	Carlow	
TP36	2.50	PM31	16/158	B	17.7								
TP37	0.60	PM33	16/160	B	18.7								
TP37	3.50	PM35	16/162	B		32	20				49.6		CL
TP38	3.00	PM36	16/163	B	*	*	*				*	Carlow	
TP39	2.50	PM39	16/166	B	23.6	38	24				61.4		
TP39A	1.50	PM62	16/108	B	17.4	36	22				59.3		CI
TP39B	0.70	PM64	16/10	B	23.9								
TP40	1.10	PM41	16/168	B	21.6								
TP41	2.00	PM44	16/171	B	*	*	*				*	Carlow	
TP41	3.60	PM45	16/172	B	11.6								

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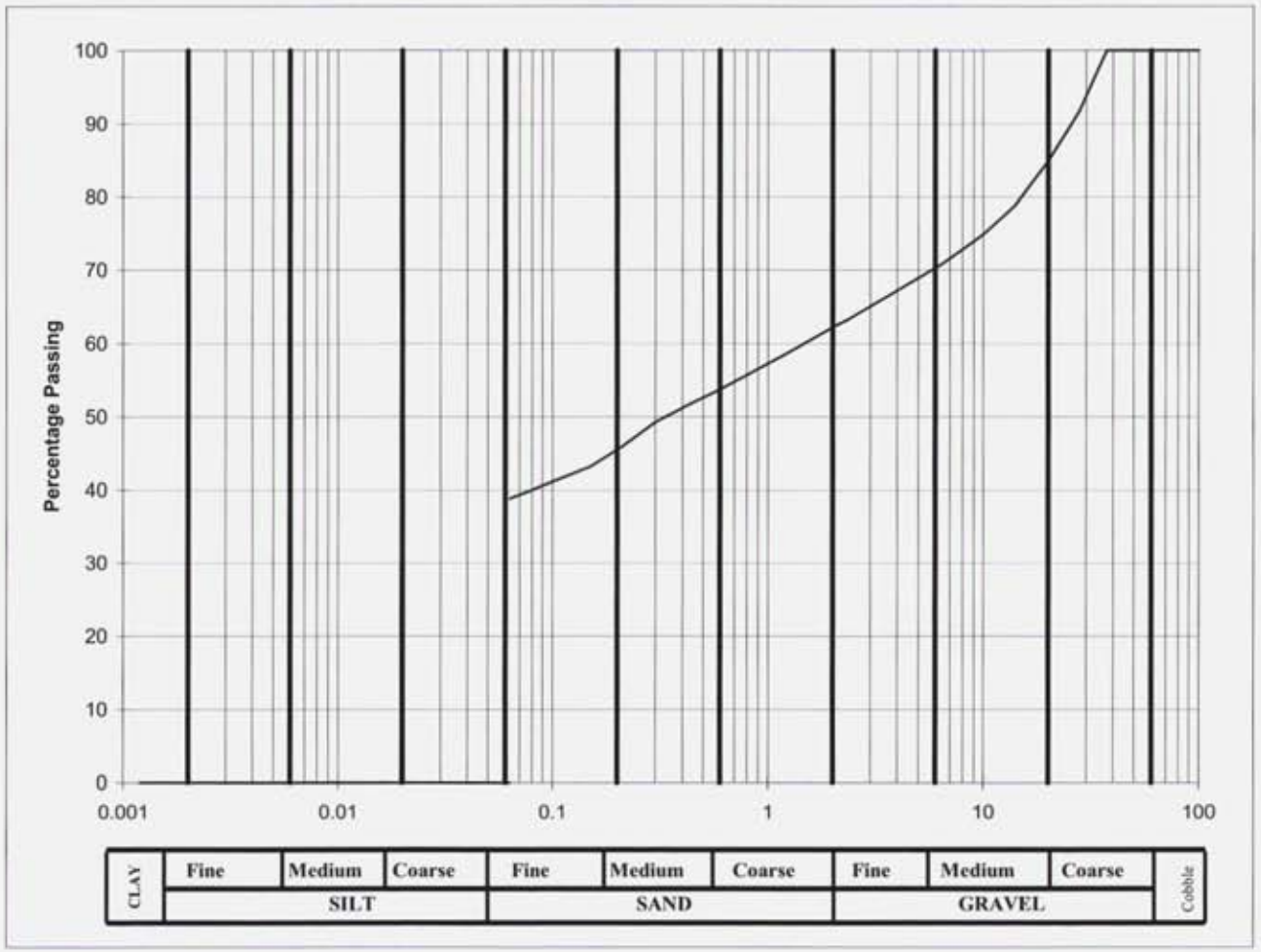
Site Investigations Ltd

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	91.7		
20	84.9		
14	78.8		
10	74.8		
6.3	70.6		
5.0	68.9		
2.36	63.2		
2.00	62.2		
1.18	58.4		
0.600	53.7		
0.425	51.6		
0.300	49.2		
0.212	46		
0.150	43.1		
0.063	39		

Cobbles, %	0
Gravel, %	38
Sand, %	23
Clay / Silt, %	39



Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/03
Sample No :	JM43

Hole ID :	BH 42
Depth, m :	5.50

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

5249-15
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BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	98.6		
10	96.9		
6.3	94.5		
5.0	93.2		
2.36	88.1		
2.00	87		
1.18	82.5		
0.600	76		
0.425	72.2		
0.300	67.4		
0.212	60.7		
0.150	52.8		
0.063	46		

Cobbles, %	0
Gravel, %	13
Sand, %	41
Clay / Silt, %	46

Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/07
Sample No :	JM25

Hole ID :	BH 44
Depth, m :	3.50

Material description :	slightly gravelly sandy silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

5249-15
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[redacted]

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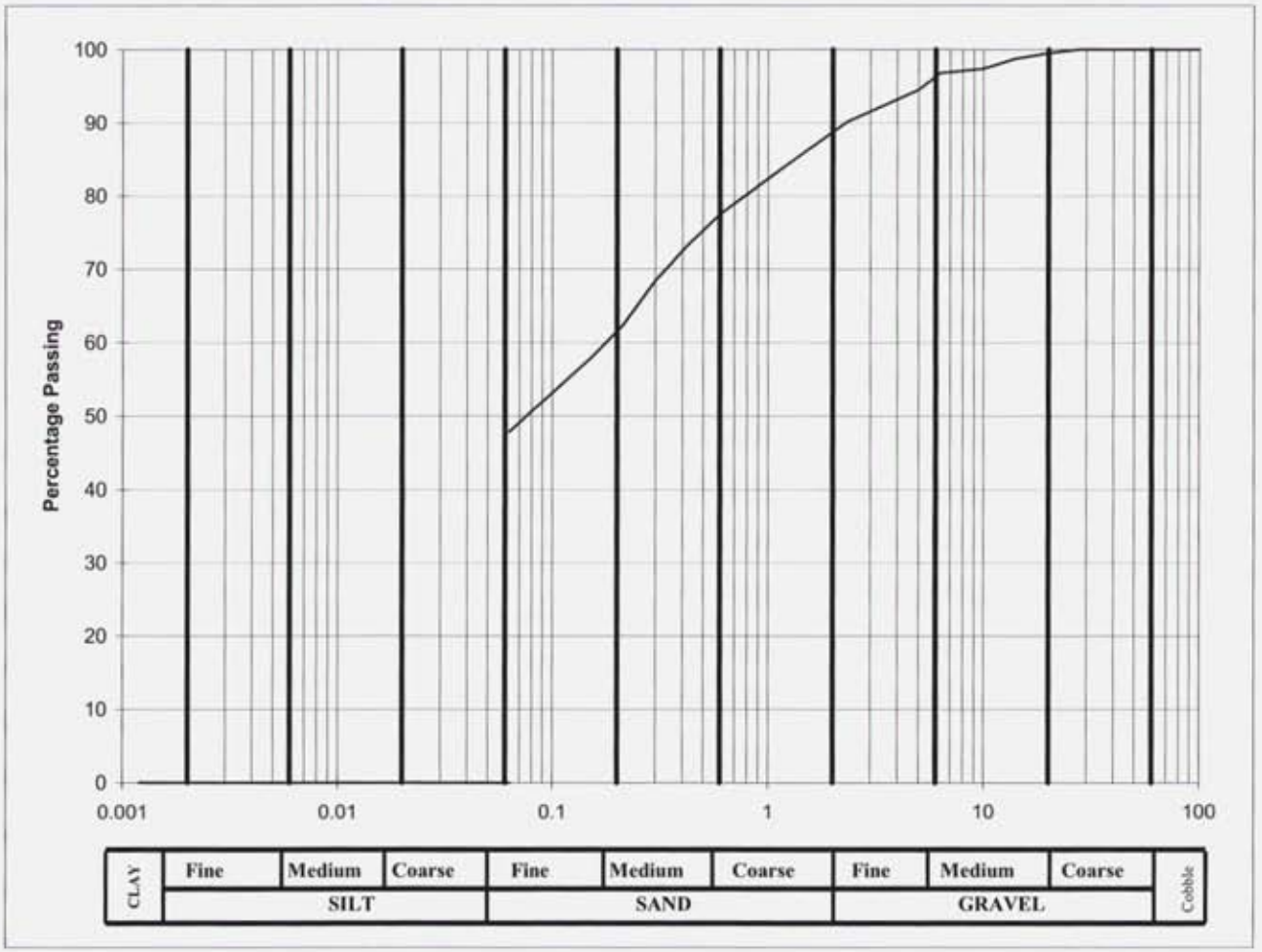
Site Investigat[redacted] Ltd

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	99.5		
14	98.7		
10	97.4		
6.3	96.8		
5.0	94.5		
2.36	90.2		
2.00	88.7		
1.18	83.9		
0.600	77.5		
0.425	73.3		
0.300	68.4		
0.212	62.3		
0.150	57.8		
0.063	48		

Cobbles, %	0
Gravel, %	11
Sand, %	41
Clay / Silt, %	48



Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/197
Sample No :	TT44

Hole ID :	BH 45
Depth, m :	4.00

Material description :	slightly gravelly sandy silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

5249-15
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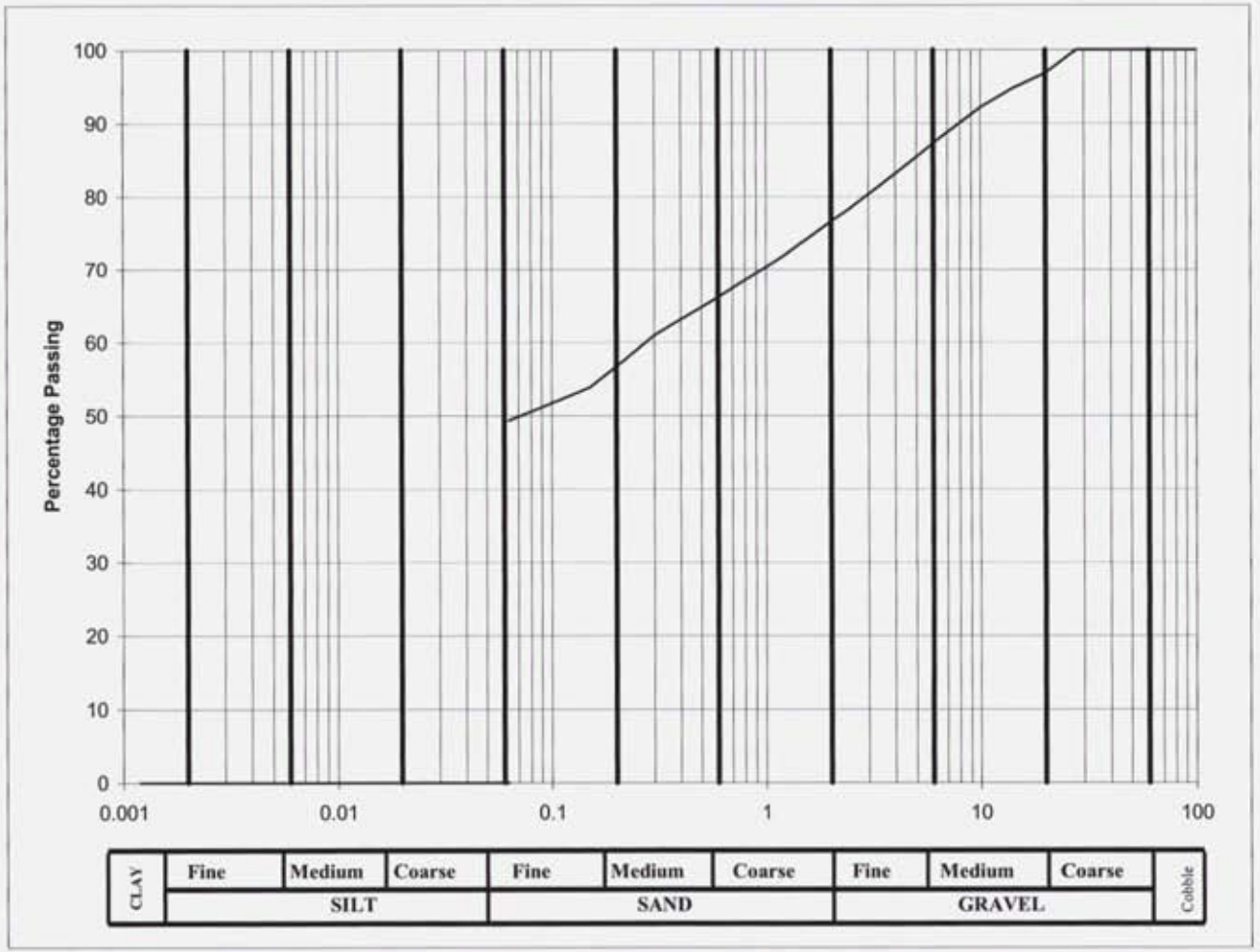
BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	96.8		
14	94.7		
10	92.1		
6.3	87.7		
5.0	85.3		
2.36	78		
2.00	76.6		
1.18	71.7		
0.600	66.1		
0.425	63.6		
0.300	60.9		
0.212	57.3		
0.150	53.8		
0.063	49		

Cobbles, %	0
Gravel, %	23
Sand, %	28
Clay / Silt, %	49



Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/11
Sample No :	TT21

Hole ID :	BH 46
Depth, m :	2.50

Material description :	slightly gravelly slightly sandy silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

5249-15
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Site Investigat[illegible] Ltd

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	94.2		
14	91.5		
10	88.8		
6.3	84.6		
5.0	81.6		
2.36	75.9		
2.00	74.8		
1.18	70.2		
0.600	64		
0.425	60.7		
0.300	56.9		
0.212	51.9		
0.150	46.5		
0.063	39		

Cobbles, %	0
Gravel, %	25
Sand, %	36
Clay / Silt, %	39

Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/18
Sample No :	JM 38

Hole ID :	BH 48
Depth, m :	3.00

Material description :	slightly gravelly sandy silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

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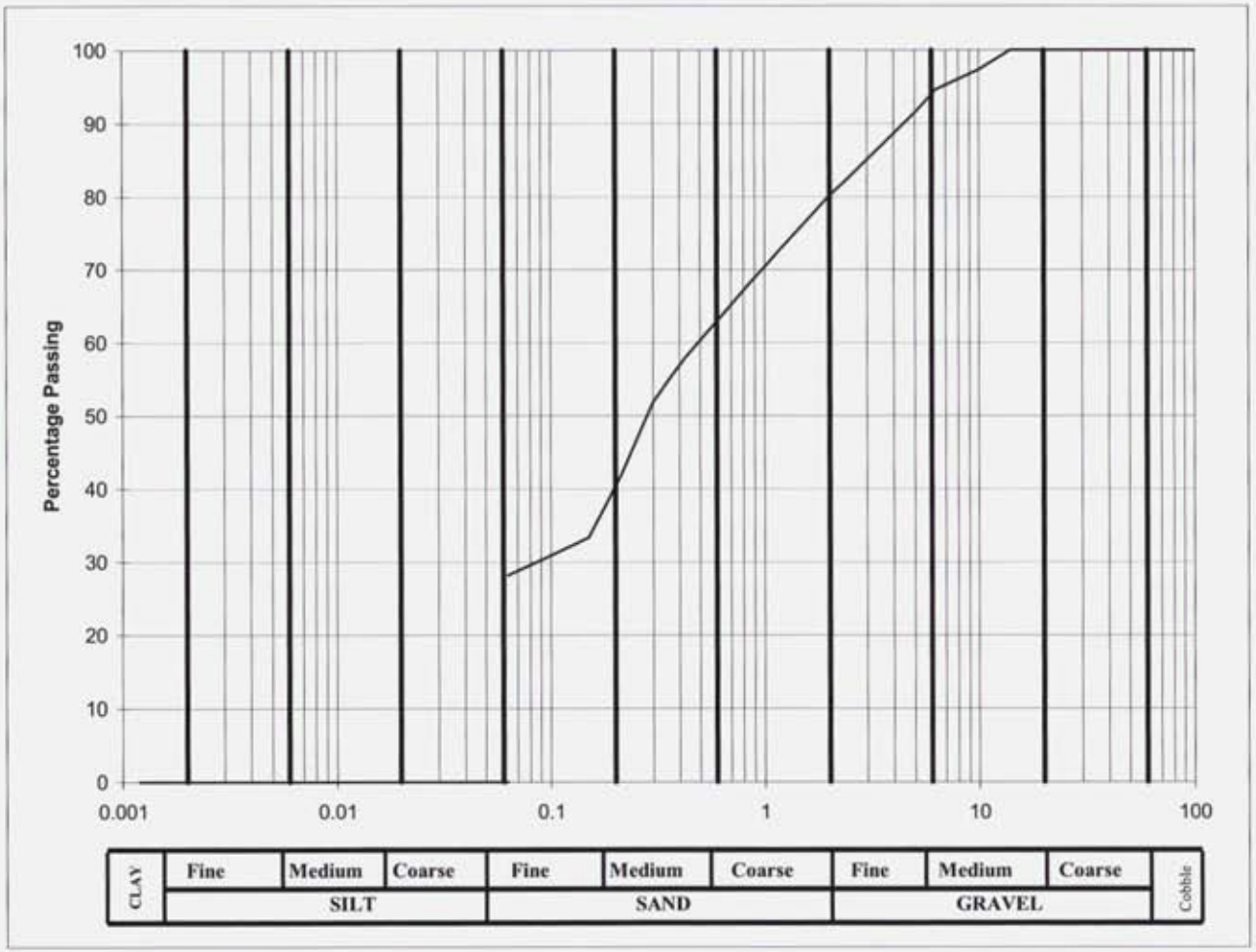
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	100		
10	97.3		
6.3	94.6		
5.0	91.4		
2.36	82		
2.00	80.2		
1.18	72.8		
0.600	62.9		
0.425	57.9		
0.300	51.9		
0.212	41.8		
0.150	33.3		
0.063	28		

Cobbles, %	0
Gravel, %	20
Sand, %	52
Clay / Silt, %	28



Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/33
Sample No :	TT10

Hole ID :	BH 57
Depth, m :	4.50

Material description :	slightly gravelly sandy silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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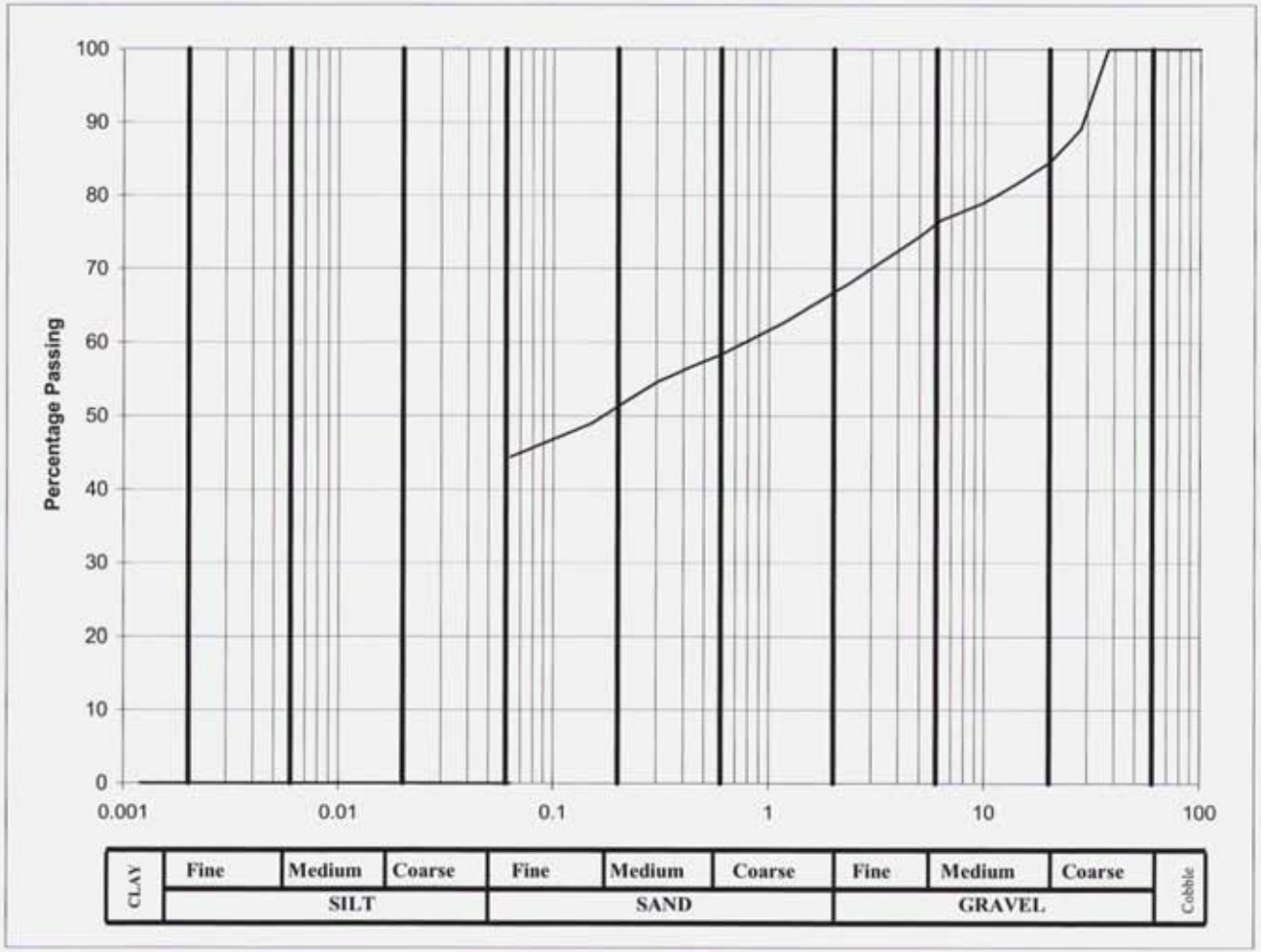
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	89.1		
20	84.6		
14	81.6		
10	79.1		
6.3	76.6		
5.0	74.4		
2.36	68		
2.00	66.8		
1.18	62.7		
0.600	58.3		
0.425	56.5		
0.300	54.5		
0.212	51.8		
0.150	48.9		
0.063	44		

Cobbles, %	0
Gravel, %	33
Sand, %	23
Clay / Silt, %	44



Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/125
Sample No :	PM04

Hole ID :	TP 19
Depth, m :	1.50

Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	88.9		
14	85.4		
10	82.1		
6.3	78.2		
5.0	74.9		
2.36	66.8		
2.00	65.5		
1.18	60.6		
0.600	55.6		
0.425	53.4		
0.300	50.9		
0.212	48		
0.150	45.1		
0.063	41		

Cobbles, %	0
Gravel, %	35
Sand, %	25
Clay / Silt, %	41

Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/148
Sample No :	PM21

Hole ID :	TP 26
Depth, m :	1.00

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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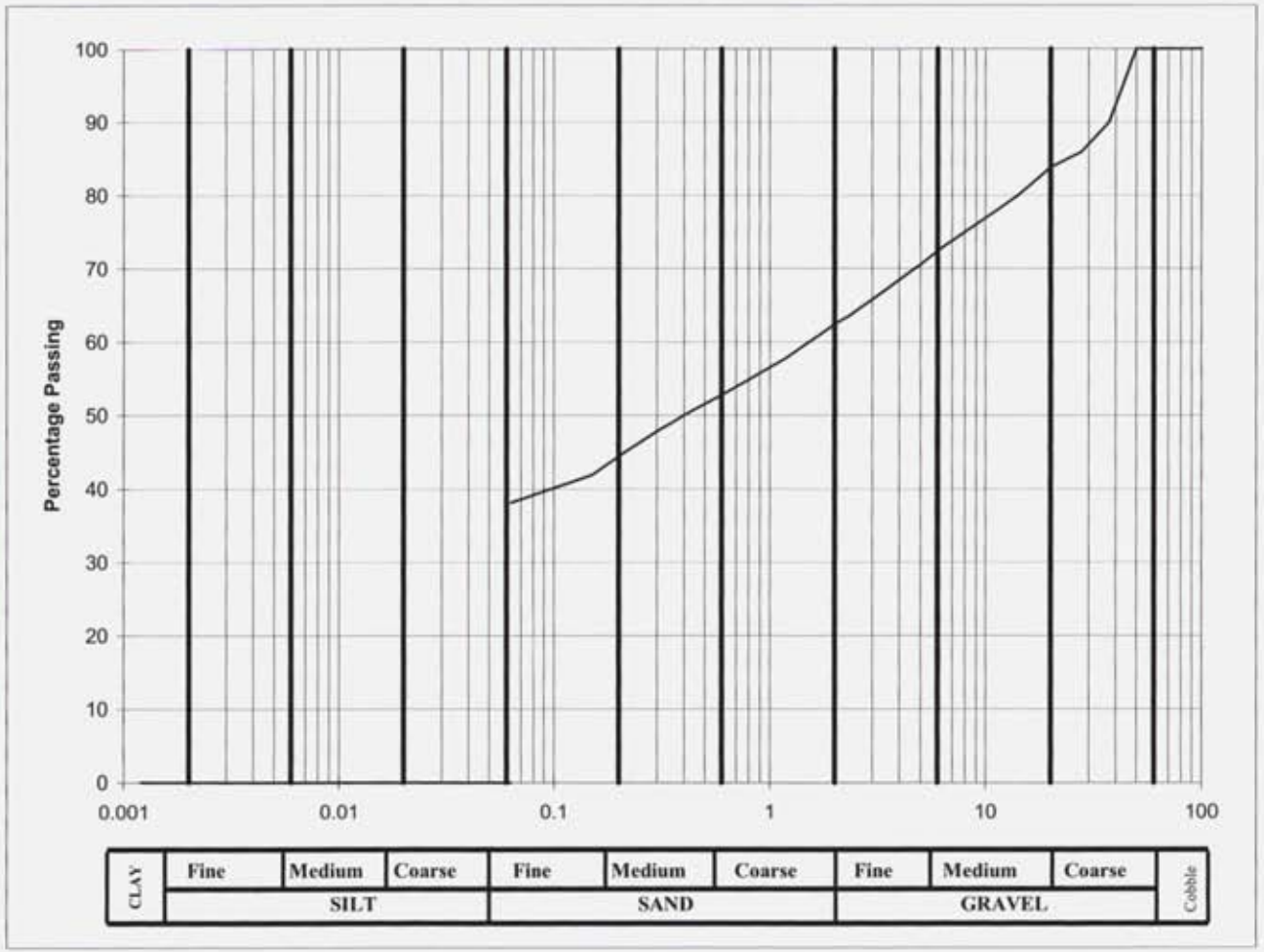
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	90		
28	85.9		
20	83.8		
14	79.9		
10	76.9		
6.3	72.9		
5.0	70.5		
2.36	63.6		
2.00	62.4		
1.18	57.7		
0.600	52.7		
0.425	50.4		
0.300	47.8		
0.212	44.9		
0.150	41.9		
0.063	38		

Cobbles, %	0
Gravel, %	38
Sand, %	24
Clay / Silt, %	38



Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/153
Sample No :	PM26

Hole ID :	TP 28
Depth, m :	1.80

Material description :	slightly sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	92.1		
14	89.7		
10	84.7		
6.3	78.1		
5.0	75.1		
2.36	68.6		
2.00	67.3		
1.18	62.7		
0.600	57.6		
0.425	55.5		
0.300	53.1		
0.212	50		
0.150	47.4		
0.063	43		

Cobbles, %	0
Gravel, %	33
Sand, %	24
Clay / Silt, %	43

Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/158
Sample No :	PM31

Hole ID :	TP 36
Depth, m :	2.50

Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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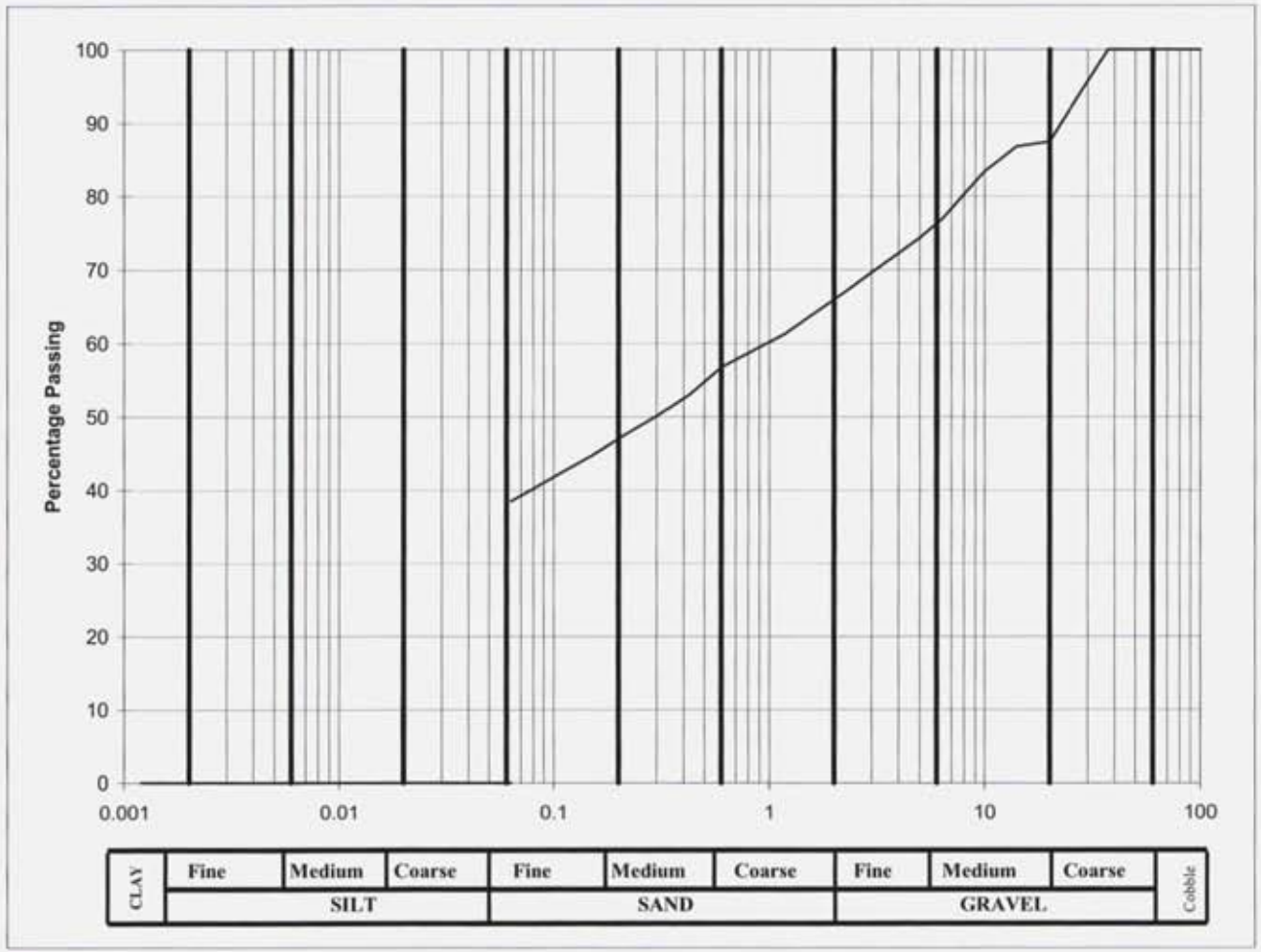
BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	94.2		
20	87.5		
14	86.8		
10	83.4		
6.3	76.8		
5.0	74.3		
2.36	67.4		
2.00	65.9		
1.18	61.3		
0.600	56.7		
0.425	53		
0.300	50.1		
0.212	47.5		
0.150	44.7		
0.063	39		

Cobbles, %	0
Gravel, %	34
Sand, %	27
Clay / Silt, %	39



Client :	Dublin Airport Authority
Project :	South Apron

Lab. No :	16/165
Sample No :	PM38

Hole ID :	TP 39
Depth, m :	1.00

Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

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California Bearing Ratio (CBR) In accordance with BS1377: Part 4: Method 7

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 15
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email siltd@indigo.ie
Test Date	29th January 2016

CBR No	Depth (mBGL)	Sample No	Sample Type	Lab Ref	Moisture Content (%)	CBR Value (%)	Location / Remarks
TP18	2.00	PM02	CBR	16/075	23.6	8.0	
TP19	2.20	PM06	CBR	16/076	25.1	4.0	
TP20	1.50	PM09	CBR	16/077	19.7	5.0	
TP20	3.50	PM11	CBR	16/078	25.6	7.0	
TP21	2.50	SL22	B	16/034	34.0	2.0	
TP21	3.50	PM14	CBR	16/079	22.7	8.0	
TP22	0.50	SL17	CBR	16/080	21.2	6.0	
TP23	2.10	PM17	CBR	16/081	19.3	3.0	
TP25	0.50	SL21	CBR	16/082	23.6	6.0	
TP25	1.50	SL22	B	16/046	27.0	1.0	
TP27	0.90	PM23	CBR	16/083	27.0	5.0	
TP28	2.00	PM27	CBR	16/084	21.5	9.0	
TP36	3.50	PM32	CBR	16/085	35.1	4.0	
TP37	0.60	PM33	CBR	16/086	14.5	6.0	
TP38	3.30	PM37	CBR	16/087	24.9	11.0	
TP39	3.90	PM40	CBR	16/088	22.6	9.0	
TP39A	2.00	PM61	CBR	16/109	24.8	8.0	
TP39B	0.70	PM64	CBR	16/110	14.3	9.0	
TP40	1.10	PM41	CBR	16/089	19.6	10.0	
TP40	3.50	PM43	CBR	16/090	16.7	9.0	
TP41	3.60	PM45	CBR	16/091	18.3	12.0	

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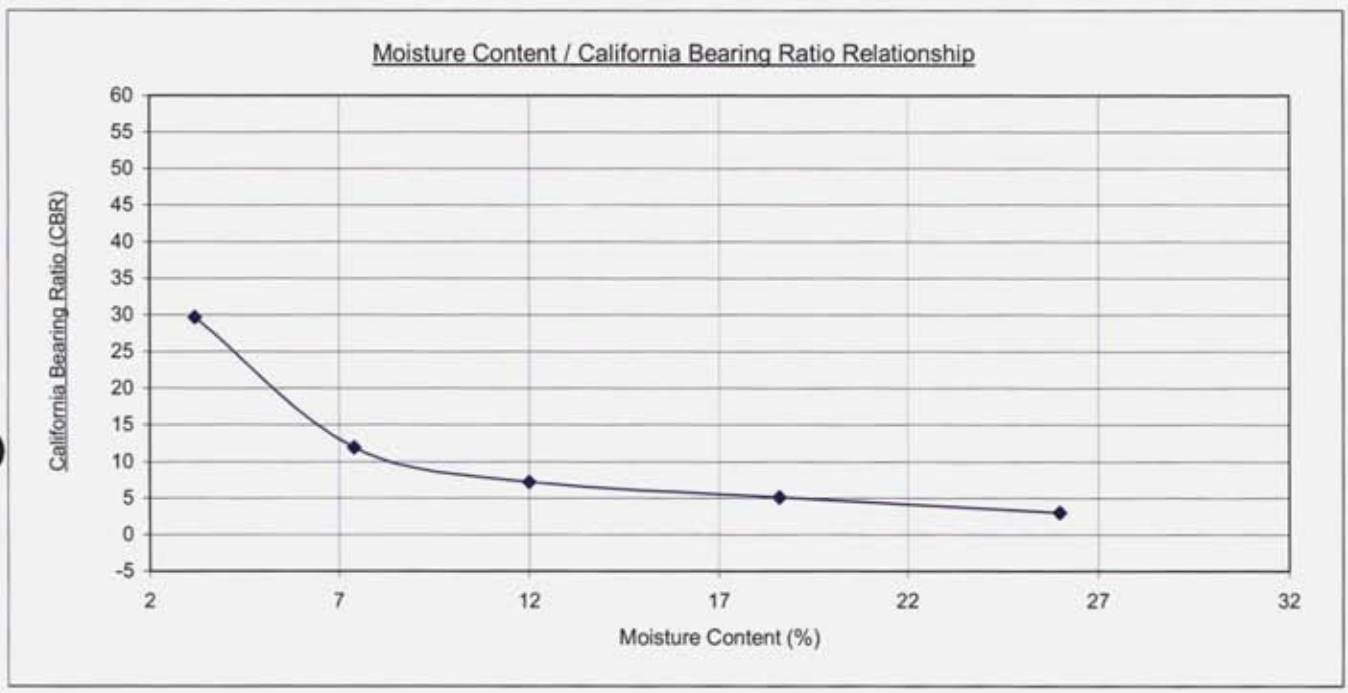
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 42
Sample No	JM45
Depth	5.50
Lab Ref:	16/003
Natural Moistue Content (%)	12.0

Point Number	1	2	3	4	5
Moisture Content (%):	3.2	7.4	12.0	18.6	26.0
CBR (%):	29.60	11.90	7.20	5.10	3.00



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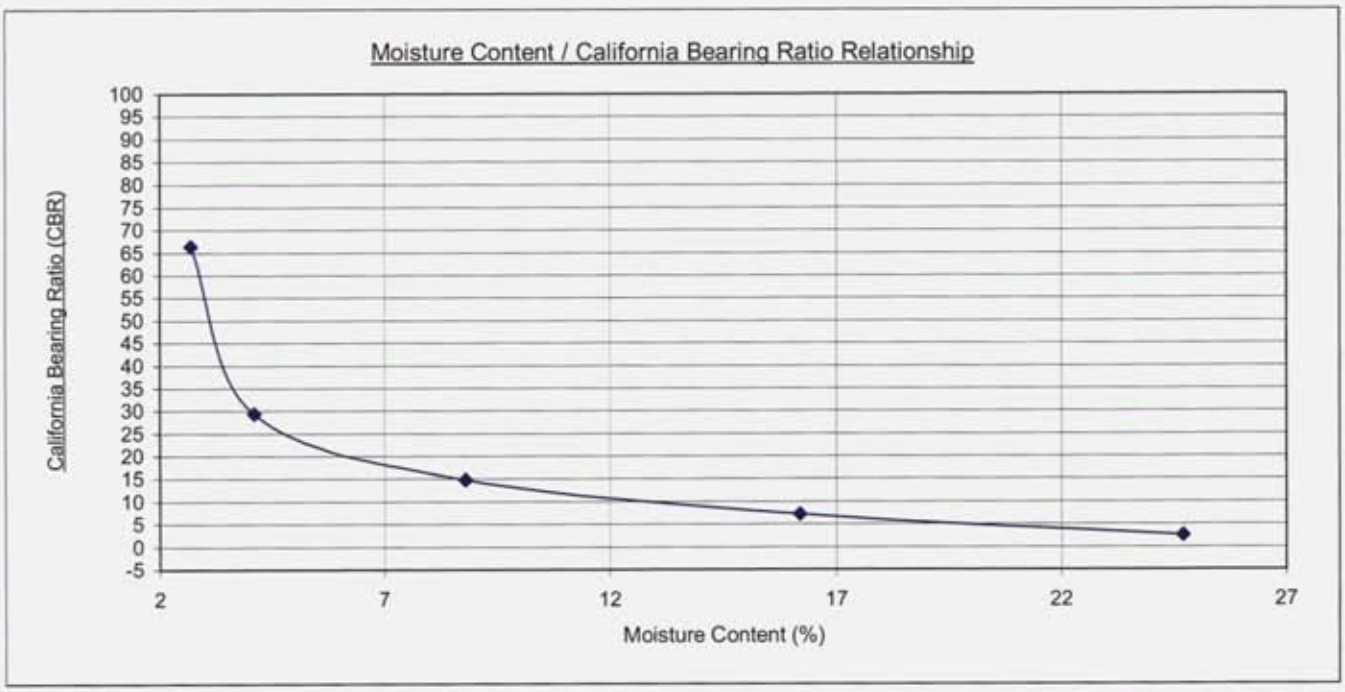
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 43
Sample No	JM21
Depth	5.50
Lab Ref:	16/006

Natural Moistue Content (%)	16.2

Point Number	1	2	3	4	5
Moisture Content (%):	2.7	4.1	8.8	16.2	24.7
CBR (%):	66.40	29.30	14.80	7.10	2.50



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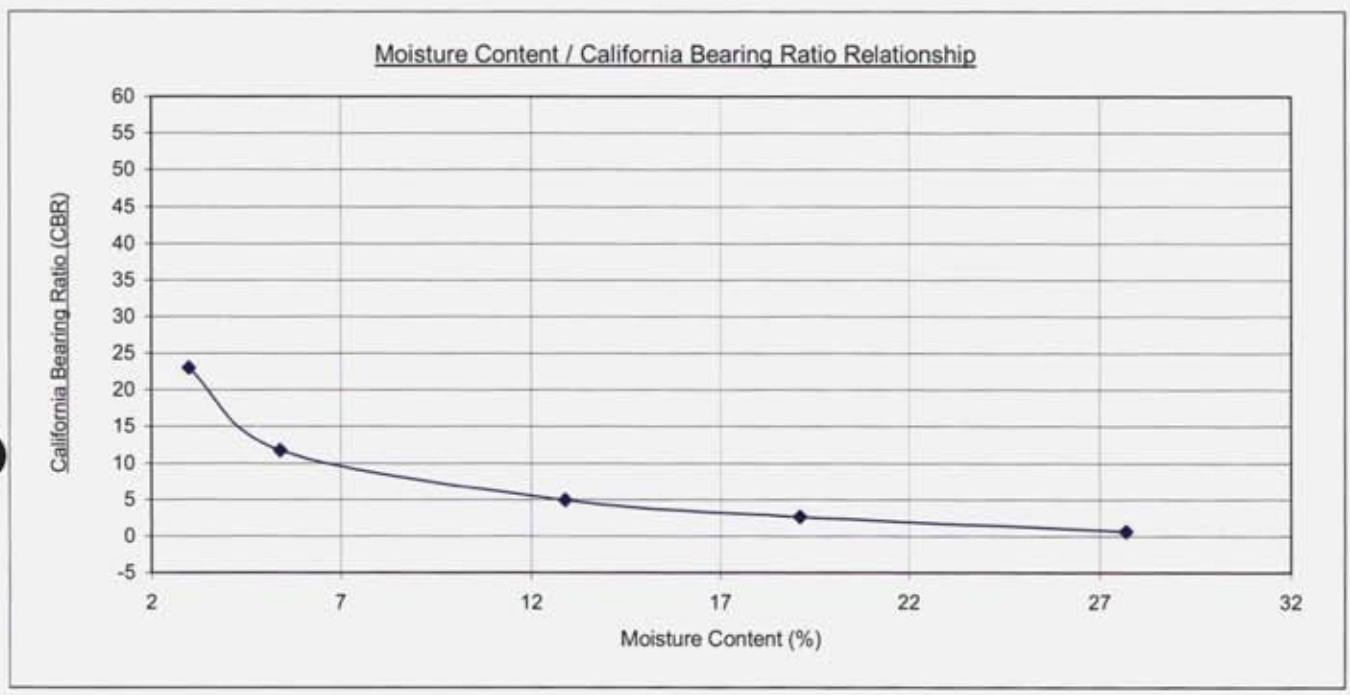
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 44
Sample No	JM28
Depth	8.00
Lab Ref:	16/010
Natural Moistue Content (%)	27.7

Point Number	1	2	3	4	5
Moisture Content (%):	3.0	5.4	12.9	19.1	27.7
CBR (%):	23.00	11.70	4.90	2.60	0.60



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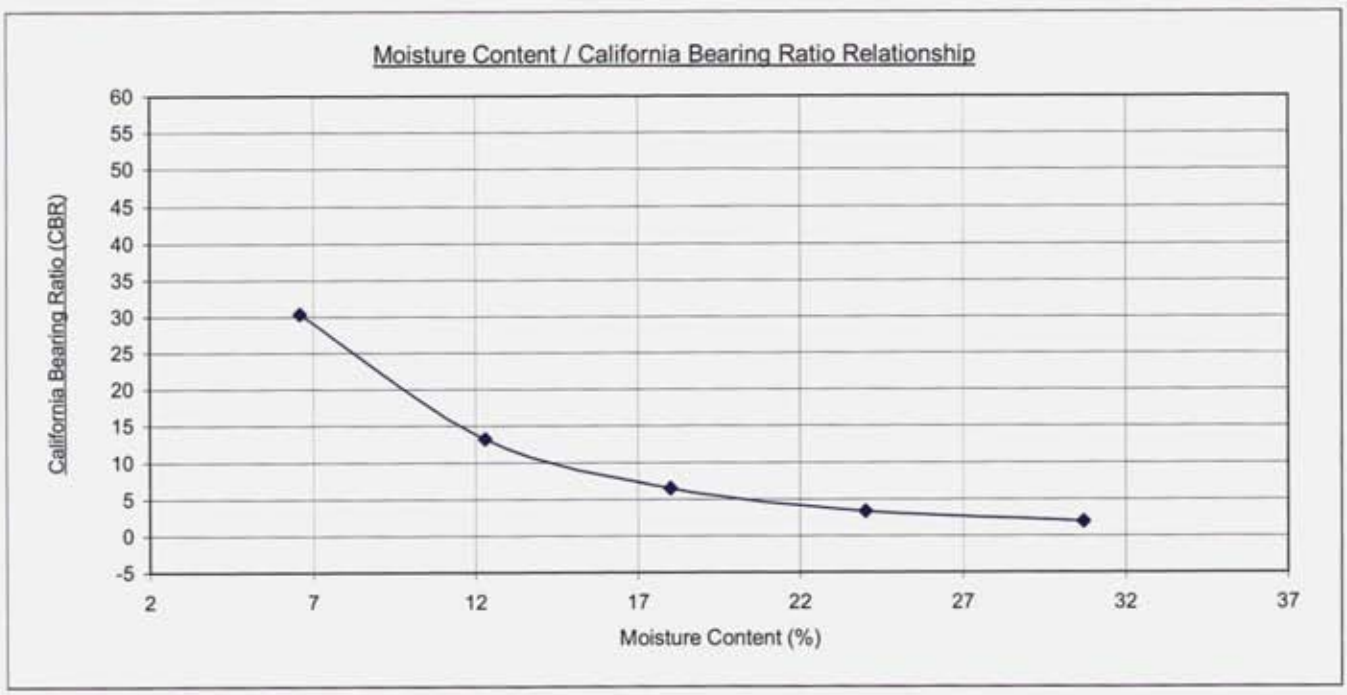
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 45
Sample No	TT42
Depth	1.00
Lab Ref:	16/195
Natural Moistue Content (%)	30.7

Point Number	1	2	3	4	5
Moisture Content (%):	6.6	12.3	18.0	24.0	30.7
CBR (%):	30.30	13.20	6.50	3.30	1.90



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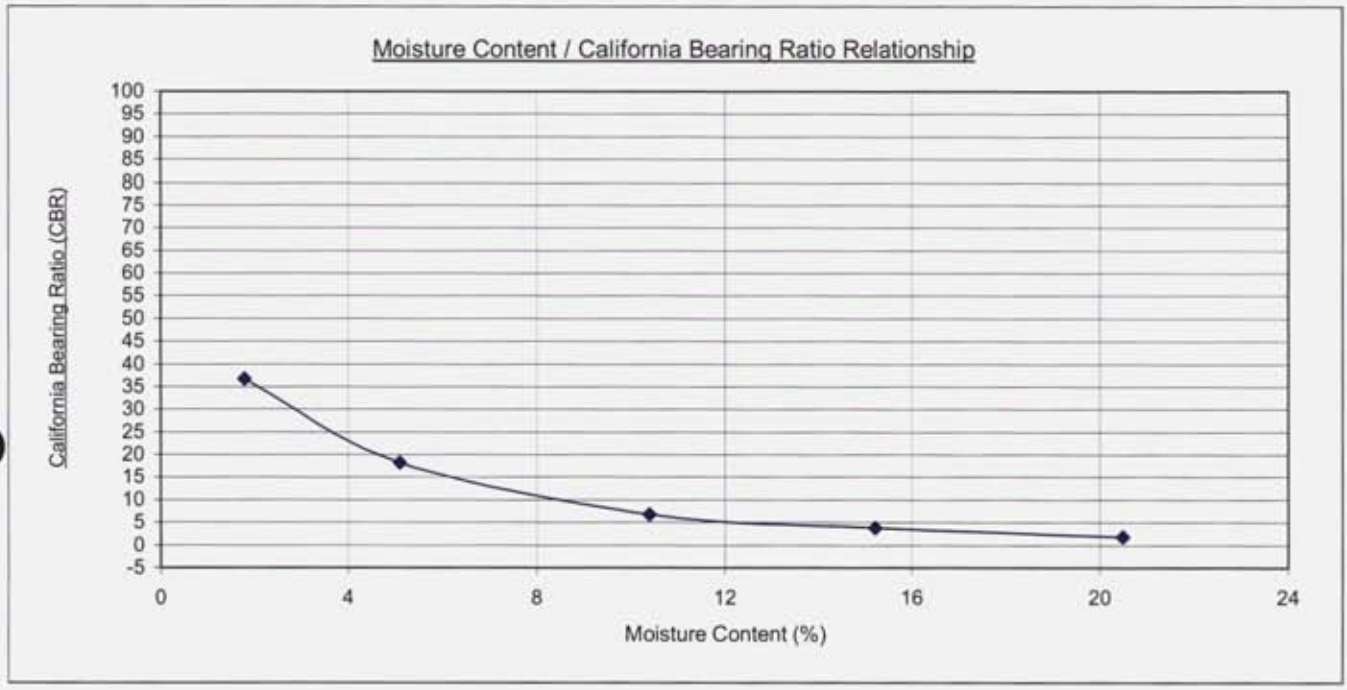
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 46
Sample No	TT25
Depth	7.00
Lab Ref:	16/014
Natural Moistue Content (%)	20.5

Point Number	1	2	3	4	5
Moisture Content (%):	1.8	5.1	10.4	15.2	20.5
CBR (%):	36.70	18.20	6.70	3.70	1.80



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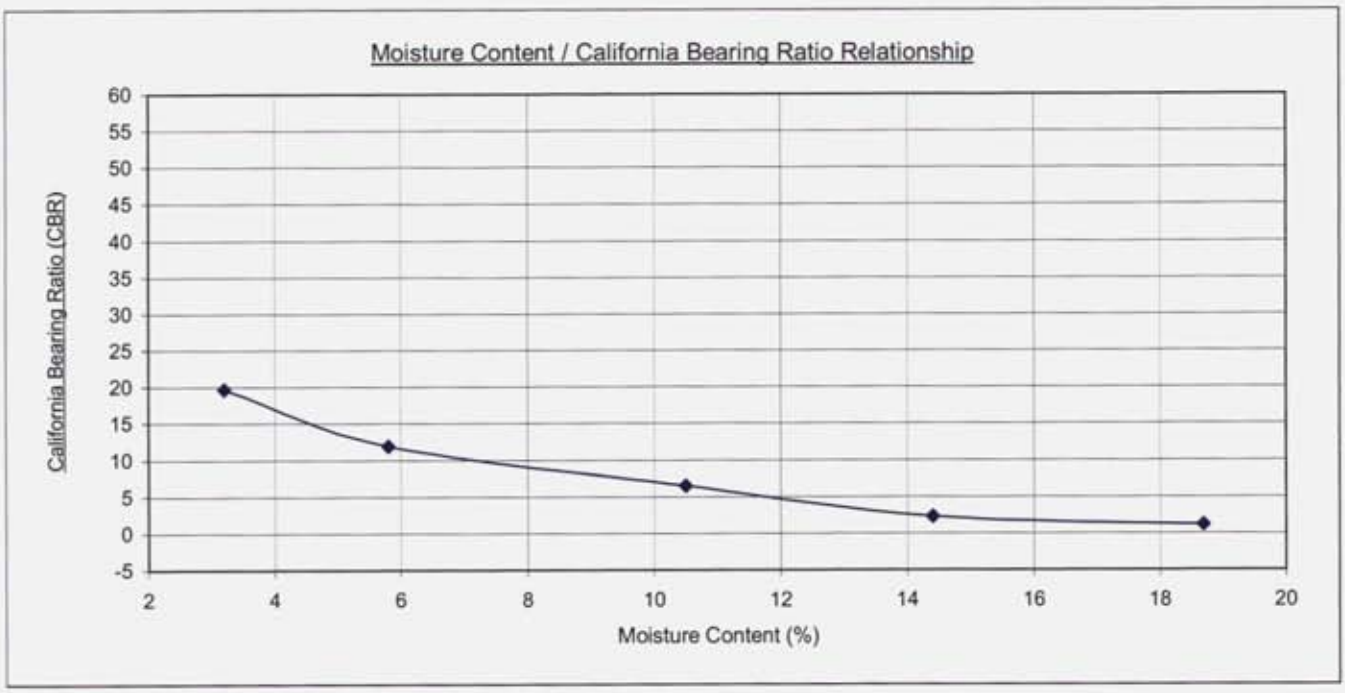
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 47
Sample No	JM34
Depth	5.50
Lab Ref:	16/017
Natural Moistue Content (%)	18.7

Point Number	1	2	3	4	5
Moisture Content (%):	3.2	5.8	10.5	14.4	18.7
CBR (%):	19.70	11.90	6.50	2.30	1.10



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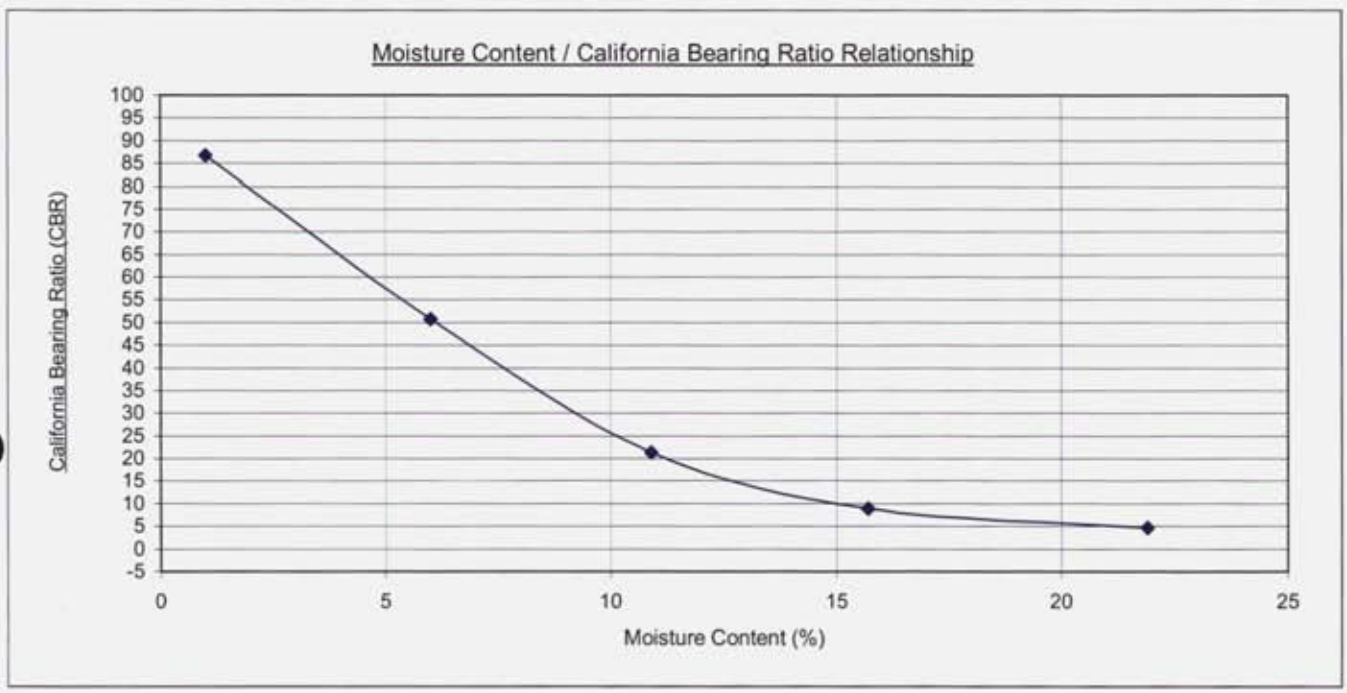
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 48
Sample No	JM39
Depth	4.50
Lab Ref:	16/019
Natural Moistue Content (%)	21.9

Point Number	1	2	3	4	5
Moisture Content (%):	1.0	6.0	10.9	15.7	21.9
CBR (%):	86.70	50.70	21.30	8.90	4.60



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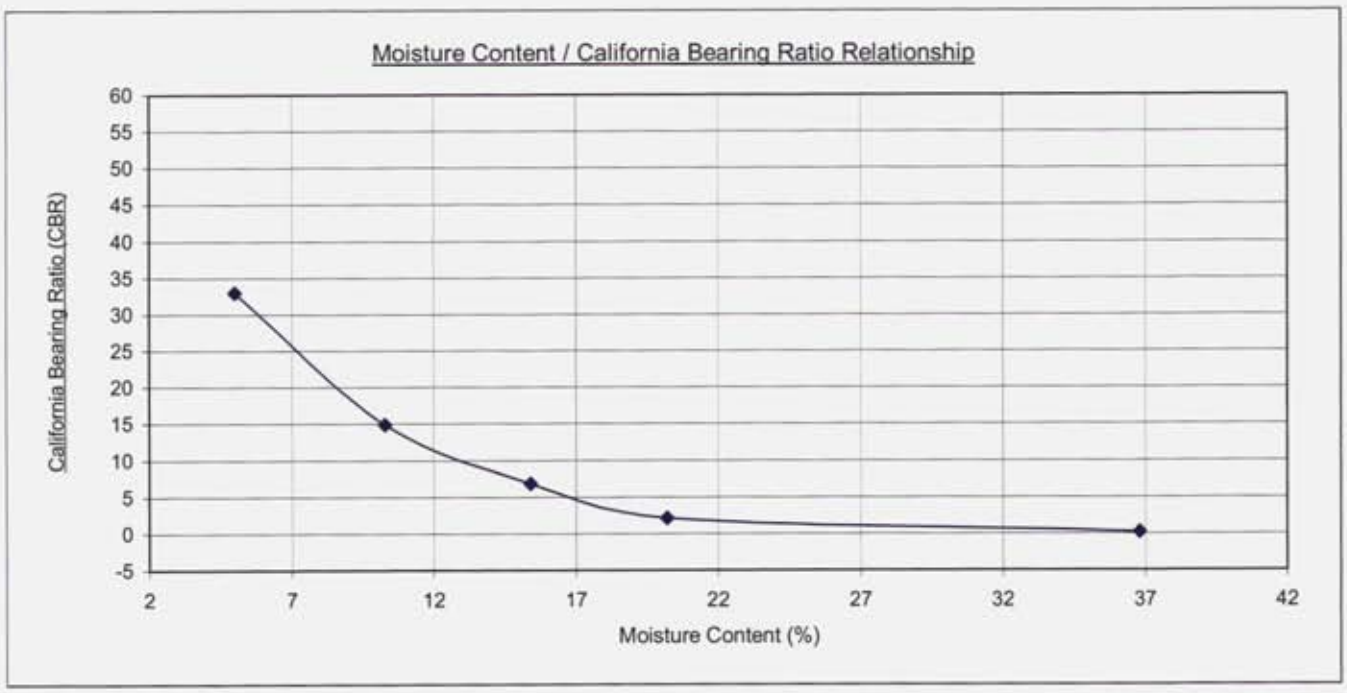
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 50
Sample No	TT03
Depth	3.50
Lab Ref:	16/024
Natural Moistue Content (%)	20.2

Point Number	1	2	3	4	5
Moisture Content (%):	5.0	10.3	15.4	20.2	36.8
CBR (%):	33.00	14.90	6.80	2.10	0.20



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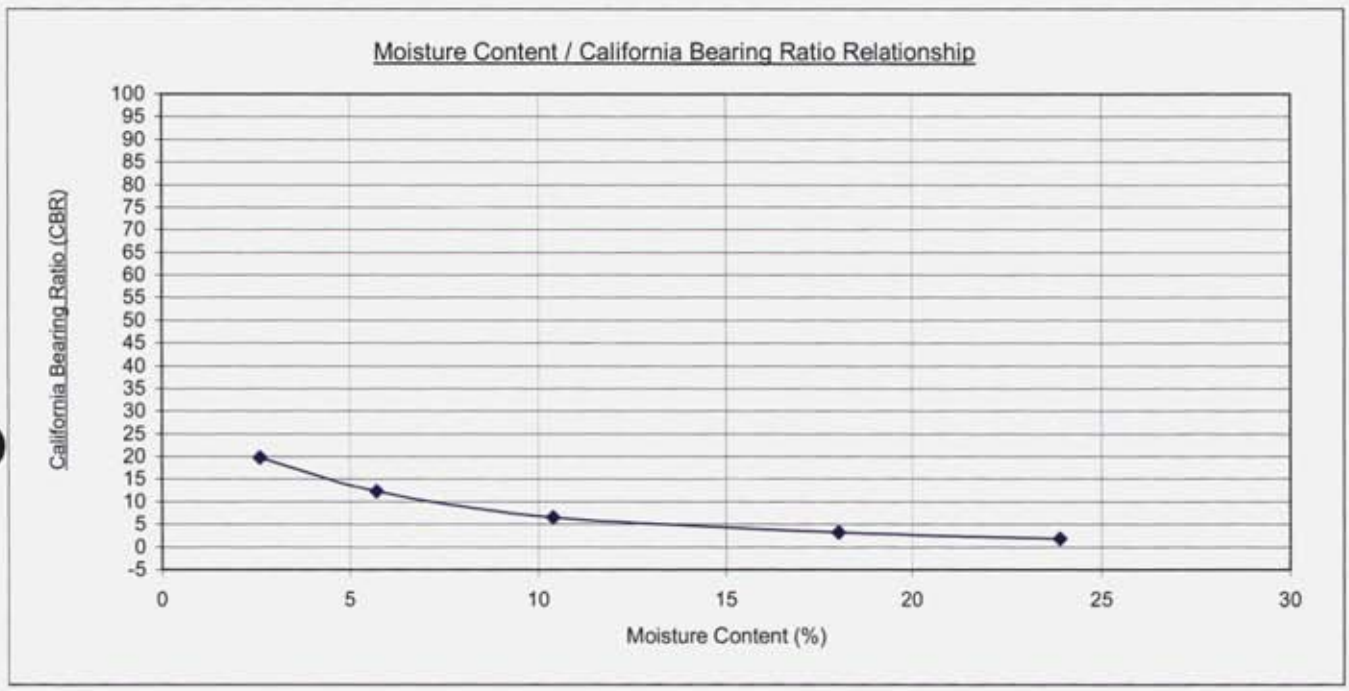
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 53
Sample No	TT36
Depth	5.00
Lab Ref:	16/027
Natural Moistue Content (%)	18.0

Point Number	1	2	3	4	5
Moisture Content (%):	2.6	5.7	10.4	18.0	23.9
CBR (%):	19.80	12.30	6.50	3.20	1.80



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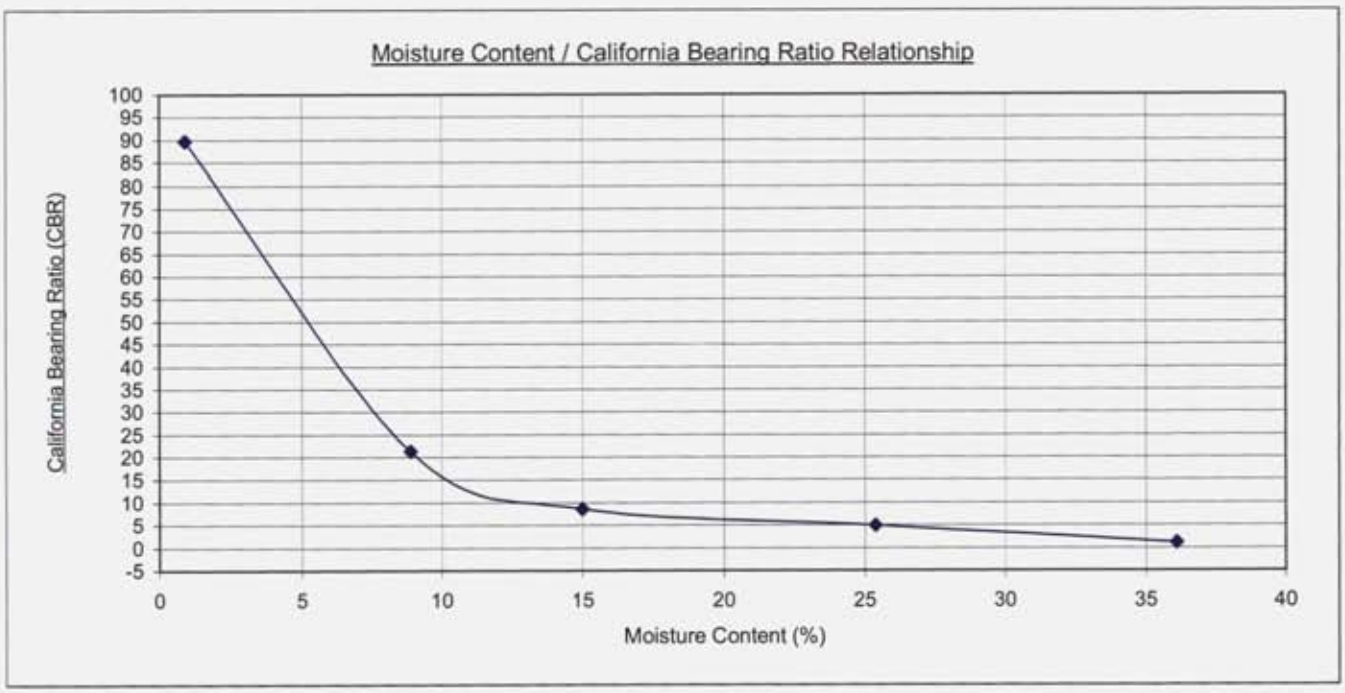
CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 59
Sample No	JM03
Depth	3.00
Lab Ref:	16/037
Natural Moistue Content (%)	36.1

Point Number	1	2	3	4	5
Moisture Content (%):	0.9	8.9	15.0	25.4	36.1
CBR (%):	89.70	21.30	8.60	4.90	1.10



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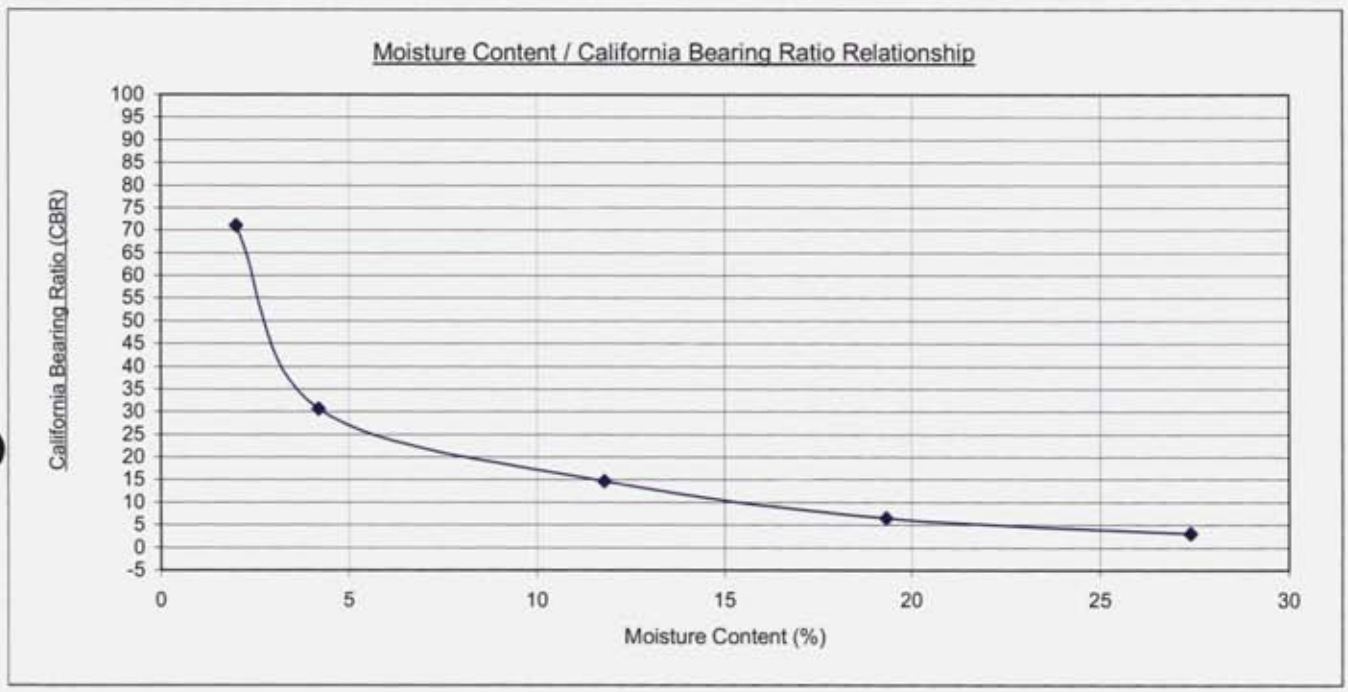
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 59
Sample No	JM10
Depth	12.00
Lab Ref:	16/040
Natural Moistue Content (%)	11.8

Point Number	1	2	3	4	5
Moisture Content (%):	2.0	4.2	11.8	19.3	27.4
CBR (%):	71.00	30.60	14.70	6.40	3.00



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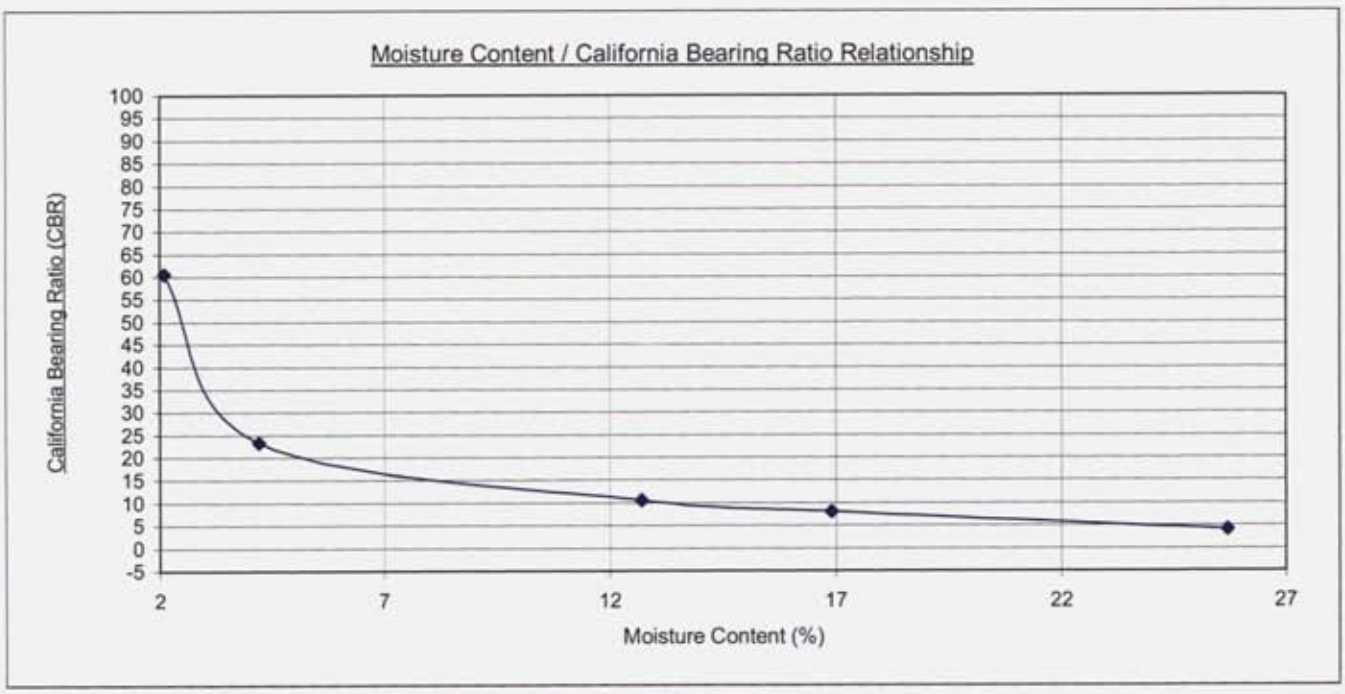
Paddy McGonagle
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	BH 61
Sample No	TT38
Depth	1.00
Lab Ref:	16/201
Natural Moistue Content (%)	12.7

Point Number	1	2	3	4	5
Moisture Content (%):	2.1	4.2	12.7	16.9	25.7
CBR (%):	60.60	23.20	10.50	8.00	4.10



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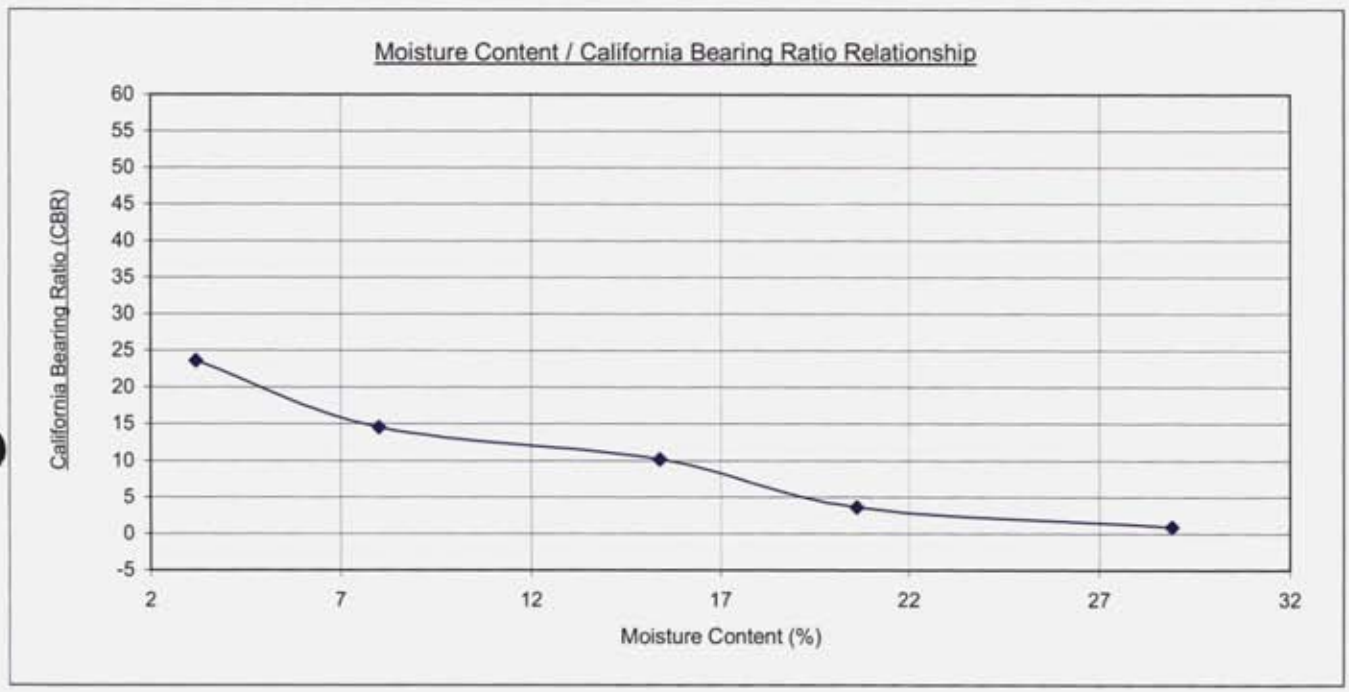
Paddy McGonagle
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 18
Sample No	PM03
Depth	2.50
Lab Ref:	16/122
Natural Moistue Content (%)	20.6

Point Number	1	2	3	4	5
Moisture Content (%):	3.2	8.0	15.4	20.6	28.9
CBR (%):	23.60	14.50	10.10	3.60	0.90



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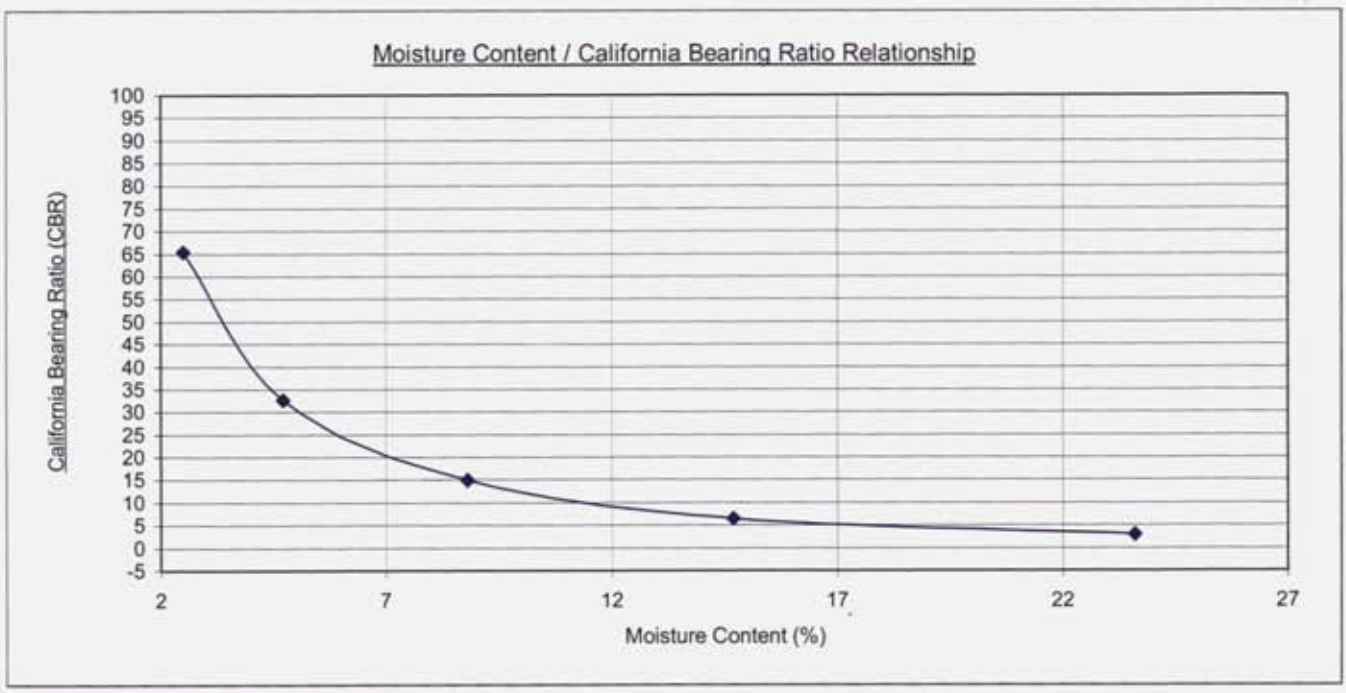
Paddy McGonagle
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 20
Sample No	PM08
Depth	0.60
Lab Ref:	16/129
Natural Moistue Content (%)	23.6

Point Number	1	2	3	4	5
Moisture Content (%):	2.5	4.7	8.8	14.7	23.6
CBR (%):	65.40	32.60	14.90	6.50	2.90



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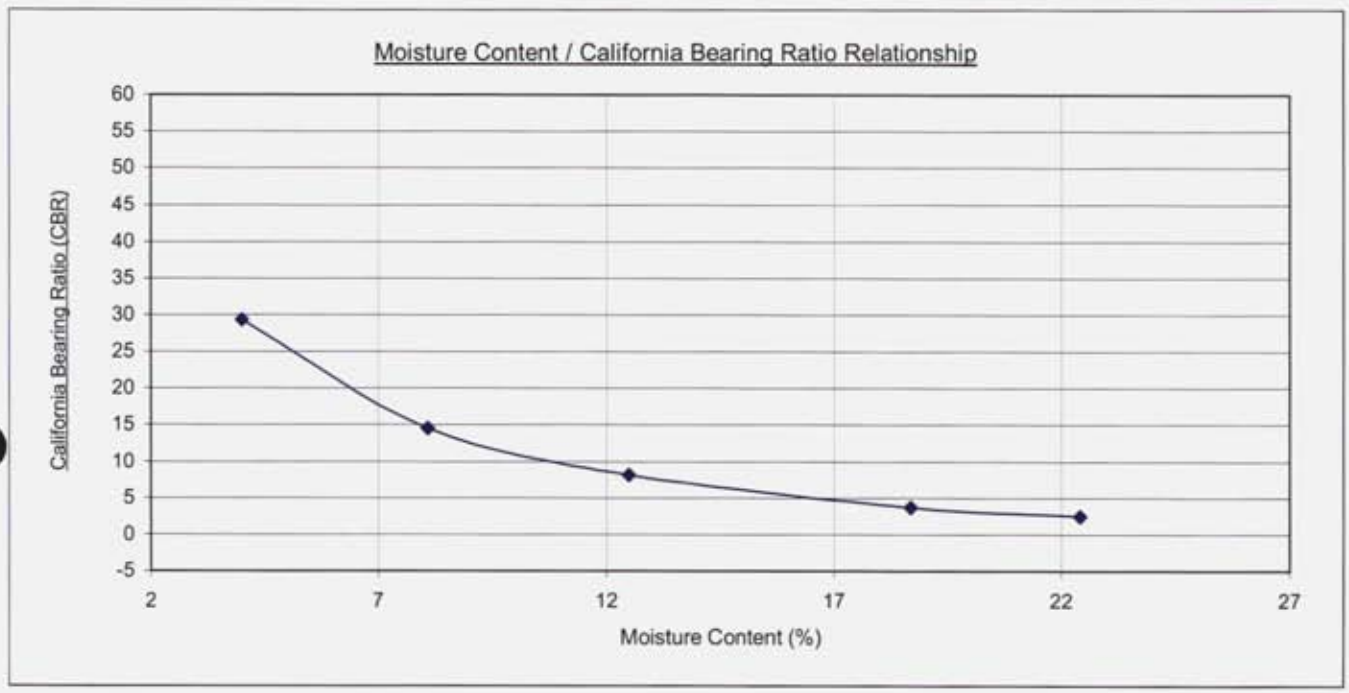
Paddy McGonagle
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 22
Sample No	SL19
Depth	2.50
Lab Ref:	16/138
Natural Moistue Content (%)	18.7

Point Number	1	2	3	4	5
Moisture Content (%):	4.0	8.1	12.5	18.7	22.4
CBR (%):	29.30	14.50	8.10	3.70	2.40



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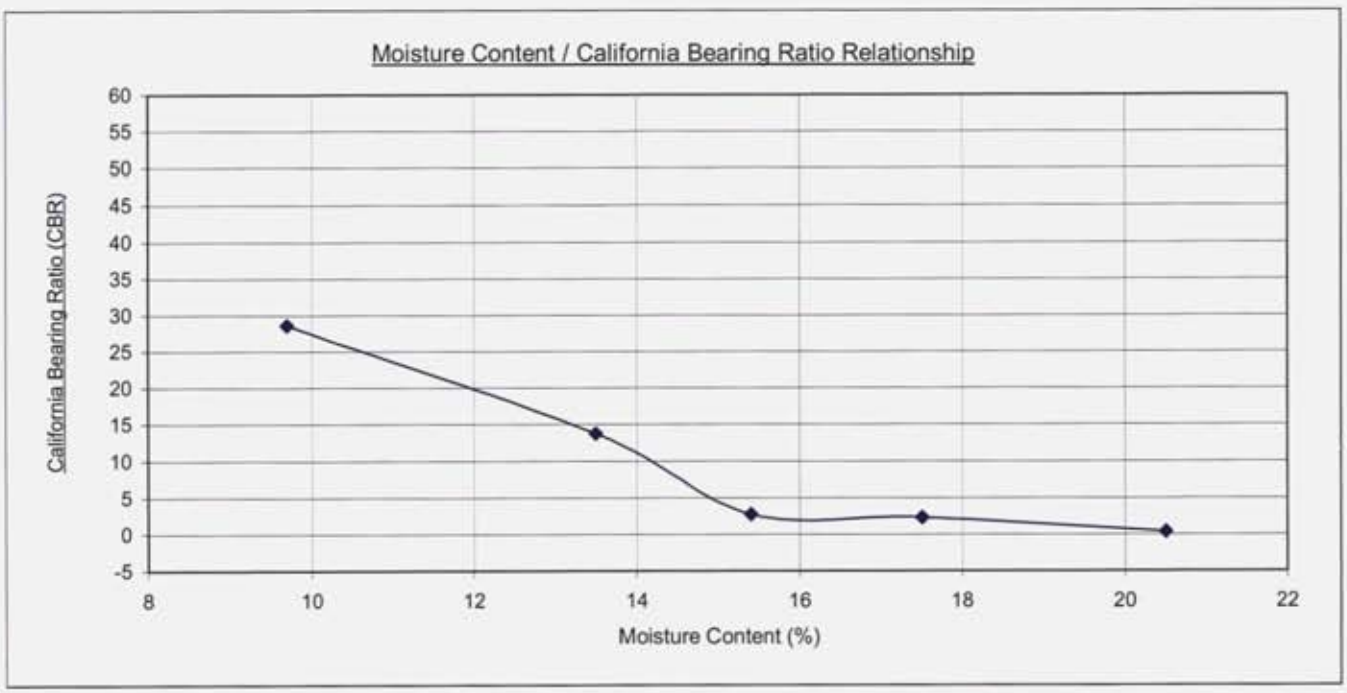
Paddy McGonagle
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	1st February 2016

Hole Id:	TP 24
Sample No	PM19
Depth	1.50
Lab Ref:	16/143
Natural Moistue Content (%)	20.5

Point Number	1	2	3	4	5
Moisture Content (%):	9.7	13.5	15.4	17.5	20.5
CBR (%):	28.60	13.70	2.70	2.30	0.30



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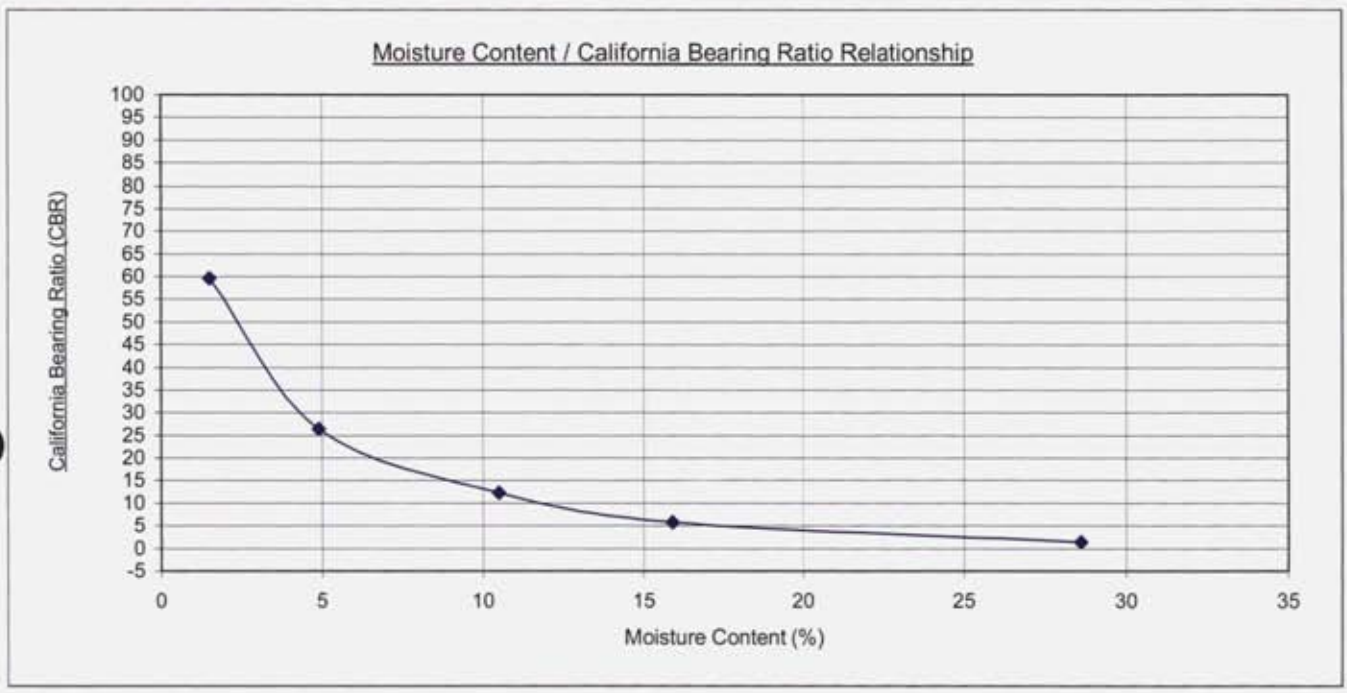
Paddy McGonagle
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 26
Sample No	PM21
Depth	1.00
Lab Ref:	16/148
Natural Moistue Content (%)	10.5

Point Number	1	2	3	4	5
Moisture Content (%):	1.5	4.9	10.5	15.9	28.6
CBR (%):	59.60	26.40	12.30	5.70	1.30



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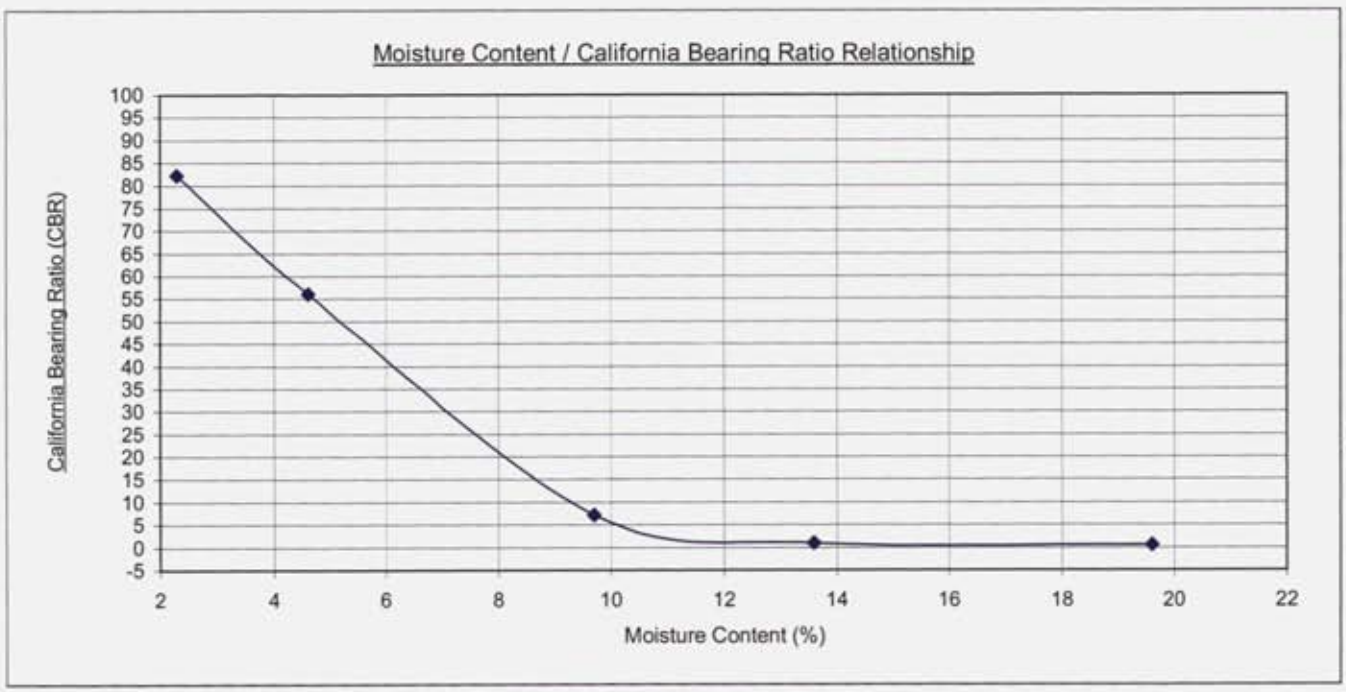
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 28
Sample No	PM26
Depth	1.80
Lab Ref:	16/153
Natural Moistue Content (%)	9.7

Point Number	1	2	3	4	5
Moisture Content (%):	2.3	4.6	9.7	13.6	19.6
CBR (%):	82.20	56.00	7.20	1.00	0.50



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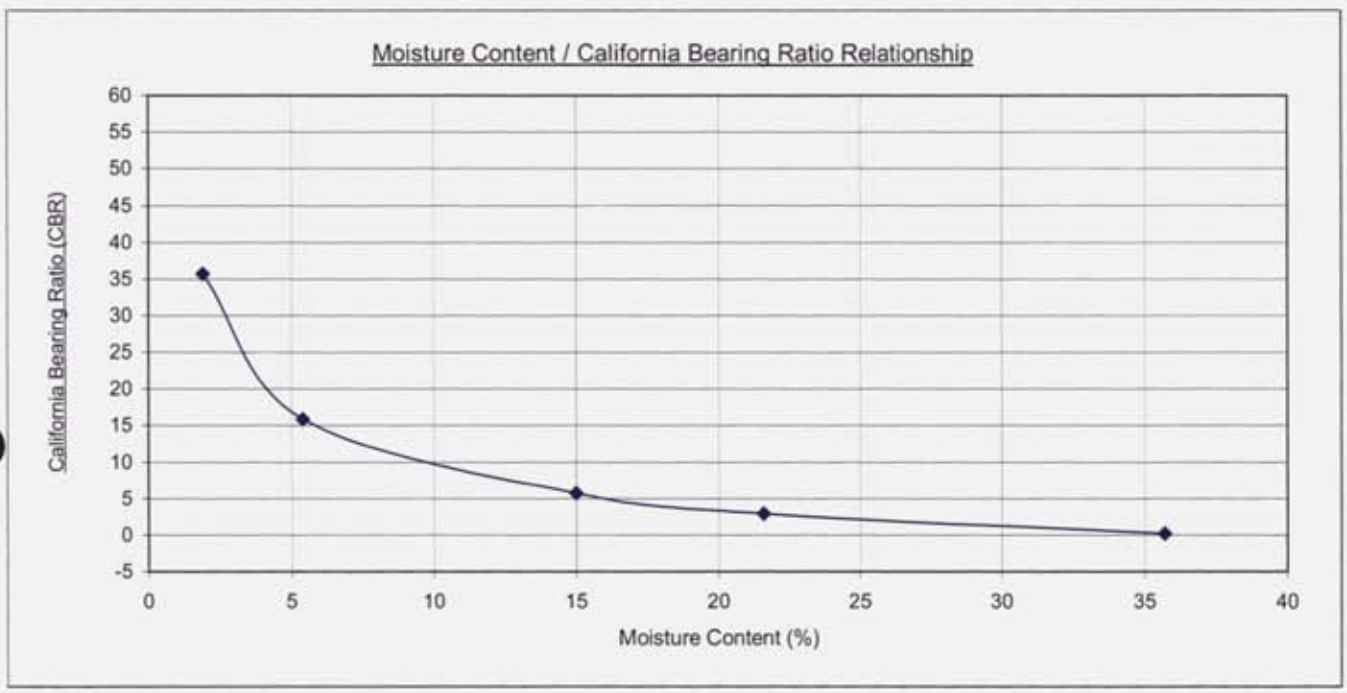
Paddy McGonagle
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 28
Sample No	PM29
Depth	3.00
Lab Ref:	16/156
Natural Moistue Content (%)	35.7

Point Number	1	2	3	4	5
Moisture Content (%):	1.9	5.4	15.0	21.6	35.7
CBR (%):	35.70	15.80	5.70	2.90	0.20



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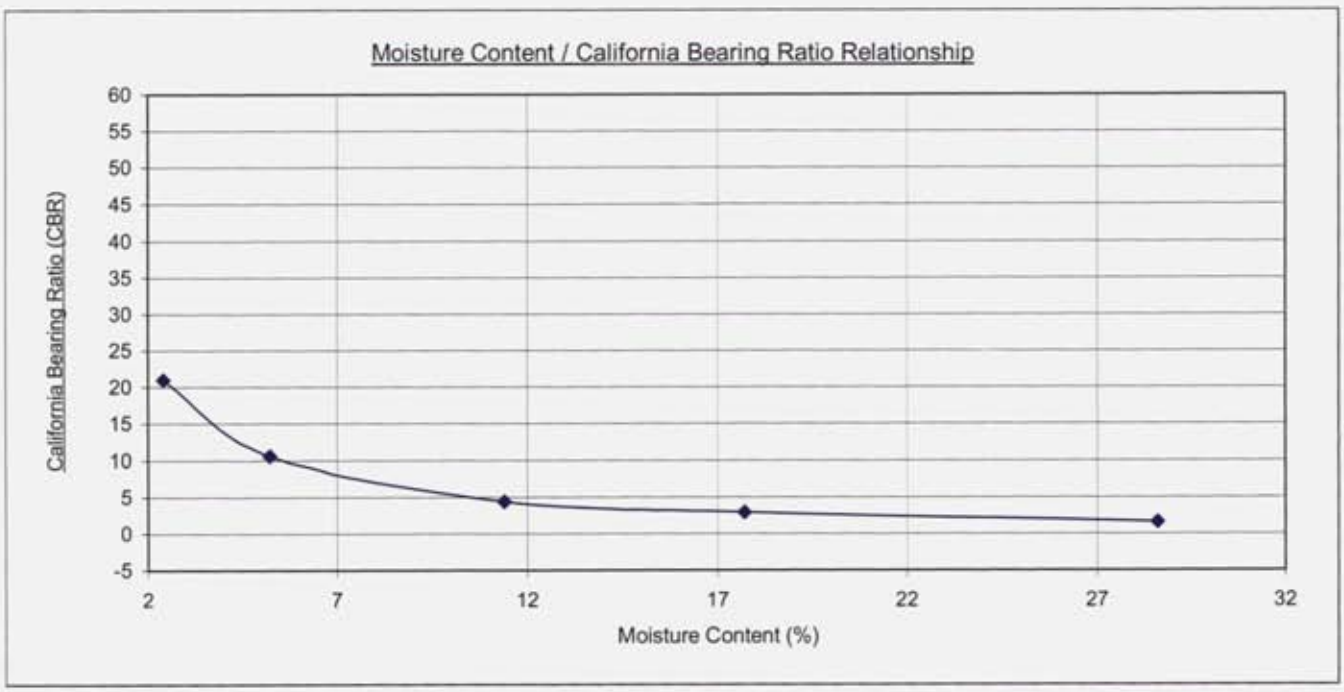
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 36
Sample No	PM31
Depth	2.50
Lab Ref:	16/158
Natural Moistue Content (%)	17.7

Point Number	1	2	3	4	5
Moisture Content (%):	2.4	5.2	11.4	17.7	28.6
CBR (%):	21.00	10.60	4.40	2.90	1.60



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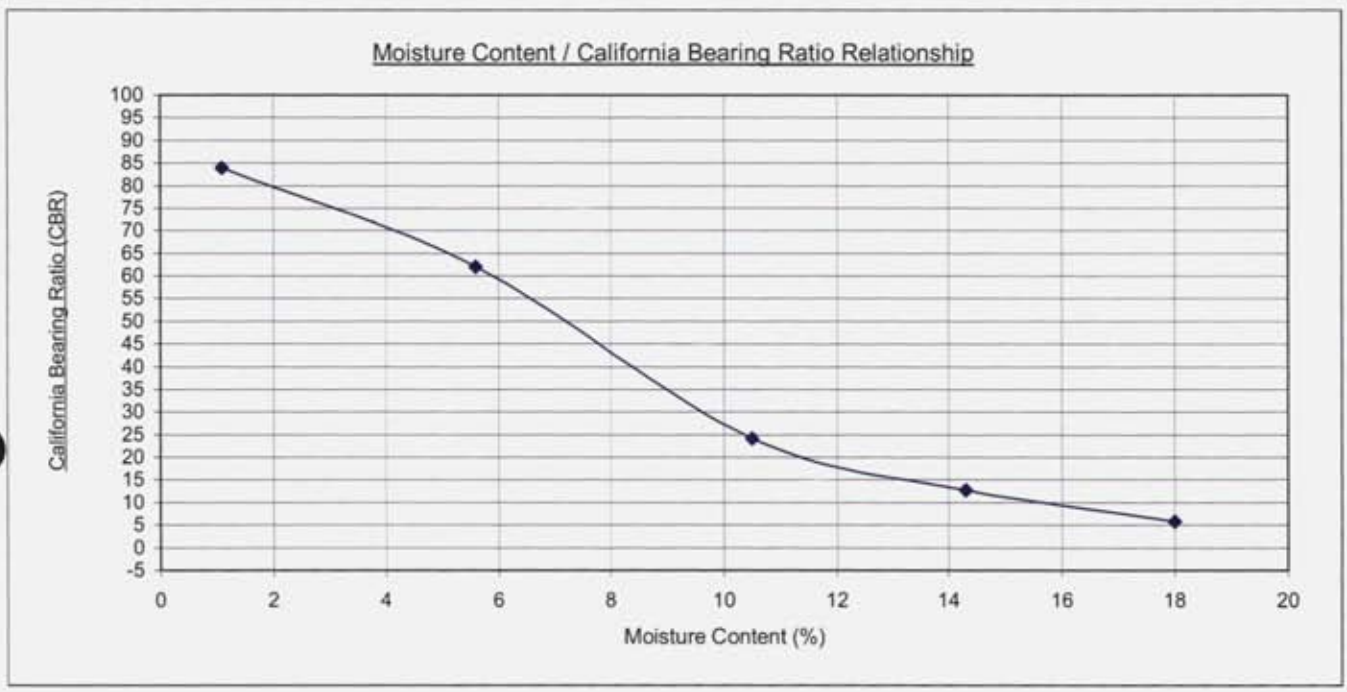
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 39
Sample No	PM38
Depth	1.00
Lab Ref:	16/165
Natural Moistue Content (%)	18

Point Number	1	2	3	4	5
Moisture Content (%):	1.1	5.6	10.5	14.3	18.0
CBR (%):	83.90	62.00	24.10	12.60	5.70



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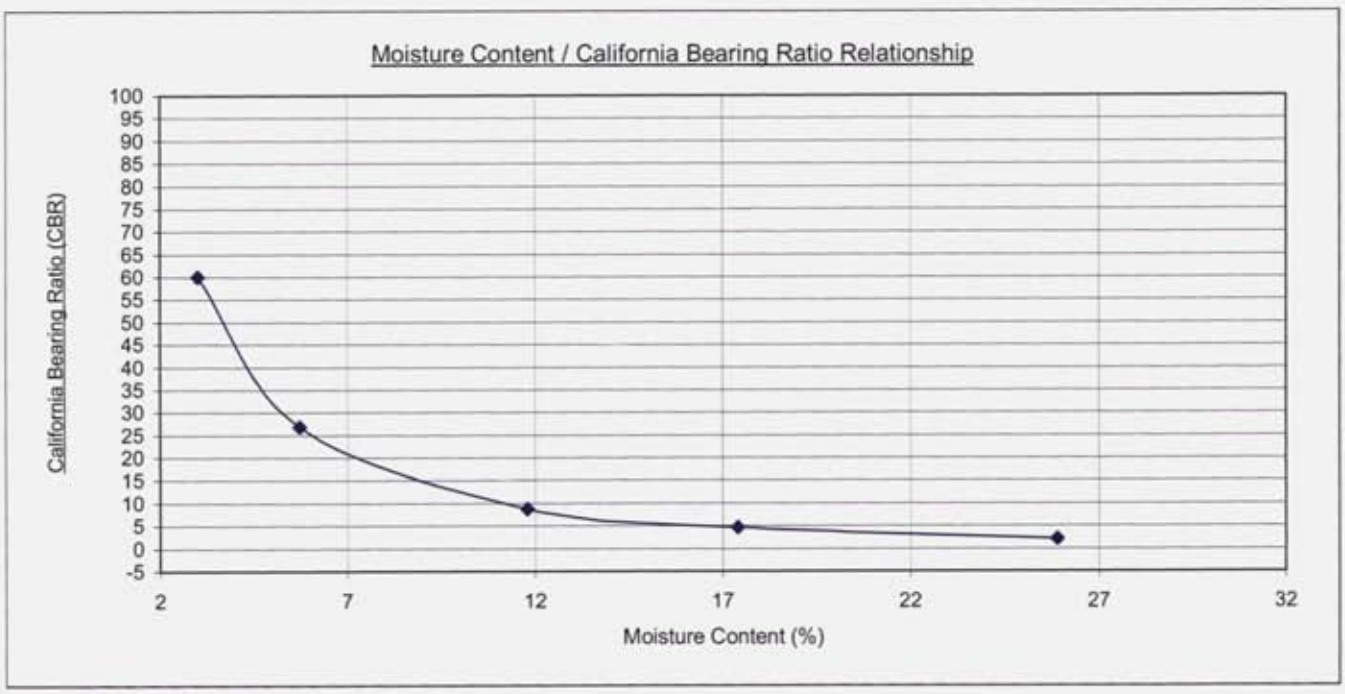
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 39A
Sample No	PM62
Depth	1.50
Lab Ref:	16/108
Natural Moistue Content (%)	17.4

Point Number	1	2	3	4	5
Moisture Content (%):	3.0	5.7	11.8	17.4	25.9
CBR (%):	60.00	26.80	8.70	4.60	2.10



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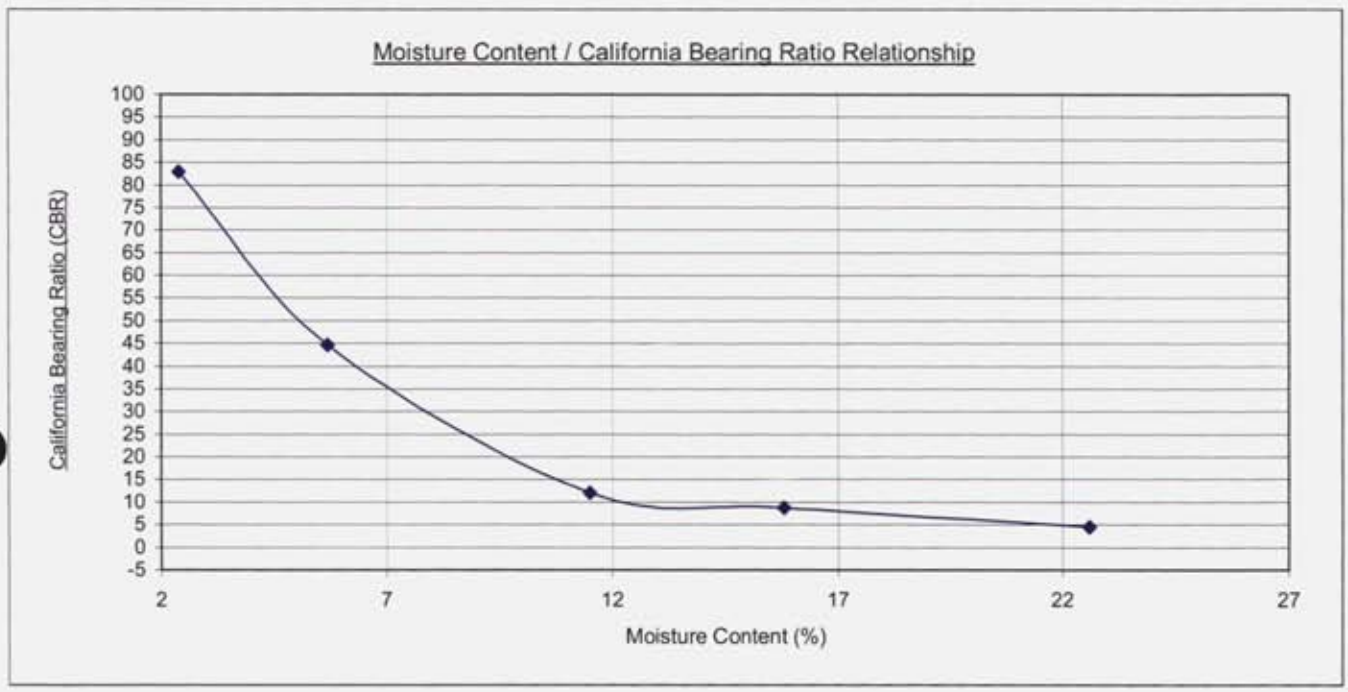
Site Investigations Ltd

CBR / Moisture Content relationship to BS 1377 : Part 4

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd, Carhugar The Grange, 12th Lock Road, Lucan, Co. Dublin Email:siltd@indigo.ie
Report Date	29th January 2016

Hole Id:	TP 41
Sample No	PM44
Depth	2.00
Lab Ref:	16/171
Natural Moistue Content (%)	11.5

Point Number	1	2	3	4	5
Moisture Content (%):	2.4	5.7	11.5	15.8	22.6
CBR (%):	82.90	44.60	11.90	8.70	4.40



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Site Investigations Ltd

SHEAR BOX TEST

Test Method: **BS 1377 : Part 7 : 1990 : Method 4**

Preparation procedure: **Remoulded with 2.5 kg rammer at natural moisture content.**

Description: **Dark grey slightly sandy slightly gravelly SILT/CLAY**

Weighings		**Stage 1**	**Stage 2**	**Stage 3**
Wet soil	gms	342.0	342.3	342.5
Dry soil	gms	152.2	152.3	152.2
Cutter	gms	156.6	156.5	156.6
Wet soil	gms	185.4	185.8	186.0
Dry soil	gms	152.2	152.3	152.2
Water	gms	33.3	33.6	33.7
Moisture Content (%)		21.9	22.0	22.1
Bulk Density (Mg/m3)		2.06	2.06	2.07
Dry density (Mg/m3)		1.691	1.7	1.692
Voids ratio e		0.5970	0.5958	0.5962
Degree of saturation (%)		99	99.8	100.3

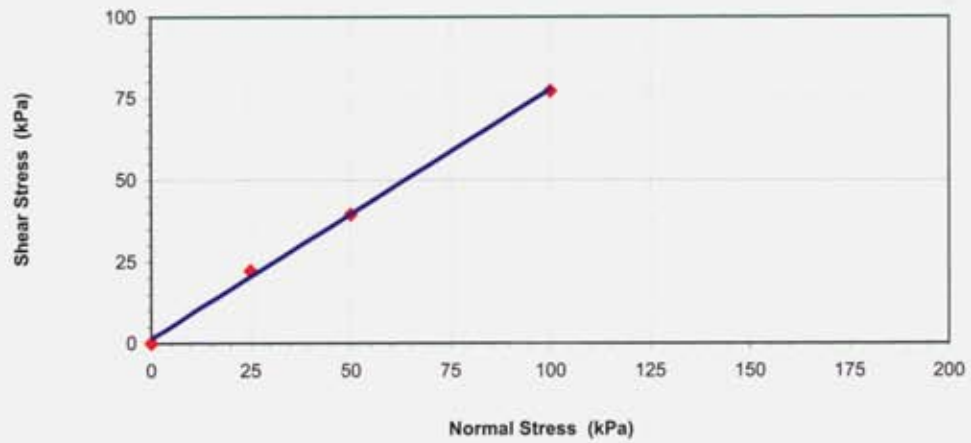
Nominal Dimensions		
Length	L1 mm	60
	L2 mm	60
Area	A mm2	3600
Height	H mm	25
Volume	V cm3	90
Particle density	Mg/m3	2.70

Final Details — **Peak**

	Stage 1	**Stage 2**	**Stage 3**
Normal Loads(kPa)	25	50	100
Shear stress (kPa)	22.2	39.4	77.2
Horizontal Displacement (mm)	3.365	3.731	3.671
Vertical displacement (mm)	0.002	0.143	0.160
Rate of displacement (mm/min)		0.0090	

			Peak
Date sampled	n/a		
Date received	20/01/2016	Cohesion c' (kPa)	1.33
Date tested	28/01/2016-31/01/2016	Friction angle phi'	37.4°

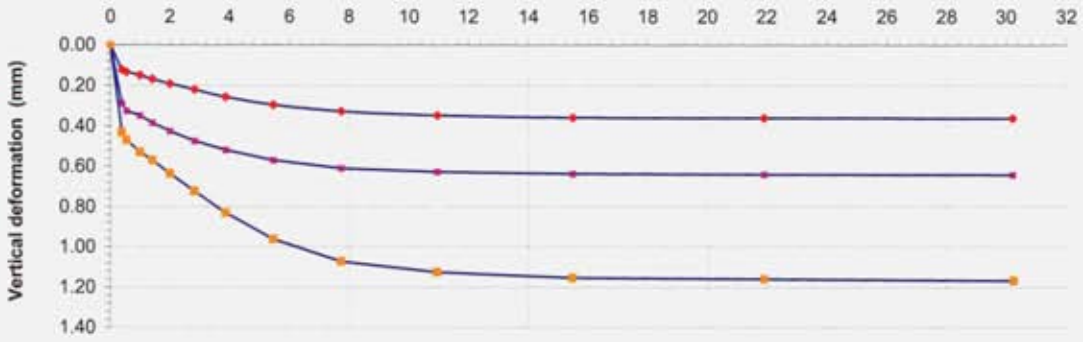
Mohr Envelope



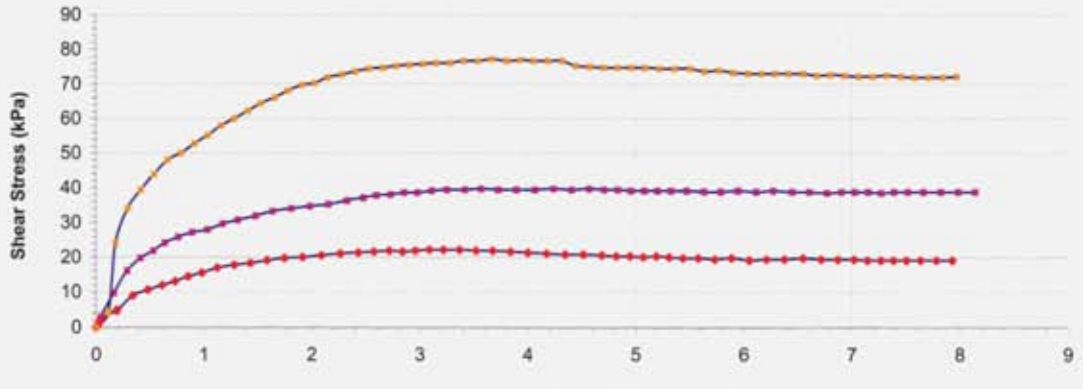
NM T L Ltd		Consolidated drained Shear Box Test in 60 mm square Box		Job No.	NMTL_1580
				BH/TP	TP20
	Project	South Apron and West Apron, Dublin Airport		Sample No.	PM10
Operator Tch	Checked	Nc	Approved Bc	Depth.	2.50m

CONSOLIDATION STAGE

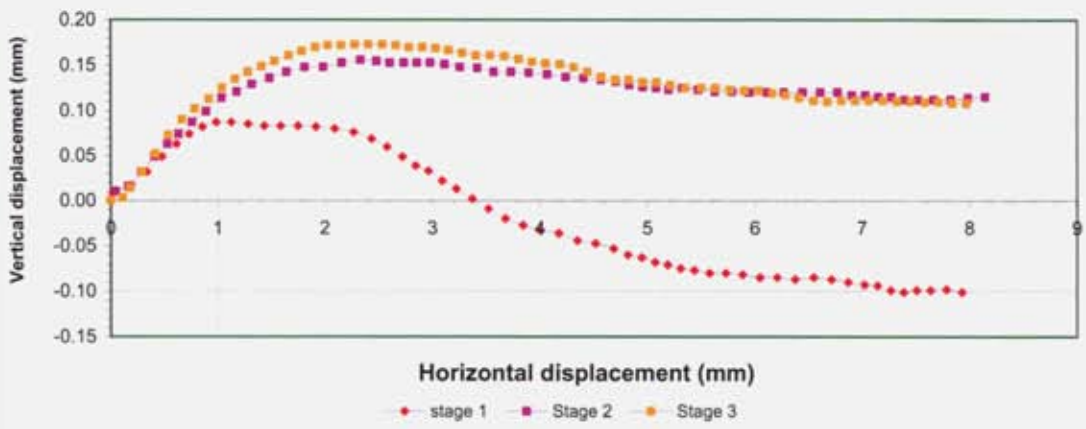
Square Root Time (mins)



SHEAR STAGE



Horizontal displacement (mm)



Horizontal displacement (mm)

stage 1 Stage 2 Stage 3

NM T L Ltd		Consolidated drained Shear Box Test in 60 mm square Box		Job No.	NMTL_1580
				BH/TP	TP20
	Project	South Apron and West Apron, Dublin Airport		Sample No.	PM10
Operator Tch	Checked	Nc	Approved Bc	Depth.	2.50m

Chemical Testing
In accordance with BS 1377: Part 3

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 15
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email siltd@indigo.ie
Report Date	29th January 2015

Hole Id	Depth (mBGL)	Sample No	Lab Ref	pH Value	Sulphate Content **Water Soluble** (SO_4) **g/L**	Sulphate Content **Water Soluble** (SO_4) **%**	Organic Content **%**	Chloride ion Content (soil:water ratio 2:1) **%**	% passing 2mm	Remarks
BH42	3.00	JM43	16/002				*			Soil Sample.
BH43	2.50	JM19	16/005	8.67	0.110	0.082			74.5	Soil Sample
BH45	2.50	TT43	16/196	8.11	0.101	0.078			76.9	Soil Sample
BH46	3.00	TT22	16/012	8.04	0.112	0.079			70.8	Soil Sample
BH47	2.00	JM31	16/015				*			Soil Sample
BH49	2.50	TT27	16/021	8.83	0.106	0.076			71.7	Soil Sample
BH50	2.00	TT02	16/023				*			Soil Sample.
BH51	2.00	JM53	16/199	8.47	0.101	0.082			81.4	Soil Sample.
BH56	1.00	TT15	16/029				*			Soil Sample
BH57	2.50	TT08	16/032				*			Soil Sample
BH58	3.00	JM50	16/036	8.78	0.112	0.084			74.8	Soil Sample
BH60	3.00	JM14	16/042	8.67	0.115	0.080			69.7	Soil Sample
BH61	2.50	TT39	16/202	7.99	0.103	0.082			79.3	Soil Sample
TP18	1.00	PM01	16/122	*	*	*				Soil Sample.
TP20	0.60	PM08	16/129	8.62	0.106	0.080			74.7	Soil Sample
TP23	2.10	PM17	16/141	8.77	0.110	0.078			70.7	Soil Sample
TP24	3.00	PM20	16/144	8.88	0.119	0.083			69.5	Soil Sample
TP26	2.50	PM22	16/149	8.66	0.099	0.038			38.7	Soil Sample
TP28	2.50	PM28	16/155	9.09	0.115	0.082			70.7	Soil Sample
TP37	2.00	PM34	16/161	*	*	*			*	Soil Sample.
TP39	2.50	PM39	16/166	8.84	0.106	0.079			73.9	Soil Sample
TP39B	0.70	PM64	16/110	8.85	0.112	0.083			74.5	Soil Sample

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Paddy McGonagle
Site Investigations Ltd.

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.com
Website: www.alcontrol.com

Site Investigations Ltd
The Grange
Carhugar
12th Lock Road
Lucan
Co. Dublin

Attention: Stephen Letch

CERTIFICATE OF ANALYSIS

Date:	27 January 2016
Customer:	D_SITEINV_NCS
Sample Delivery Group (SDG):	160121-141
Your Reference:	5249
Location:	Dublin Airport
Report No:	346621

We received 15 samples on Thursday January 21, 2016 and 15 of these samples were scheduled for analysis which was completed on Wednesday January 27, 2016. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

All chemical testing (unless subcontracted) is performed at ALcontrol Hawarden Laboratories.

Approved By:

Sonia McWhan
Operations Manager

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
12789180	BH42		3.00	16/01/2016
12789181	BH50		2.00	16/01/2016
12789183	BH57		2.50	16/01/2016
12789184	BH86		3.50	16/01/2016
12789397	TP18		1.00	16/01/2016
12789398	TP20		0.60	16/01/2016
12789399	TP23		1.00	16/01/2016
12789400	TP26		1.00	16/01/2016
12789405	TP40		2.50	16/01/2016
12789407	TP47		2.00	16/01/2016
12789408	TP56		1.00	16/01/2016
12789409	TP75		1.80	16/01/2016
12789410	TP76		1.70	16/01/2016
12789411	TP86		0.70	16/01/2016
12789412	TP86		1.50	16/01/2016

Only received samples which have had analysis scheduled will be shown on the following pages.

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

SOI

Results Legend

X Test

N No Determination Possible

Lab Sample No(s)	Customer Sample Reference	AGS Reference	Depth (m)	Container
12789180	BH42		3.00	1kg TUB
12789181	BH50		2.00	1kg TUB
12789183	BH57		2.50	1kg TUB
12789184	BH86		3.50	1kg TUB
12789397	TP18		1.00	250g Amber Jar (AL 60g VOC (ALE215) 1kg TUB
12789398	TP20		0.60	250g Amber Jar (AL 60g VOC (ALE215) 1kg TUB
12789399	TP23		1.00	250g Amber Jar (AL 60g VOC (ALE215) 1kg TUB
12789400	TP26		1.00	250g Amber Jar (AL 60g VOC (ALE215) 1kg TUB
12789405	TP40		2.50	250g Amber Jar (AL 60g VOC (ALE215) 1kg TUB
12789407	TP47		2.00	1kg TUB
12789408	TP56		1.00	1kg TUB
12789409	TP75		1.80	1kg TUB
12789410	TP76		1.70	1kg TUB
12789411	TP86		0.70	1kg TUB
12789412	TP86		1.50	1kg TUB

ANC at pH4 and ANC at pH 6	All	NDPs: 0 Tests: 5	X X X X X
Anions by Kone (w)	All	NDPs: 0 Tests: 5	X X X X X
CEN Readings	All	NDPs: 0 Tests: 5	X X X X X
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 5	X X X X X
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 5	X X X X X
Fluoride	All	NDPs: 0 Tests: 5	X X X X X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 5	X X X X X
Loss on Ignition in soils	All	NDPs: 0 Tests: 5	X X X X X
Mercury Dissolved	All	NDPs: 0 Tests: 5	X X X X X
Mineral Oil	All	NDPs: 0 Tests: 5	X X X X X
PAH Value of soil	All	NDPs: 0 Tests: 5	X X X X X
PCBs by GCMS	All	NDPs: 0 Tests: 5	X X X X X
pH	All	NDPs: 0 Tests: 5	X X X X X
Phenols by HPLC (W)	All	NDPs: 0 Tests: 5	X X X X X
Sar escription	All	NDPs: 0 Tests: 15	X X X X X X X X X X X X X X X

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

SOLID

Results Legend

X Test

N No Determination Possible

			12789180	12789181	12789183	12789184	12789397	12789398	12789399	12789400	12789405	12789407	12789408	12789409	12789410	12789411	12789412
Lab Sample No(s)																	
Customer Sample Reference			BH42	BH50	BH57	BH86	TP18	TP20	TP23	TP26	TP40	TP47	TP56	TP75	TP76	TP86	TP86
AGS Reference																	
Depth (m)			3.00	2.00	2.50	3.50	1.00	0.60	1.00	1.00	2.50	2.00	1.00	1.80	1.70	0.70	1.50
Container			1kg TUB	1kg TUB	1kg TUB	1kg TUB	250g Amber Jar (AL	60g VOC (ALE215)	1kg TUB	250g Amber Jar (AL	60g VOC (ALE215)	1kg TUB	250g Amber Jar (AL	60g VOC (ALE215)	1kg TUB	1kg TUB	1kg TUB
Total Dissolved Solids	All	NDPs: 0 Tests: 5				X		X		X		X					
Total Organic Carbon	All	NDPs: 0 Tests: 15	X	X	X	X	X		X		X		X		X	X	X

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Grain size	Inclusions	Inclusions 2
12789180	BH42	3.00	Dark Brown	Clay Loam	0.063 - 0.1 mm	Stones	None
12789181	BH50	2.00	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	Vegetation
12789183	BH57	2.50	Dark Brown	Sandy Clay Loam	0.1 - 2 mm	Vegetation	Stones
12789184	BH86	3.50	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None
12789397	TP18	1.00	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None
12789398	TP20	0.60	Dark Brown	Clay	<0.063 mm	Stones	None
12789399	TP23	1.00	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None
12789400	TP26	1.00	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None
12789405	TP40	2.50	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	N/A
12789407	TP47	2.00	Light Brown	Silt Loam	0.063 - 0.1 mm	Stones	None
12789408	TP56	1.00	Light Brown	Sandy Clay Loam	0.063 - 0.1 mm	Stones	None
12789409	TP75	1.80	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None
12789410	TP76	1.70	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None
12789411	TP86	0.70	Dark Brown	Clay	<0.063 mm	Stones	Vegetation
12789412	TP86	1.50	Dark Brown	Sandy Clay	0.1 - 2 mm	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+[i]	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	BH42	BH50	BH57	BH86	TP18	TP20
			Depth (m)	3.00	2.00	2.50	3.50	1.00	0.60
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	16/01/2016	16/01/2016	16/01/2016	16/01/2016	16/01/2016	16/01/2016
			Sample Time	-	-	-	-	-	-
			Date Received	21/01/2016	21/01/2016	21/01/2016	21/01/2016	21/01/2016	21/01/2016
			SDG Ref	160121-141	160121-141	160121-141	160121-141	160121-141	160121-141
			Lab Sample No.(s)	12789180	12789181	12789183	12789184	12789397	12789398
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		20	27	26	13	14	16
Loss on ignition	<0.7 %	TM018						3.76 M	2.75 M
Mineral oil >C10-C40	<1 mg/kg	TM061						196	21.4
Mineral Oil Surrogate % recovery**	%	TM061						99.3	97.1
Organic Carbon, Total	<0.2 %	TM132						0.743 M	0.461 M
Soil Organic Matter (SOM)	<0.35 %	TM132		1.02 #	2.76 #	4.55 #	0.462 #		
pH	1 pH Units	TM133						8.49 M	8.32 M
PCB congener 28	<3 µg/kg	TM168						<3 M	<3 M
PCB congener 52	<3 µg/kg	TM168						<3 M	<3 M
PCB congener 101	<3 µg/kg	TM168						<3 M	<3 M
PCB congener 118	<3 µg/kg	TM168						<3 M	<3 M
PCB congener 138	<3 µg/kg	TM168						<3 M	<3 M
PCB congener 153	<3 µg/kg	TM168						<3 M	<3 M
PCB congener 180	<3 µg/kg	TM168						<3 M	<3 M
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168						<21	<21
ANC @ pH 4	<0.03 mol/kg	TM182						1.89	2.4
ANC @ pH 6	<0.03 mol/kg	TM182						0.331	0.338
Polyaromatic hydrocarbons, Total 17	<10 mg/kg	TM213						<10	<10

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

Results Legend

#	17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+$@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	TP23	TP26	TP40	TP47	TP56	TP75
			Depth (m)	1.00	1.00	2.50	2.00	1.00	1.80
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid
			Date Sampled	16/01/2016	16/01/2016	16/01/2016	16/01/2016	16/01/2016	16/01/2016
			Sample Time	-	-	-	-	-	-
			Date Received	21/01/2016	21/01/2016	21/01/2016	21/01/2016	21/01/2016	21/01/2016
			SDG Ref	160121-141	160121-141	160121-141	160121-141	160121-141	160121-141
			Lab Sample No.(s)	12789399	12789400	12789405	12789407	12789408	12789409
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		15	13	14	16	13	13
Loss on ignition	<0.7 %	TM018		3.87 M	2.32 M	4.76 M			
Mineral oil >C10-C40	<1 mg/kg	TM061		16.2	8.3	80			
Mineral Oil Surrogate % recovery**	%	TM061		95.1	94	101			
Organic Carbon, Total	<0.2 %	TM132		0.737 M	0.398 M	1.62 M			
Soil Organic Matter (SOM)	<0.35 %	TM132					1.33 #	1.13 #	1.22 #
pH	1 pH Units	TM133		8.28 M	8.62 M	8.15 M			
PCB congener 28	<3 µg/kg	TM168		<3 M	<3 M	<3 M			
PCB congener 52	<3 µg/kg	TM168		<3 M	<3 M	<3 M			
PCB congener 101	<3 µg/kg	TM168		<3 M	<3 M	<3 M			
PCB congener 118	<3 µg/kg	TM168		<3 M	<3 M	<3 M			
PCB congener 138	<3 µg/kg	TM168		<3 M	<3 M	<3 M			
PCB congener 153	<3 µg/kg	TM168		<3 M	<3 M	<3 M			
PCB congener 180	<3 µg/kg	TM168		<3 M	<3 M	<3 M			
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168		<21	<21	<21			
ANC @ pH 4	<0.03 mol/kg	TM182		1.81	3.16	2.67			
ANC @ pH 6	<0.03 mol/kg	TM182		0.316	0.477	0.504			
Polyaromatic hydrocarbons, Total 17	<10 mg/kg	TM213		<10	<10	<10			

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted test.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1-5&+§@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample R	TP76	TP86	TP86			
			Depth (m)	1.70	0.70	1.50			
			Sample Type	Soil/Solid	Soil/Solid	Soil/Solid			
			Date Sampled	16/01/2016	16/01/2016	16/01/2016			
			Sample Time	-	-	-			
			Date Received	21/01/2016	21/01/2016	21/01/2016			
			SDG Ref	160121-141	160121-141	160121-141			
			Lab Sample No.(s)	12789410	12789411	12789412			
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		12	25	16			
Soil Organic Matter (SOM)	<0.35 %	TM132		1.54 #	1.5 #	0.895 #			

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

GRO[illegible] GC-FID (S)

Results Legend		Customer Sample R	TP18	TP20	TP23	TP26	TP40	
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.	Depth (m)	1.00	0.60	1.00	1.00	2.50	
diss.filt	Dissolved / filtered sample.	Sample Type	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	Soil/Solid	
tot.unfilt	Total / unfiltered sample.	Date Sampled	16/01/2016	16/01/2016	16/01/2016	16/01/2016	16/01/2016	
*	Subcontracted test.	Sample Time	-	-	-	-	-	
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery	Date Received	21/01/2016	21/01/2016	21/01/2016	21/01/2016	21/01/2016	
		SDG Ref	160121-141	160121-141	160121-141	160121-141	160121-141	
(F)	Trigger breach confirmed	Lab Sample No.(s)	12789397	12789398	12789399	12789400	12789405	
1-5&+$@	Sample deviation (see appendix)	AGS Reference						

Component	LOD/Units	Method						
Methyl tertiary butyl ether (MTBE)	<5 µg/kg	TM089	<5 #	<5 #	<5 #	<5 #	<5 #	
Benzene	<10 µg/kg	TM089	<10 M	<10 M	<10 M	<10 M	<10 M	
Toluene	<2 µg/kg	TM089	<2 M	<2 M	<2 M	<2 M	<2 M	
Ethylbenzene	<3 µg/kg	TM089	<3 M	<3 M	<3 M	<3 M	<3 M	
m,p-Xylene	<6 µg/kg	TM089	<6 M	<6 M	<6 M	<6 M	<6 M	
o-Xylene	<3 µg/kg	TM089	<3 M	<3 M	<3 M	<3 M	<3 M	
sum of detected mpo xyle[illegible] GC	<9 µg/kg	TM089	<9	<9	<9	<9	<9	
sum[illegible]etected BTEX by GC	<24 µg/kg	TM089	<24	<24	<24	<24	<24	

ALcontrol Laboratories

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CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Dublin Airport
Mass Sample taken (kg)	0.107	**Natural Moisture Content (%)**	19.2
Mass of dry sample (kg)	0.175	**Dry Matter Content (%)**	83.9
Particle Size <4mm	>95%		

Case	
SDG	160121-141
Lab Sample Number(s)	12789397
Sampled Date	16-Jan-2016
Customer Sample Ref.	TP18
Depth (m)	1.00

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	0.743	3	5	6
Loss on Ignition (%)	3.76	-	-	[redacted]
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	196	500	-	-
PAH Sum of 17 (mg/kg)	<10	100	-	-
pH (pH Units)	8.49	-	<6	-
ANC to pH 6 (mol/kg)	0.331	-	-	-
ANC to pH 4 (mol/kg)	1.89	-	-	-

Eluate Analysis	**C_2** Concⁿ in 10:1 eluate (mg/l)		**A_2** 10:1 concⁿ leached (mg/kg)		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.000566	<0.00012	0.00566	<0.0012	0.5	2	25
Barium	0.0188	<0.00003	0.188	<0.0003	20	100	300
Cadmium	<0.0001	<0.0001	<0.001	<0.001	0.04	1	5
Chromium	0.00158	<0.00022	0.0158	<0.0022	0.5	10	70
Copper	0.00263	<0.00085	0.0263	<0.0085	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00694	<0.00024	0.0694	<0.0024	0.5	10	30
Nickel	0.00128	<0.00015	0.0128	<0.0015	0.4	10	40
Lead	0.00108	<0.00002	0.0108	<0.0002	0.5	10	50
Antimony	0.0017	<0.00016	0.017	<0.0016	0.06	0.7	[redacted]
Selenium	0.00116	<0.00039	0.0116	<0.0039	0.1	0.5	7
Zinc	0.00183	<0.00041	0.0183	<0.0041	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	87.5	<5	875	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	3.88	<3	38.8	<30	500	800	1000

Leach Test Information

Date Prepared	22-Jan-2016
pH (pH Units)	8.05
Conductivity (µS/cm)	112.00
Temperature (°C)	17.50
Volume Leachant (Litres)	0.883

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
27/01/2016 14:22:25

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CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Dublin Airport
Mass Sample taken (kg)	0.106	**Natural Moisture Content (%)**	18.1
Mass of dry sample (kg)	0.175	**Dry Matter Content (%)**	84.7
Particle Size <4mm	>95%		

Case	
SDG	160121-141
Lab Sample Number(s)	12789398
Sampled Date	16-Jan-2016
Customer Sample Ref.	TP20
Depth (m)	0.60

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	0.461	3	5	6
Loss on Ignition (%)	2.75	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	21.4	500	-	-
PAH Sum of 17 (mg/kg)	<10	100	-	-
pH (pH Units)	8.32	-	<6	-
ANC to pH 6 (mol/kg)	0.338	-	-	-
ANC to pH 4 (mol/kg)	2.4	-	-	-

Eluate Analysis	**C_2** Conc^n in 10:1 eluate (mg/l)		**A_2** 10:1 conc^n leached (mg/kg)		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.000681	<0.00012	0.00681	<0.0012	0.5	2	25
Barium	0.0181	<0.00003	0.181	<0.0003	20	100	300
Cadmium	<0.0001	<0.0001	<0.001	<0.001	0.04	1	5
Chromium	0.00145	<0.00022	0.0145	<0.0022	0.5	10	70
Copper	0.00156	<0.00085	0.0156	<0.0085	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00991	<0.00024	0.0991	<0.0024	0.5	10	30
Nickel	0.000874	<0.00015	0.00874	<0.0015	0.4	10	40
Lead	0.000052	<0.00002	0.00052	<0.0002	0.5	10	50
Antimony	0.00137	<0.00016	0.0137	<0.0016	0.06	0.7	5
Selenium	<0.00039	<0.00039	<0.0039	<0.0039	0.1	0.5	7
Zinc	<0.00041	<0.00041	<0.0041	<0.0041	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	19.8	<2	198	<20	1000	20000	50000
Total Dissolved Solids	107	<5	1070	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	22-Jan-2016
pH (pH Units)	7.38
Conductivity (µS/cm)	140.00
Temperature (°C)	17.60
Volume of Leachant (Litres)	0.884

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
27/01/2016 14:22:25

14:22:15 27/01/2016

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CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Dublin Airport
Mass Sample taken (kg)	0.108	**Natural Moisture Content (%)**	19.5
Mass of dry sample (kg)	0.175	**Dry Matter Content (%)**	83.7
Particle Size <4mm	>95%		

Case	
SDG	160121-141
Lab Sample Number(s)	12789399
Sampled Date	16-Jan-2016
Customer Sample Ref.	TP23
Depth (m)	1.00

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	0.737	3	5	6
Loss on Ignition (%)	3.87	-	-	[redacted]
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	16.2	500	-	-
PAH Sum of 17 (mg/kg)	<10	100	-	-
pH (pH Units)	8.28	-	<6	-
ANC to pH 6 (mol/kg)	0.316	-	-	-
ANC to pH 4 (mol/kg)	1.81	-	-	-

Eluate Analysis	**C_2 Conc^n in 10:1 eluate (mg/l)**		**A_2 10:1 conc^n leached (mg/kg)**		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.000814	<0.00012	0.00814	<0.0012	0.5	2	25
Barium	0.0173	<0.00003	0.173	<0.0003	20	100	300
Cadmium	<0.0001	<0.0001	<0.001	<0.001	0.04	1	5
Chromium	0.00167	<0.00022	0.0167	<0.0022	0.5	10	70
Copper	0.00338	<0.00085	0.0338	<0.0085	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.0067	<0.00024	0.067	<0.0024	0.5	10	30
Nickel	0.00132	<0.00015	0.0132	<0.0015	0.4	10	40
Lead	0.000089	<0.00002	0.00089	<0.0002	0.5	10	50
Antimony	0.00262	<0.00016	0.0262	<0.0016	0.06	0.7	[redacted]
Selenium	0.00347	<0.00039	0.0347	<0.0039	0.1	0.5	7
Zinc	<0.00041	<0.00041	<0.0041	<0.0041	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	<2	<2	<20	<20	1000	20000	50000
Total Dissolved Solids	88.2	<5	882	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	4.28	<3	42.8	<30	500	800	1000

Leach Test Information

Date Prepared	22-Jan-2016
pH (pH Units)	7.86
Conductivity (µS/cm)	112.00
Temperature (°C)	17.30
Volume Leachant (Litres)	0.882

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
27/01/2016 14:22:25
14:22:15 27/01/2016

ALcontrol Laboratories

Validated

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Dublin Airport
Mass Sample taken (kg)	0.107	**Natural Moisture Content (%)**	19.8
Mass of dry sample (kg)	0.175	**Dry Matter Content (%)**	83.5
Particle Size <4mm	>95%		

Case	
SDG	160121-141
Lab Sample Number(s)	12789400
Sampled Date	16-Jan-2016
Customer Sample Ref.	TP26
Depth (m)	1.00

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	**Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon (%)	0.398	3	5	6
Loss on Ignition (%)	2.32	-	-	10
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	8.3	500	-	-
PAH Sum of 17 (mg/kg)	<10	100	-	-
pH (pH Units)	8.62	-	<6	-
ANC to pH 6 (mol/kg)	0.477	-	-	-
ANC to pH 4 (mol/kg)	3.16	-	-	-

Eluate Analysis	**C_2** Conc^n in 10:1 eluate (mg/l)		**A_2** 10:1 conc^n leached (mg/kg)		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	**Limit of Detection**	**Result**	**Limit of Detection**			
Arsenic	0.00119	<0.00012	0.0119	<0.0012	0.5	2	25
Barium	0.0213	<0.00003	0.213	<0.0003	20	100	300
Cadmium	<0.0001	<0.0001	<0.001	<0.001	0.04	1	5
Chromium	0.00138	<0.00022	0.0138	<0.0022	0.5	10	70
Copper	0.00105	<0.00085	0.0105	<0.0085	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00721	<0.00024	0.0721	<0.0024	0.5	10	30
Nickel	0.000857	<0.00015	0.00857	<0.0015	0.4	10	40
Lead	0.000235	<0.00002	0.00235	<0.0002	0.5	10	50
Antimony	0.00189	<0.00016	0.0189	<0.0016	0.06	0.7	5
Selenium	0.000669	<0.00039	0.00669	<0.0039	0.1	0.5	7
Zinc	<0.00041	<0.00041	<0.0041	<0.0041	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	12.3	<2	123	<20	1000	20000	50000
Total Dissolved Solids	97	<5	970	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	22-Jan-2016
pH (pH Units)	7.58
Conductivity (µS/cm)	128.00
Temperature (°C)	19.10
Volume of Leachant (Litres)	0.882

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates
27/01/2016 14:22:25
14:22:15 27/01/2016

ALcontrol Laboratories

Validated

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		**Site Location**	Dublin Airport
Mass Sample taken (kg)	0.108	**Natural Moisture Content (%)**	19.2
Mass of dry sample (kg)	0.175	**Dry Matter Content (%)**	83.9
Particle Size <4mm	>95%		

Case	
SDG	160121-141
Lab Sample Number(s)	12789405
Sampled Date	16-Jan-2016
Customer Sample Ref.	TP40
Depth (m)	2.50

Solid Waste Analysis	**Result**	**Landfill Waste Acceptance Criteria Limits**		
		Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	1.62	3	5	6
Loss on Ignition (%)	4.76	-	-	[redacted]
Sum of BTEX (mg/kg)	<0.024	6	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	80	500	-	-
PAH Sum of 17 (mg/kg)	<10	100	-	-
pH (pH Units)	8.15	-	<6	-
ANC to pH 6 (mol/kg)	0.504	-	-	-
ANC to pH 4 (mol/kg)	2.67	-	-	-

Eluate Analysis	**C_2 Concⁿ in 10:1 eluate (mg/l)**		**A_2 10:1 concⁿ leached (mg/kg)**		**Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg**		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.00188	<0.00012	0.0188	<0.0012	0.5	2	25
Barium	0.0355	<0.00003	0.355	<0.0003	20	100	300
Cadmium	<0.0001	<0.0001	<0.001	<0.001	0.04	1	5
Chromium	0.00215	<0.00022	0.0215	<0.0022	0.5	10	70
Copper	0.00675	<0.00085	0.0675	<0.0085	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.0189	<0.00024	0.189	<0.0024	0.5	10	30
Nickel	0.00383	<0.00015	0.0383	<0.0015	0.4	10	40
Lead	0.000149	<0.00002	0.00149	<0.0002	0.5	10	50
Antimony	0.00624	<0.00016	0.0624	<0.0016	0.06	0.7	[redacted]
Selenium	0.0019	<0.00039	0.019	<0.0039	0.1	0.5	7
Zinc	0.00135	<0.00041	0.0135	<0.0041	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	19.9	<2	199	<20	1000	20000	50000
Total Dissolved Solids	136	<5	1360	<50	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	6.25	<3	62.5	<30	500	800	1000

Leach Test Information

Date Prepared	22-Jan-2016
pH (pH Units)	8.05
Conductivity (µS/cm)	0.02
Temperature (°C)	19.10
Volume Leachant (Litres)	0.883

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALcontrol cannot be held responsible for any discrepancies with current legislation
Mcerts Certification does not apply to leachates

27/01/2016 14:22:25

14:22:15 27/01/2016

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

Table of Results - Appendix

Method No	Reference	Description	Wet/Dry Sample [1]	Surrogate Corrected
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material		
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step		
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition		
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)		
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)		
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water		
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser		
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water		
TM132	In - house Method	ELTRA CS800 Operators Guide		
TM133	BS 1377: Part 3 1990;BS 6068-2.5	Determination of pH in Soil and Water using the GLpH pH Meter		
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS		
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils		
TM182	CEN/TC 292 - WI 292046-chacterization of waste-leaching Behaviour Tests- Acid and Base Neutralization Capacity Test	Determination of Acid Neutralisation Capacity (ANC) Using Autotitration in Soils		
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry		
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers		
TM213	In-house Method	Rapid Determination of PAHs by GC-FID		
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC		

[1] Applies to Solid samples only. DRY indicates samples have been dried at 35°C. NA = not applicable.

CERTIFICATE OF ANALYSIS

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	12789180	12789181	12789183	12789184	12789397	12789398	12789399	12789400	12789405	12789407
Customer Sample Ref.	BH42	BH50	BH57	BH88	TP18	TP20	TP23	TP26	TP40	TP47
AGS Ref.										
Depth	3.00	2.00	2.50	3.50	1.00	0.60	1.00	1.00	2.50	2.00
Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID
ANC at pH4 and ANC at pH 6					25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	
Anions by Kone (w)					25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	
CEN 10:1 Leachate (1 Stage)					22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	
CEN Readings					25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	
Dissolved Metals by ICP-MS					26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	
Dissolved Organic/Inorganic Carbon					26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	
Fluoride					26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	
GRO by GC-FID (S)					25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	
Loss on Ignition in soils					25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	
Mercury Dissolved					26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	
Mineral Oil					26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	27-Jan-2016	
PAH Value of soil					26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	
PCBs by GCMS					26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	
pH					25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	
Phenols by HPLC (W)					27-Jan-2016	27-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	
Sample description	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016
Total Dissolved Solids					25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	25-Jan-2016	
Total Organic Carbon	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016

Lab Sample No(s)	12789408	12789409	12789410	12789411	12789412
Customer Sample Ref.	TP56	TP75	TP76	TP98	TP86
AGS Ref.					
Depth	1.00	1.80	1.70	0.70	1.50
Type	SOLID	SOLID	SOLID	SOLID	SOLID
Sample description	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016	22-Jan-2016
Total Organic Carbon	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016	26-Jan-2016

SDG:	160121-141	**Location:**	Dublin Airport	**Order Number:**	
Job:	D_SITEINV_NCS-60	**Customer:**	Site Investigations Ltd	**Report Number:**	346621
Client Reference:	5249	**Attention:**	Stephen Letch	**Superseded Report:**	

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICS and SVOC TICS.

2. Samples will be run in duplicate upon request, but an additional charge may be incurred.

3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.

4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track [redacted] will be utilised.

6. When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible. The quantity of asbestos present is not determined unless specifically requested.

7. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

8. If appropriate preserved bottles are not received preservation will take place on receipt . However, the integrity of the data may be compromised.

9. NDP -No determination possible due to insufficient /unsuitable sample.

10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals -total metals must be requested separately.

11. Results relate only to the items tested.

12. [redacted] for wet tests reported on a dry weight basis are not corrected for moisture conte[redacted]

13. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%, they are generally wider for volatiles analysis, 50-150%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment . Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect .

14. **Product analyses** -Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.

15. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).

16. Total of 5 speciated phenols by HPLC includes Phenol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 15).

17. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the meth[redacted]ection limit to be raised.

19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.

22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill /made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

23. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5 -C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

Sample Deviations

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Holding time exceeded before sample received
5	Samples exceeded holding time before presevation was performed
§	Sampled on date not provided
*	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to sampled on date
&	Sample Holding Time exceeded - Late arrival of instructions.

Asbestos

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using Alcontrol Laboratories (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than : - Trace - Where only one or two asbestos fibres were identified.

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

Test Amendment Notice

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd., Carhugar the Grange, 12th Lock Road, Lucan, Co. Dublin. Tel: (01) 6108768 Email: siltd@indigo.ie
Date	1st February 2016

Hole Id	Depth (mBGL)	Sample No	Sample Type	Tests Scheduled	Remarks / Comments
TP18	2.50	PM03	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
TP19	2.50	PM07	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
TP23	3.00	PM18	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
TP25	2.50	SL23	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
TP28	1.80	PM26	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
TP37	3.50	PM35	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
TP40	2.50	PM42	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
BH44	5.00	JM26	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
BH45	5.50	TT45	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
BH51	2.00	JM53	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
BH56	5.50	TT18	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
BH59	5.50	JM05	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample
BH61	2.50	TT39	B	Oedometer (Quick)	Not suitable for testing on a disturbed sample

TP18	1.00	PM01	B	SO3&pH/Shearbox (Quick)	Awaitng results from Carlow Lab
TP19	2.00	PM05	B	Moisture Content/Shearbox (Quick)/5pt CBR	Awaitng results from Carlow Lab
TP21	2.50	PM13	B	Shearbox (Drained)/5pt CBR	Awaitng results from Carlow Lab. Single point CBR was carried out as there is insufficient material remaining to do a 5 pt CBR
TP22	1.50	SL18	B	Moisture Content/Shearbox (Quick)	Awaitng results from Carlow Lab
TP23	1.00	PM16	B	Shearbox (Quick)/5pt CBR	Awaitng results from Carlow Lab
TP24	1.50	PM19	B	Moisture Content/Shearbox (Quick)	Awaitng results from Carlow Lab

Printed 01-02-16

Site Investigations Ltd

Test Amendment Notice

Client	Dublin Airport Authority
Site	South Apron
S.I. File No	5249 / 16
Test Lab	Site Investigations Ltd., Carhugar the Grange, 12th Lock Road, Lucan, Co. Dublin. Tel: (01) 6108768 Email: siltd@indigo.ie
Date	1st February 2016

Hole Id	Depth (mBGL)	Sample No	Sample Type	Tests Scheduled	Remarks / Comments
TP25	1.50	SL22	B	5pt CBR	Single point CBR was carried out as there is insufficient material remaining to do a 5 pt CBR. Awaitng Shearbox results from Carlow Lab
TP27	2.50	PM25	B	5pt CBR	Insufficient sample remaining to carry out tests scheduled. Single point CBR tested in Carlow Lab
TP35	3.50	PM30	B	5pt CBR	Insufficient sample remaining to carry out tests scheduled. Single point CBR tested in Carlow Lab
TP37	2.00	PM34	B	5pt CBR	Insufficient sample remaining to carry out tests scheduled. Single point CBR tested in Carlow Lab
TP38	3.00	PM36	B	Moisture Content/Shearbox (Quick)/Att. Limits	Awaitng results from Carlow Lab
TP39B	1.20	PM65	B	5pt CBR	Insufficient sample remaining to carry out tests scheduled. Single point CBR tested in Carlow Lab
TP40	2.50	PM42	B	Shearbox (Drained)	Awaitng results from Carlow Lab
TP41	2.00	PM44	B	Att. Limits/Shearbox (Drained)/5pt CBR	Awaitng results from Carlow Lab
BH42	3.00	JM43	B	PSD/Shearbox (Quick)	Awaitng results from Carlow Lab
BH45	1.00	TT42	B	WAC Analysis	Awaiting results from Alcontrol Laboratories
BH48	3.00	JM38	B	Shearbox (Drained)	Awaitng results from Carlow Lab
BH60	2.00	JM13	B	Shearbox (Quick)	Awaitng results from Carlow Lab

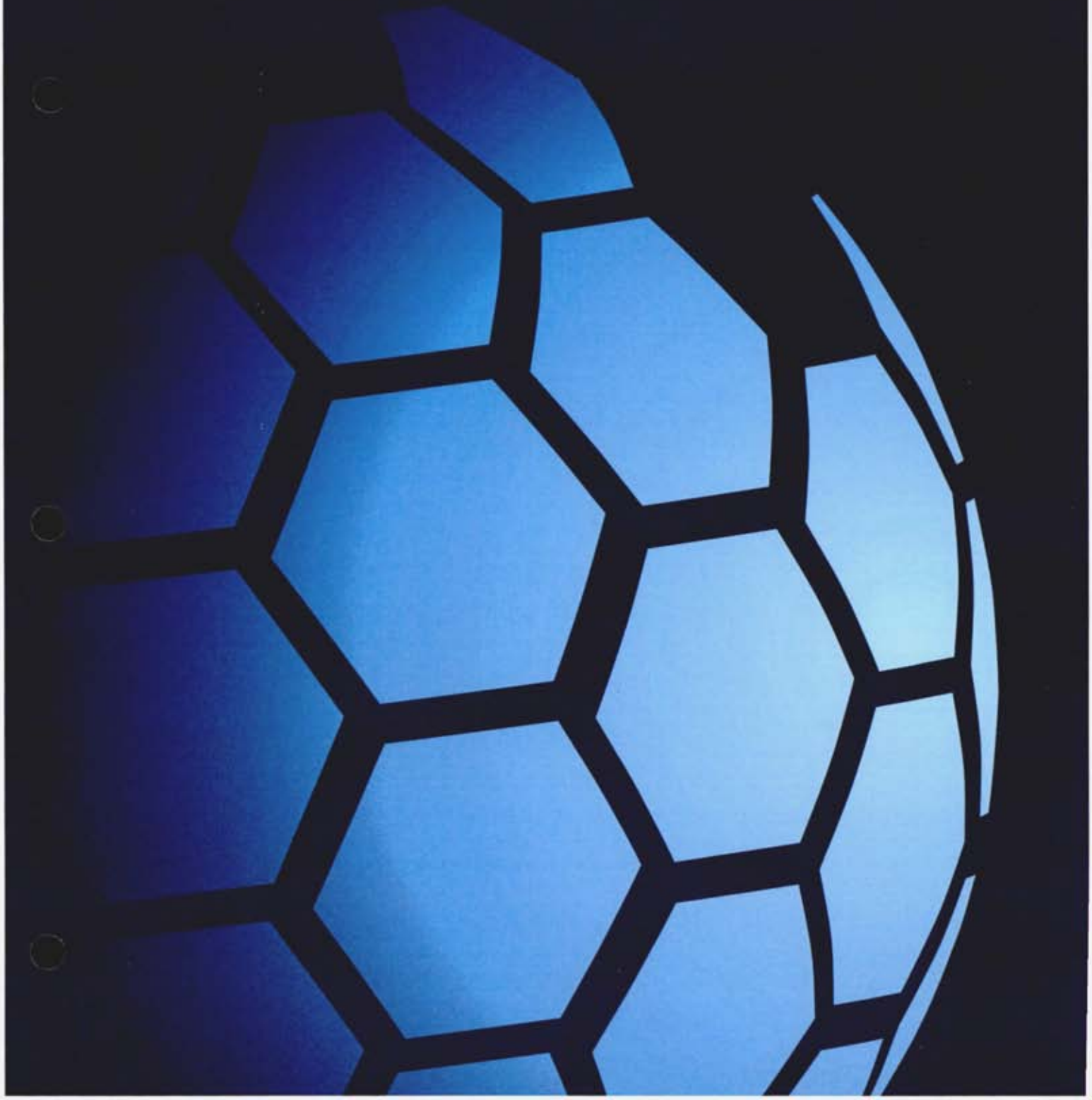
Printed 01-02-16

Site Investigations Ltd

CAUSEWAY GEOTECH

APPENDIX G

ENVIRONMENTAL LABORATORY TEST RESULTS



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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
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Email: info@chemtest.co.uk

UKAS TESTING
2183

Final Report

Report No.:	18-23385-1
Initial Date of Issue:	14-Aug-2018
Client	Causeway Geotech Ltd
Client Address:	8 Drumahiskey Road Balnamore Ballymoney County Antrim BT53 7QL
Contact(s):	Carin Cornwall Colm Hurley Darren O'Mahony Gabriella Horan John Cameron Lucy Newland Matthew Gilbert Neil Haggan Paul Dunlop Paul McNamara Sean Ross Stephen Franey Stephen Watson Stuart Abraham
Project	18-0577 - DAA Surveys

Quotation No.:		**Date Received:**	06-Aug-2018
Order No.:		**Date Instructed:**	07-Aug-2018
No. of Samples:	38		
Turnaround (Wkdays):	4	**Results Due:**	10-Aug-2018
Date Approved:	14-Aug-2018		

Approved By:

Details: Martin Dyer, Laboratory Manager

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Results - Leachate

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666482	666485	666488	666490	666493	666495	666500	666502	666510
Order No.:					Client Location ID.:	TP17	TP24	TP25	TP28	TP29	TP03	TP30	TP02	TP11
					Client Sample Ref.:	ES2	ES1	ES2	ES2	ES1	ES1	ES2	ES2	ES2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.5	0.5	1.0	1.0	0.5	0.5	1.0	1.5	1.5
					Date Sampled:	03-Aug-2018	30-Jul-2018	30-Jul-2018	31-Jul-2018	01-Aug-2018	01-Aug-2018	31-Jul-2018	31-Jul-2018	02-Aug-2018
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Ammonium	U	1220	mg/l	0.050		0.092	< 0.050	0.19	0.095	0.18	0.21	0.19	0.13	0.13
Ammonium	N	1220	mg/kg	0.10		0.92	0.32	1.9	0.95	1.8	2.1	1.9	1.3	1.3

Chemtest
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Results - Leachate

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					**Chemtest Job No.:**	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					**Chemtest Sample ID.:**	666511	666514	666516	666517	666520	666521	666525	666527	666529
Order No.:					Client Location ID.:	TP09	TP19	TP04	TP21	TP22	TP06	TP27	TP14	TP18
					Client Sample Ref.:	ES1	ES2	ES2	ES1	ES2	ES1	ES1	ES1	ES1
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.5	1.5	1.5	0.5	1.0	0.5	0.5	0.5	0.5
					Date Sampled:	02-Aug-2018	02-Aug-2018	01-Aug-2018	31-Jul-2018	31-Jul-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	02-Aug-2018
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Ammonium	U	1220	mg/l	0.050		0.18	0.16	0.14	0.13	0.25	0.14	0.41	0.30	0.15
Ammonium	N	1220	mg/kg	0.10		1.8	1.6	1.4	1.3	2.5	1.4	4.1	3.0	1.5

Chemtest
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Results - Leachate

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd			**Chemtest Job No.:**		18-23385
Quotation No.:			**Chemtest Sample ID.:**		666532
Order No.:			Client Location ID.:		TP08
			Client Sample Ref.:		ES2
			Sample Type:		SOIL
			Top Depth (m):		1.5
			Date Sampled:		02-Aug-2018
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Ammonium	U	1220	mg/l	0.050	0.24
Ammonium	N	1220	mg/kg	0.10	2.4

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666482	666483	666485	666486	666487	666488	666489	666490	666493
Order No.:					Client Location ID.:	TP17	TP17	TP24	TP24	TP25	TP25	TP28	TP28	TP29
					Client Sample Ref.:	ES2	ES1	ES1	ES2	ES1	ES2	ES1	ES2	ES1
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.5	0.5	0.5	1.0	0.5	1.0	0.5	1.0	0.5
					Date Sampled:	03-Aug-2018	03-Aug-2018	30-Jul-2018	30-Jul-2018	30-Jul-2018	30-Jul-2018	31-Jul-2018	31-Jul-2018	01-Aug-2018
					Asbestos Lab:	COVENTRY		COVENTRY			COVENTRY		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A		-		-			-		-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected		No Asbestos Detected			No Asbestos Detected		No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020		11	11	11	7.9	6.6	9.0	11	8.7	17
Dry Matter	N		%	N/A			89		92	93		89		
pH	U	2010		N/A		8.4		8.1			8.4		8.4	8.1
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		< 0.40		< 0.40			< 0.40		< 0.40	0.70
Sulphur (Elemental)	U	2180	mg/kg	1.0		< 1.0		< 1.0			< 1.0		< 1.0	1.5
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50		< 0.50			< 0.50		< 0.50	< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		9.1		1.2			9.4		8.8	9.8
Sulphate (Total)	U	2430	%	0.010		0.048		0.021			0.044		0.14	0.13
Arsenic	U	2450	mg/kg	1.0		27		22			28		35	57
Barium	U	2450	mg/kg	10		73		190			96		200	430
Cadmium	U	2450	mg/kg	0.10		1.9		3.7			2.0		1.8	6.0
Chromium	U	2450	mg/kg	1.0		19		31			20		14	26
Molybdenum	U	2450	mg/kg	2.0		6.0		5.8			5.7		3.3	< 2.0
Antimony	N	2450	mg/kg	2.0		2.0		3.1			2.0		2.2	2.5
Copper	U	2450	mg/kg	0.50		30		45			31		20	32
Mercury	U	2450	mg/kg	0.10		< 0.10		0.10			< 0.10		< 0.10	0.32
Nickel	U	2450	mg/kg	0.50		53		99			55		33	30
Lead	U	2450	mg/kg	0.50		22		32			21		63	170
Selenium	U	2450	mg/kg	0.20		0.56		0.79			0.48		0.21	1.1
Zinc	U	2450	mg/kg	0.50		65		120			68		160	4100
Chromium (Trivalent)	N	2490	mg/kg	1.0		19		31			20		14	26
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50		< 0.50			< 0.50		< 0.50	< 0.50
Total Organic Carbon	U	2625	%	0.20		0.37		0.73			0.60		0.40	1.9
Mineral Oil	N	2670	mg/kg	10		< 10		< 10			< 10		< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		[C] < 5.0		< 5.0			< 5.0		< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666482	666483	666485	666486	666487	666488	666489	666490	666493
Order No.:					Client Location ID.:	TP17	TP17	TP24	TP24	TP25	TP25	TP28	TP28	TP29
					Client Sample Ref.:	ES2	ES1	ES1	ES2	ES1	ES2	ES1	ES2	ES1
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.5	0.5	0.5	1.0	0.5	1.0	0.5	1.0	0.5
					Date Sampled:	03-Aug-2018	03-Aug-2018	30-Jul-2018	30-Jul-2018	30-Jul-2018	30-Jul-2018	31-Jul-2018	31-Jul-2018	01-Aug-2018
					Asbestos Lab:	COVENTRY		COVENTRY			COVENTRY		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	2.7
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	6.6
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[C] < 5.0		< 5.0			< 5.0		< 5.0	9.4
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[C] < 10		< 10			< 10		< 10	< 10
Benzene	U	2760	µg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	[C] < 1.0		< 1.0			< 1.0		< 1.0	< 1.0
Naphthalene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Acenaphthene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Fluorene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Phenanthrene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Anthracene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Fluoranthene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	0.23
Pyrene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	0.21
Benzo[a]anthracene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Chrysene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Coronene	N	2800	mg/kg	0.10	< 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0	< 2.0		< 2.0			< 2.0		< 2.0	< 2.0
PCB 28	U	2815	mg/kg	0.010	[C] < 0.010		< 0.010			< 0.010		< 0.010	< 0.010
PCB 52	U	2815	mg/kg	0.010	[C] < 0.010		< 0.010			< 0.010		< 0.010	< 0.010
PCB 90+101	U	2815	mg/kg	0.010	[C] < 0.010		< 0.010			< 0.010		< 0.010	< 0.010
PCB 118	U	2815	mg/kg	0.010	[C] < 0.010		< 0.010			< 0.010		< 0.010	< 0.010
PCB 153	U	2815	mg/kg	0.010	[C] < 0.010		< 0.010			< 0.010		< 0.010	< 0.010
PCB 138	U	2815	mg/kg	0.010	[C] < 0.010		< 0.010			< 0.010		< 0.010	< 0.010

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Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					666482	666483	666485	666486	666487	666488	666489	666490	666493
Order No.:					TP17	TP17	TP24	TP24	TP25	TP25	TP28	TP28	TP29
					ES2	ES1	ES1	ES2	ES1	ES2	ES1	ES2	ES1
					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					1.5	0.5	0.5	1.0	0.5	1.0	0.5	1.0	0.5
					03-Aug-2018	03-Aug-2018	30-Jul-2018	30-Jul-2018	30-Jul-2018	30-Jul-2018	31-Jul-2018	31-Jul-2018	01-Aug-2018
					COVENTRY		COVENTRY			COVENTRY		COVENTRY	COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
PCB 180	U	2815	mg/kg	0.010	[C] < 0.010		< 0.010			< 0.010		< 0.010	< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10	[C] < 0.10		< 0.10			< 0.10		< 0.10	< 0.10
Total Phenols	U	2920	mg/kg	0.30	< 0.30		< 0.30			< 0.30		< 0.30	< 0.30

Chemtest
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Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd		Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:		Chemtest Sample ID.:	666494	666495	666496	666499	666500	666501	666502	666509	666510
Order No.:		Client Location ID.:	TP29	TP03	TP03	TP30	TP30	TP02	TP02	TP11	TP11
		Client Sample Ref.:	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2
		Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):	1.0	0.5	1.5	0.5	1.0	0.5	1.5	0.5	1.5
		Date Sampled:	01-Aug-2018	01-Aug-2018	01-Aug-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018	02-Aug-2018	02-Aug-2018
		Asbestos Lab:		COVENTRY			COVENTRY		COVENTRY		COVENTRY

Determinand	Accred.	SOP	Units	LOD								
ACM Type	U	2192		N/A		-			-		-	-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected			No Asbestos Detected		No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	7.0	11	9.1	10	7.6	6.4	14	8.9	9.8
Dry Matter	N		%	N/A	93		91	90		94		91	
pH	U	2010		N/A		8.1			8.4		8.4		8.4
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		0.57			< 0.40		< 0.40		< 0.40
Sulphur (Elemental)	U	2180	mg/kg	1.0		4.3			< 1.0		< 1.0		< 1.0
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50			< 0.50		< 0.50		< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		4.1			9.4		35		8.1
Sulphate (Total)	U	2430	%	0.010		0.080			0.058		0.050		0.046
Arsenic	U	2450	mg/kg	1.0		22			59		30		22
Barium	U	2450	mg/kg	10		110			190		76		81
Cadmium	U	2450	mg/kg	0.10		1.7			1.7		0.65		1.5
Chromium	U	2450	mg/kg	1.0		21			12		21		15
Molybdenum	U	2450	mg/kg	2.0		2.9			2.2		< 2.0		4.2
Antimony	N	2450	mg/kg	2.0		2.8			3.4		2.1		2.2
Copper	U	2450	mg/kg	0.50		36			20		28		28
Mercury	U	2450	mg/kg	0.10		0.24			< 0.10		< 0.10		< 0.10
Nickel	U	2450	mg/kg	0.50		46			39		56		53
Lead	U	2450	mg/kg	0.50		60			99		31		21
Selenium	U	2450	mg/kg	0.20		0.55			< 0.20		< 0.20		1.2
Zinc	U	2450	mg/kg	0.50		150			260		100		64
Chromium (Trivalent)	N	2490	mg/kg	1.0		21			12		21		15
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50			< 0.50		< 0.50		< 0.50
Total Organic Carbon	U	2625	%	0.20		1.5			0.29		0.39		0.70
Mineral Oil	N	2670	mg/kg	10		< 10			< 10		< 10		< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0			< 5.0		< 5.0		< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666494	666495	666496	666499	666500	666501	666502	666509	666510
Order No.:					Client Location ID.:	TP29	TP03	TP03	TP30	TP30	TP02	TP02	TP11	TP11
					Client Sample Ref.:	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.0	0.5	1.5	0.5	1.0	0.5	1.5	0.5	1.5
					Date Sampled:	01-Aug-2018	01-Aug-2018	01-Aug-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018	02-Aug-2018	02-Aug-2018
					Asbestos Lab:		COVENTRY			COVENTRY		COVENTRY		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0			< 5.0		< 5.0		< 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		< 10			< 10		< 10		< 10	
Benzene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Toluene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Ethylbenzene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
m & p-Xylene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
o-Xylene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0		< 1.0	
Naphthalene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Acenaphthylene	N	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Acenaphthene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Fluorene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Phenanthrene	U	2800	mg/kg	0.10		0.24			< 0.10		< 0.10		< 0.10	
Anthracene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Fluoranthene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Pyrene	U	2800	mg/kg	0.10		0.10			< 0.10		< 0.10		< 0.10	
Benzo[a]anthracene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Chrysene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Benzo[b]fluoranthene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Benzo[k]fluoranthene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Benzo[a]pyrene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Coronene	N	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10	
Total Of 17 PAH's	N	2800	mg/kg	2.0		< 2.0			< 2.0		< 2.0		< 2.0	
PCB 28	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010		< 0.010	
PCB 52	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010		< 0.010	
PCB 90+101	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010		< 0.010	
PCB 118	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010		< 0.010	
PCB 153	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010		< 0.010	
PCB 138	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010		< 0.010	

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666494	666495	666496	666499	666500	666501	666502	666509	666510
Order No.:					Client Location ID.:	TP29	TP03	TP03	TP30	TP30	TP02	TP02	TP11	TP11
					Client Sample Ref.:	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.0	0.5	1.5	0.5	1.0	0.5	1.5	0.5	1.5
					Date Sampled:	01-Aug-2018	01-Aug-2018	01-Aug-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018	02-Aug-2018	02-Aug-2018
					Asbestos Lab:		COVENTRY			COVENTRY		COVENTRY		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
PCB 180	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010		< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10		< 0.10			< 0.10		< 0.10		< 0.10
Total Phenols	U	2920	mg/kg	0.30		< 0.30			< 0.30		< 0.30		< 0.30

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666511	666512	666513	666514	666515	666516	666517	666518	666519
Order No.:					Client Location ID.:	TP09	TP09	TP19	TP19	TP04	TP04	TP21	TP21	TP22
					Client Sample Ref.:	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.5	1.5	0.5	1.5	0.5	1.5	0.5	1.0	0.5
					Date Sampled:	02-Aug-2018	02-Aug-2018	02-Aug-2018	02-Aug-2018	01-Aug-2018	01-Aug-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018
					Asbestos Lab:	COVENTRY			COVENTRY		COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A		-			-		-	-		
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected			No Asbestos Detected		No Asbestos Detected	No Asbestos Detected		
Moisture	N	2030	%	0.020		8.6	8.3	8.3	10	7.2	8.4	8.3	6.8	11
Dry Matter	N		%	N/A			92	92		93			93	89
pH	U	2010		N/A		8.1			8.1		8.4	8.0		
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		0.42			< 0.40		< 0.40	< 0.40		
Sulphur (Elemental)	U	2180	mg/kg	1.0		1.2			< 1.0		< 1.0	< 1.0		
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50			< 0.50		< 0.50	< 0.50		
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		6.7			2.3		9.8	3.2		
Sulphate (Total)	U	2430	%	0.010		0.054			0.043		0.10	0.045		
Arsenic	U	2450	mg/kg	1.0		18			16		26	21		
Barium	U	2450	mg/kg	10		71			62		80	74		
Cadmium	U	2450	mg/kg	0.10		1.3			1.5		1.6	2.0		
Chromium	U	2450	mg/kg	1.0		21			20		18	24		
Molybdenum	U	2450	mg/kg	2.0		2.7			3.2		4.9	3.5		
Antimony	N	2450	mg/kg	2.0		2.2			2.2		2.3	2.5		
Copper	U	2450	mg/kg	0.50		33			30		31	33		
Mercury	U	2450	mg/kg	0.10		0.29			< 0.10		< 0.10	< 0.10		
Nickel	U	2450	mg/kg	0.50		48			52		57	65		
Lead	U	2450	mg/kg	0.50		56			31		22	30		
Selenium	U	2450	mg/kg	0.20		0.34			0.59		5.9	1.0		
Zinc	U	2450	mg/kg	0.50		83			84		78	97		
Chromium (Trivalent)	N	2490	mg/kg	1.0		21			20		18	24		
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50			< 0.50		< 0.50	< 0.50		
Total Organic Carbon	U	2625	%	0.20		1.2			0.69		0.67	0.72		
Mineral Oil	N	2670	mg/kg	10		< 10			< 10		< 10	< 10		
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0			< 5.0		< 5.0	< 5.0		
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666511	666512	666513	666514	666515	666516	666517	666518	666519
Order No.:					Client Location ID.:	TP09	TP09	TP19	TP19	TP04	TP04	TP21	TP21	TP22
					Client Sample Ref.:	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.5	1.5	0.5	1.5	0.5	1.5	0.5	1.0	0.5
					Date Sampled:	02-Aug-2018	02-Aug-2018	02-Aug-2018	02-Aug-2018	01-Aug-2018	01-Aug-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018
					Asbestos Lab:	COVENTRY			COVENTRY		COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0			< 5.0		< 5.0	< 5.0		
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		< 10			< 10		< 10	< 10		
Benzene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Toluene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Ethylbenzene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
m & p-Xylene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
o-Xylene	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0		< 1.0			< 1.0		< 1.0	< 1.0		
Naphthalene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Acenaphthylene	N	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Acenaphthene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Fluorene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Phenanthrene	U	2800	mg/kg	0.10		0.13			< 0.10		< 0.10	< 0.10		
Anthracene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Fluoranthene	U	2800	mg/kg	0.10		0.14			< 0.10		< 0.10	< 0.10		
Pyrene	U	2800	mg/kg	0.10		0.15			< 0.10		< 0.10	< 0.10		
Benzo[a]anthracene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Chrysene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Benzo[b]fluoranthene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Benzo[k]fluoranthene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Benzo[a]pyrene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Coronene	N	2800	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Total Of 17 PAH's	N	2800	mg/kg	2.0		< 2.0			< 2.0		< 2.0	< 2.0		
PCB 28	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010	< 0.010		
PCB 52	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010	< 0.010		
PCB 90+101	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010	< 0.010		
PCB 118	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010	< 0.010		
PCB 153	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010	< 0.010		
PCB 138	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010	< 0.010		

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666511	666512	666513	666514	666515	666516	666517	666518	666519
Order No.:					Client Location ID.:	TP09	TP09	TP19	TP19	TP04	TP04	TP21	TP21	TP22
					Client Sample Ref.:	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.5	1.5	0.5	1.5	0.5	1.5	0.5	1.0	0.5
					Date Sampled:	02-Aug-2018	02-Aug-2018	02-Aug-2018	02-Aug-2018	01-Aug-2018	01-Aug-2018	31-Jul-2018	31-Jul-2018	31-Jul-2018
					Asbestos Lab:	COVENTRY			COVENTRY		COVENTRY	COVENTRY		
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
PCB 180	U	2815	mg/kg	0.010		< 0.010			< 0.010		< 0.010	< 0.010		
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10		< 0.10			< 0.10		< 0.10	< 0.10		
Total Phenols	U	2920	mg/kg	0.30		< 0.30			< 0.30		< 0.30	< 0.30		

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666520	666521	666522	666525	666526	666527	666528	666529	666530
Order No.:					Client Location ID.:	TP22	TP06	TP06	TP27	TP27	TP14	TP14	TP18	TP18
					Client Sample Ref.:	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.0	0.5	1.5	0.5	1.0	0.5	1.3	0.5	1.5
					Date Sampled:	31-Jul-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	02-Aug-2018	02-Aug-2018
					Asbestos Lab:	COVENTRY	COVENTRY		COVENTRY		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
ACM Type	U	2192		N/A		-	-		-		-		-	
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected	No Asbestos Detected		No Asbestos Detected		No Asbestos Detected		No Asbestos Detected	
Moisture	N	2030	%	0.020		8.5	9.8	9.9	5.0	7.8	10	13	9.9	10
Dry Matter	N		%	N/A				90		92		87		90
pH	U	2010		N/A		8.3	7.9		8.4		8.1		8.3	
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		< 0.40	0.51		< 0.40		0.47		< 0.40	
Sulphur (Elemental)	U	2180	mg/kg	1.0		< 1.0	< 1.0		< 1.0		3.6		< 1.0	
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50	< 0.50		< 0.50		< 0.50		< 0.50	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		8.8	1.7		10		4.7		7.4	
Sulphate (Total)	U	2430	%	0.010		0.045	0.063		0.048		0.11		0.038	
Arsenic	U	2450	mg/kg	1.0		27	16		36		21		21	
Barium	U	2450	mg/kg	10		93	96		150		86		70	
Cadmium	U	2450	mg/kg	0.10		1.7	1.4		0.86		1.6		1.5	
Chromium	U	2450	mg/kg	1.0		17	25		17		24		21	
Molybdenum	U	2450	mg/kg	2.0		4.8	2.5		< 2.0		2.7		2.0	
Antimony	N	2450	mg/kg	2.0		2.2	< 2.0		< 2.0		< 2.0		< 2.0	
Copper	U	2450	mg/kg	0.50		30	36		11		32		26	
Mercury	U	2450	mg/kg	0.10		< 0.10	0.19		< 0.10		0.16		< 0.10	
Nickel	U	2450	mg/kg	0.50		60	42		30		55		55	
Lead	U	2450	mg/kg	0.50		22	52		27		53		22	
Selenium	U	2450	mg/kg	0.20		0.52	0.63		< 0.20		0.27		< 0.20	
Zinc	U	2450	mg/kg	0.50		74	97		550		98		76	
Chromium (Trivalent)	N	2490	mg/kg	1.0		17	25		17		24		21	
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50	< 0.50		< 0.50		< 0.50		< 0.50	
Total Organic Carbon	U	2625	%	0.20		0.50	1.3		0.33		1.4		0.48	
Mineral Oil	N	2670	mg/kg	10		< 10	< 10		< 10		< 10		< 10	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0	< 5.0		< 5.0		< 5.0		< 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666520	666521	666522	666525	666526	666527	666528	666529	666530
Order No.:					Client Location ID.:	TP22	TP06	TP06	TP27	TP27	TP14	TP14	TP18	TP18
					Client Sample Ref.:	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.0	0.5	1.5	0.5	1.0	0.5	1.3	0.5	1.5
					Date Sampled:	31-Jul-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	02-Aug-2018	02-Aug-2018
					Asbestos Lab:	COVENTRY	COVENTRY		COVENTRY		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0	< 5.0		< 5.0		< 5.0		< 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		< 10	< 10		< 10		< 10		< 10	
Benzene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Toluene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Ethylbenzene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
m & p-Xylene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
o-Xylene	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0		< 1.0	< 1.0		< 1.0		< 1.0		< 1.0	
Naphthalene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		0.28		< 0.10	
Acenaphthylene	N	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Acenaphthene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		0.10		< 0.10	
Fluorene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Phenanthrene	U	2800	mg/kg	0.10		< 0.10	0.14		< 0.10		0.69		< 0.10	
Anthracene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Fluoranthene	U	2800	mg/kg	0.10		< 0.10	0.11		< 0.10		0.39		< 0.10	
Pyrene	U	2800	mg/kg	0.10		< 0.10	0.15		< 0.10		0.36		< 0.10	
Benzo[a]anthracene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Chrysene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Benzo[b]fluoranthene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Benzo[k]fluoranthene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Benzo[a]pyrene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Coronene	N	2800	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Total Of 17 PAH's	N	2800	mg/kg	2.0		< 2.0	< 2.0		< 2.0		2.0		< 2.0	
PCB 28	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010		< 0.010		< 0.010	
PCB 52	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010		< 0.010		< 0.010	
PCB 90+101	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010		< 0.010		< 0.010	
PCB 118	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010		< 0.010		< 0.010	
PCB 153	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010		< 0.010		< 0.010	
PCB 138	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010		< 0.010		< 0.010	

Chemtest
The right chemistry to deliver results

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666520	666521	666522	666525	666526	666527	666528	666529	666530
Order No.:					Client Location ID.:	TP22	TP06	TP06	TP27	TP27	TP14	TP14	TP18	TP18
					Client Sample Ref.:	ES2	ES1	ES2	ES1	ES2	ES1	ES2	ES1	ES2
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	1.0	0.5	1.5	0.5	1.0	0.5	1.3	0.5	1.5
					Date Sampled:	31-Jul-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	01-Aug-2018	02-Aug-2018	02-Aug-2018
					Asbestos Lab:	COVENTRY	COVENTRY		COVENTRY		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**										
PCB 180	U	2815	mg/kg	0.010		< 0.010	< 0.010		< 0.010		< 0.010		< 0.010	
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10		< 0.10	< 0.10		< 0.10		< 0.10		< 0.10	
Total Phenols	U	2920	mg/kg	0.30		< 0.30	< 0.30		< 0.30		< 0.30		< 0.30	

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd		Chemtest Job No.:			18-23385	18-23385
Quotation No.:		Chemtest Sample ID.:			666531	666532
Order No.:		Client Location ID.:			TP08	TP08
		Client Sample Ref.:			ES1	ES2
		Sample Type:			SOIL	SOIL
		Top Depth (m):			0.5	1.5
		Date Sampled:			02-Aug-2018	02-Aug-2018
		Asbestos Lab:				COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
ACM Type	U	2192		N/A		-
Asbestos Identification	U	2192	%	0.001		No Asbestos Detected
Moisture	N	2030	%	0.020	9.1	7.0
Dry Matter	N		%	N/A	91	
pH	U	2010		N/A		8.3
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40		< 0.40
Sulphur (Elemental)	U	2180	mg/kg	1.0		< 1.0
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50		6.8
Sulphate (Total)	U	2430	%	0.010		0.082
Arsenic	U	2450	mg/kg	1.0		24
Barium	U	2450	mg/kg	10		110
Cadmium	U	2450	mg/kg	0.10		1.7
Chromium	U	2450	mg/kg	1.0		16
Molybdenum	U	2450	mg/kg	2.0		6.5
Antimony	N	2450	mg/kg	2.0		2.3
Copper	U	2450	mg/kg	0.50		31
Mercury	U	2450	mg/kg	0.10		< 0.10
Nickel	U	2450	mg/kg	0.50		53
Lead	U	2450	mg/kg	0.50		27
Selenium	U	2450	mg/kg	0.20		2.6
Zinc	U	2450	mg/kg	0.50		69
Chromium (Trivalent)	N	2490	mg/kg	1.0		16
Chromium (Hexavalent)	N	2490	mg/kg	0.50		< 0.50
Total Organic Carbon	U	2625	%	0.20		0.80
Mineral Oil	N	2670	mg/kg	10		< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd		Chemtest Job No.:			18-23385	18-23385
Quotation No.:		Chemtest Sample ID.:			666531	666532
Order No.:		Client Location ID.:			TP08	TP08
		Client Sample Ref.:			ES1	ES2
		Sample Type:			SOIL	SOIL
		Top Depth (m):			0.5	1.5
		Date Sampled:			02-Aug-2018	02-Aug-2018
		Asbestos Lab:				COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**		
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0		< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		< 10
Benzene	U	2760	µg/kg	1.0		< 1.0
Toluene	U	2760	µg/kg	1.0		< 1.0
Ethylbenzene	U	2760	µg/kg	1.0		< 1.0
m & p-Xylene	U	2760	µg/kg	1.0		< 1.0
o-Xylene	U	2760	µg/kg	1.0		< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0		< 1.0
Naphthalene	U	2800	mg/kg	0.10		< 0.10
Acenaphthylene	N	2800	mg/kg	0.10		< 0.10
Acenaphthene	U	2800	mg/kg	0.10		< 0.10
Fluorene	U	2800	mg/kg	0.10		< 0.10
Phenanthrene	U	2800	mg/kg	0.10		< 0.10
Anthracene	U	2800	mg/kg	0.10		< 0.10
Fluoranthene	U	2800	mg/kg	0.10		< 0.10
Pyrene	U	2800	mg/kg	0.10		< 0.10
Benzo[a]anthracene	U	2800	mg/kg	0.10		< 0.10
Chrysene	U	2800	mg/kg	0.10		< 0.10
Benzo[b]fluoranthene	U	2800	mg/kg	0.10		< 0.10
Benzo[k]fluoranthene	U	2800	mg/kg	0.10		< 0.10
Benzo[a]pyrene	U	2800	mg/kg	0.10		< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2800	mg/kg	0.10		< 0.10
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10		< 0.10
Benzo[g,h,i]perylene	U	2800	mg/kg	0.10		< 0.10
Coronene	N	2800	mg/kg	0.10		< 0.10
Total Of 17 PAH's	N	2800	mg/kg	2.0		< 2.0
PCB 28	U	2815	mg/kg	0.010		< 0.010
PCB 52	U	2815	mg/kg	0.010		< 0.010
PCB 90+101	U	2815	mg/kg	0.010		< 0.010
PCB 118	U	2815	mg/kg	0.010		< 0.010
PCB 153	U	2815	mg/kg	0.010		< 0.010
PCB 138	U	2815	mg/kg	0.010		< 0.010

Results - Soil

Project: 18-0577 - DAA Surveys

Client: Causeway Geotech Ltd					Chemtest Job No.:	18-23385	18-23385
Quotation No.:					Chemtest Sample ID.:	666531	666532
Order No.:					Client Location ID.:	TP08	TP08
					Client Sample Ref.:	ES1	ES2
					Sample Type:	SOIL	SOIL
					Top Depth (m):	0.5	1.5
					Date Sampled:	02-Aug-2018	02-Aug-2018
					Asbestos Lab:		COVENTRY
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
PCB 180	U	2815	mg/kg	0.010			< 0.010
Total PCBs (7 Congeners)	N	2815	mg/kg	0.10			< 0.10
Total Phenols	U	2920	mg/kg	0.30			< 0.30

Project: 18-0577 - DAA Surveys

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666482						
Sample Location ID:	TP17						
Sample Ref:	ES2						
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	03-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.37	3	5	6
Loss On Ignition	2610	U	%	2.0	--	--	10
Total BTEX	2760	U	mg/kg	[C] < 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	[C] < 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.10	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0073	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.016	0.16	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	0.0019	0.019	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.22	2.2	10	150	500
Sulphate	1220	U	2.2	22	1000	20000	50000
Total Dissolved Solids	1020	N	51	510	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.3	73	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666483						
Sample Location ID:	TP17						
Sample Ref:	ES1				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	03-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	1.2	3	5	6
Loss On Ignition	2610	U	%	4.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		7.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.014	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0013	< 0.050	0.5	2	25
Barium	1450	U	0.0036	< 0.50	20	100	300
Cadmium	1450	U	0.00011	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0028	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0052	0.052	0.5	10	30
Nickel	1450	U	0.0030	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0056	< 0.50	4	50	200
Chloride	1220	U	2.4	24	800	15000	25000
Fluoride	1220	U	0.37	3.7	10	150	500
Sulphate	1220	U	2.8	28	1000	20000	50000
Total Dissolved Solids	1020	N	60	600	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	12	120	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666485						
Sample Location ID:	TP24						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	30-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.73	3	5	6
Loss On Ignition	2610	U	%	3.6	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.011	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0031	< 0.050	0.5	2	25
Barium	1450	U	0.0026	< 0.50	20	100	300
Cadmium	1450	U	0.00019	< 0.010	0.04	1	5
Chromium	1450	U	0.0022	< 0.050	0.5	10	70
Copper	1450	U	0.0062	0.062	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0025	< 0.050	0.5	10	30
Nickel	1450	U	0.011	0.11	0.4	10	40
Lead	1450	U	0.0023	0.023	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.017	< 0.50	4	50	200
Chloride	1220	U	2.7	27	800	15000	25000
Fluoride	1220	U	0.45	4.5	10	150	500
Sulphate	1220	U	5.7	57	1000	20000	50000
Total Dissolved Solids	1020	N	42	420	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	12	120	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666486						
Sample Location ID:	TP24						
Sample Ref:	ES2				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Top Depth(m):	1.0						
Bottom Depth(m):							
Sampling Date:	30-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	0.52	3	5	6
Loss On Ignition	2610	U	%	2.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.084	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0052	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0082	0.082	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.6	16	800	15000	25000
Fluoride	1220	U	0.49	4.9	10	150	500
Sulphate	1220	U	4.6	46	1000	20000	50000
Total Dissolved Solids	1020	N	56	560	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.7	77	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.9

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666487						
Sample Location ID:	TP25						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	30-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	2.5	3	5	6
Loss On Ignition	2610	U	%	5.8	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	1000	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.058	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0057	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0022	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.011	0.11	0.5	10	30
Nickel	1450	U	0.0011	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	3.1	31	800	15000	25000
Fluoride	1220	U	0.29	2.9	10	150	500
Sulphate	1220	U	3.4	34	1000	20000	50000
Total Dissolved Solids	1020	N	130	1300	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	22	220	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	6.6

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666488						
Sample Location ID:	TP25						
Sample Ref:	ES2				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Top Depth(m):	1.0						
Bottom Depth(m):							
Sampling Date:	30-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	0.60	3	5	6
Loss On Ignition	2610	U	%	2.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.12	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.010	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.021	0.21	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.6	26	800	15000	25000
Fluoride	1220	U	0.31	3.1	10	150	500
Sulphate	1220	U	3.0	30	1000	20000	50000
Total Dissolved Solids	1020	N	56	560	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.1	91	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.0

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666489						
Sample Location ID:	TP28						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	1.1	3	5	6
Loss On Ignition	2610	U	%	4.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	42	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.018	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.013	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0015	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.0	20	800	15000	25000
Fluoride	1220	U	0.34	3.4	10	150	500
Sulphate	1220	U	4.4	44	1000	20000	50000
Total Dissolved Solids	1020	N	56	560	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.9	89	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666490						
Sample Location ID:	TP28						
Sample Ref:	ES2						
Top Depth(m):	1.0						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.40	3	5	6
Loss On Ignition	2610	U	%	2.0	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.048	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.30	3.0	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0041	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.9	19	800	15000	25000
Fluoride	1220	U	0.28	2.8	10	150	500
Sulphate	1220	U	9.9	99	1000	20000	50000
Total Dissolved Solids	1020	N	62	620	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.4	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.7

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666493						
Sample Location ID:	TP29						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	1.9	3	5	6
Loss On Ignition	2610	U	%	6.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.043	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0028	< 0.050	0.5	2	25
Barium	1450	U	0.061	0.61	20	100	300
Cadmium	1450	U	0.00048	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0023	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0014	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	0.0047	0.047	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.065	0.65	4	50	200
Chloride	1220	U	3.0	30	800	15000	25000
Fluoride	1220	U	0.73	7.3	10	150	500
Sulphate	1220	U	3.2	32	1000	20000	50000
Total Dissolved Solids	1020	N	68	680	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	14	140	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	17

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666494						
Sample Location ID:	TP29						
Sample Ref:	ES2						
Top Depth(m):	1.0						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.51	3	5	6
Loss On Ignition	2610	U	%	1.8	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	21	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.12	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.33	3.3	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0040	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0013	0.013	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.4	14	800	15000	25000
Fluoride	1220	U	0.40	4.0	10	150	500
Sulphate	1220	U	4.5	45	1000	20000	50000
Total Dissolved Solids	1020	N	50	500	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.7	77	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.0

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666495						
Sample Location ID:	TP03						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	1.5	3	5	6
Loss On Ignition	2610	U	%	5.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.026	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0085	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0024	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0065	0.065	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0035	< 0.50	4	50	200
Chloride	1220	U	2.3	23	800	15000	25000
Fluoride	1220	U	0.58	5.8	10	150	500
Sulphate	1220	U	5.9	59	1000	20000	50000
Total Dissolved Solids	1020	N	83	830	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	10	100	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666496						
Sample Location ID:	TP03						
Sample Ref:	ES2				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	0.54	3	5	6
Loss On Ignition	2610	U	%	2.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	130	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.093	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0082	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0093	0.093	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.0	10	800	15000	25000
Fluoride	1220	U	0.25	2.5	10	150	500
Sulphate	1220	U	1.7	17	1000	20000	50000
Total Dissolved Solids	1020	N	51	510	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.2	82	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.1

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666499						
Sample Location ID:	TP30						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	1.1	3	5	6
Loss On Ignition	2610	U	%	4.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.034	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.26	2.6	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0025	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	8.0	80	800	15000	25000
Fluoride	1220	U	0.38	3.8	10	150	500
Sulphate	1220	U	13	130	1000	20000	50000
Total Dissolved Solids	1020	N	91	910	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.4	94	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666500						
Sample Location ID:	TP30						
Sample Ref:	ES2				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Top Depth(m):	1.0						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	0.29	3	5	6
Loss On Ignition	2610	U	%	1.7	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.050	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.093	0.93	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0028	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.9	19	800	15000	25000
Fluoride	1220	U	0.18	1.8	10	150	500
Sulphate	1220	U	6.4	64	1000	20000	50000
Total Dissolved Solids	1020	N	52	520	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.4	74	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.6

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666501						
Sample Location ID:	TP02						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.65	3	5	6
Loss On Ignition	2610	U	%	3.0	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.031	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0072	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0011	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0057	0.057	0.5	10	30
Nickel	1450	U	0.0016	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0024	< 0.50	4	50	200
Chloride	1220	U	3.4	34	800	15000	25000
Fluoride	1220	U	0.47	4.7	10	150	500
Sulphate	1220	U	2.8	28	1000	20000	50000
Total Dissolved Solids	1020	N	73	730	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.0	90	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	6.4

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666502						
Sample Location ID:	TP02						
Sample Ref:	ES2						
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.39	3	5	6
Loss On Ignition	2610	U	%	2.7	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.092	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.011	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0040	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	3.0	30	800	15000	25000
Fluoride	1220	U	0.30	3.0	10	150	500
Sulphate	1220	U	2.9	29	1000	20000	50000
Total Dissolved Solids	1020	N	59	590	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.8	78	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	14

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666509						
Sample Location ID:	TP11						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.63	3	5	6
Loss On Ignition	2610	U	%	3.2	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.077	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0038	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0043	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.7	17	800	15000	25000
Fluoride	1220	U	0.44	4.4	10	150	500
Sulphate	1220	U	2.6	26	1000	20000	50000
Total Dissolved Solids	1020	N	77	770	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.1	51	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.9

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666510						
Sample Location ID:	TP11						
Sample Ref:	ES2						
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.70	3	5	6
Loss On Ignition	2610	U	%	7.6	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.10	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0059	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.011	0.11	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.1	21	800	15000	25000
Fluoride	1220	U	0.28	2.8	10	150	500
Sulphate	1220	U	1.9	19	1000	20000	50000
Total Dissolved Solids	1020	N	55	550	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.7	67	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.8

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666511						
Sample Location ID:	TP09						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	1.2	3	5	6
Loss On Ignition	2610	U	%	4.3	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.034	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0039	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0013	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0093	0.093	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	3.4	34	800	15000	25000
Fluoride	1220	U	0.36	3.6	10	150	500
Sulphate	1220	U	2.7	27	1000	20000	50000
Total Dissolved Solids	1020	N	72	720	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.3	83	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.6

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666512						
Sample Location ID:	TP09						
Sample Ref:	ES2						
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.71	3	5	6
Loss On Ignition	2610	U	%	2.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.094	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0042	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0037	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.12	1.2	10	150	500
Sulphate	1220	U	1.1	11	1000	20000	50000
Total Dissolved Solids	1020	N	36	360	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.0	70	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.3

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666513						
Sample Location ID:	TP19						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.40	3	5	6
Loss On Ignition	2610	U	%	2.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.070	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0026	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0017	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.11	1.1	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	33	330	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.5	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.3

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666514						
Sample Location ID:	TP19						
Sample Ref:	ES2						
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.69	3	5	6
Loss On Ignition	2610	U	%	3.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.026	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0023	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.5	15	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	1.2	12	1000	20000	50000
Total Dissolved Solids	1020	N	38	380	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.3	83	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666515						
Sample Location ID:	TP04						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.69	3	5	6
Loss On Ignition	2610	U	%	3.2	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.090	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0036	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0024	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.7	17	800	15000	25000
Fluoride	1220	U	0.18	1.8	10	150	500
Sulphate	1220	U	1.9	19	1000	20000	50000
Total Dissolved Solids	1020	N	41	410	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.1	81	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.2

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666516						
Sample Location ID:	TP04						
Sample Ref:	ES2				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	0.67	3	5	6
Loss On Ignition	2610	U	%	2.7	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.12	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0050	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0041	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0044	0.044	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.7	17	800	15000	25000
Fluoride	1220	U	0.16	1.6	10	150	500
Sulphate	1220	U	2.2	22	1000	20000	50000
Total Dissolved Solids	1020	N	36	360	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.2	92	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.4

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666517						
Sample Location ID:	TP21						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.72	3	5	6
Loss On Ignition	2610	U	%	3.4	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.034	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0026	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.7	17	800	15000	25000
Fluoride	1220	U	0.17	1.7	10	150	500
Sulphate	1220	U	2.4	24	1000	20000	50000
Total Dissolved Solids	1020	N	48	480	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	7.1	71	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.3

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste material is hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666518						
Sample Location ID:	TP21						
Sample Ref:	ES2				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Top Depth(m):	1.0						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	0.51	3	5	6
Loss On Ignition	2610	U	%	1.7	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.082	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0032	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0020	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.4	14	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	41	410	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.1	61	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	6.8

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666519						
Sample Location ID:	TP22						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.49	3	5	6
Loss On Ignition	2610	U	%	2.9	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.015	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0015	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0015	< 0.50	4	50	200
Chloride	1220	U	1.1	11	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	1.6	16	1000	20000	50000
Total Dissolved Solids	1020	N	33	330	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.9	89	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	11

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste material is hazardous or non-hazardous.

roject: 18-0577 - DAA Surveys

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666520						
Sample Location ID:	TP22						
Sample Ref:	ES2						
Top Depth(m):	1.0						
Bottom Depth(m):							
Sampling Date:	31-Jul-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.50	3	5	6
Loss On Ignition	2610	U	%	2.2	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.096	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0025	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0020	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.6	26	800	15000	25000
Fluoride	1220	U	0.12	1.2	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	27	270	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.9	59	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	8.5

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666521						
Sample Location ID:	TP06						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	1.3	3	5	6
Loss On Ignition	2610	U	%	4.7	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		7.9	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.019	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	< 0.0010	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	17	170	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.2	82	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste material is hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666522						
Sample Location ID:	TP06						
Sample Ref:	ES2						
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.56	3	5	6
Loss On Ignition	2610	U	%	2.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.084	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0058	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0034	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.0	10	800	15000	25000
Fluoride	1220	U	0.13	1.3	10	150	500
Sulphate	1220	U	1.6	16	1000	20000	50000
Total Dissolved Solids	1020	N	38	380	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.3	63	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.9

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666525						
Sample Location ID:	TP27						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.33	3	5	6
Loss On Ignition	2610	U	%	1.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.076	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0028	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.0037	< 0.50	4	50	200
Chloride	1220	U	6.6	66	800	15000	25000
Fluoride	1220	U	0.22	2.2	10	150	500
Sulphate	1220	U	1.4	14	1000	20000	50000
Total Dissolved Solids	1020	N	26	260	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	8.3	83	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	5.0

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste material is hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666526						
Sample Location ID:	TP27						
Sample Ref:	ES2						
Top Depth(m):	1.0						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.46	3	5	6
Loss On Ignition	2610	U	%	1.0	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.10	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	0.0032	< 0.050	0.5	2	25
Barium	1450	U	0.0051	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	0.0013	0.013	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	0.015	< 0.50	4	50	200
Chloride	1220	U	1.1	11	800	15000	25000
Fluoride	1220	U	0.15	1.5	10	150	500
Sulphate	1220	U	1.1	11	1000	20000	50000
Total Dissolved Solids	1020	N	32	320	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.6	96	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.8

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

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					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666527						
Sample Location ID:	TP14						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	1.4	3	5	6
Loss On Ignition	2610	U	%	3.5	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	2.0	100	--	--
pH	2010	U		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.075	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0021	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	2.5	25	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	2.3	23	1000	20000	50000
Total Dissolved Solids	1020	N	38	380	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.9	99	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste material is hazardous or non-hazardous.

roject: 18-0577 - DAA Surveys

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666528						
Sample Location ID:	TP14						
Sample Ref:	ES2						
Top Depth(m):	1.3						
Bottom Depth(m):							
Sampling Date:	01-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	1.4	3	5	6
Loss On Ignition	2610	U	%	4.2	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.071	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0025	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0011	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	3.9	39	800	15000	25000
Fluoride	1220	U	0.16	1.6	10	150	500
Sulphate	1220	U	2.7	27	1000	20000	50000
Total Dissolved Solids	1020	N	43	430	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	11	110	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	13

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Project: 18-0577 - DAA Surveys

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666529						
Sample Location ID:	TP18						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.48	3	5	6
Loss On Ignition	2610	U	%	2.4	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.041	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0019	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.2	12	800	15000	25000
Fluoride	1220	U	0.13	1.3	10	150	500
Sulphate	1220	U	1.7	17	1000	20000	50000
Total Dissolved Solids	1020	N	29	290	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.7	97	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.9

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Project: 18-0577 - DAA Surveys

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666530						
Sample Location ID:	TP18						
Sample Ref:	ES2				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	0.48	3	5	6
Loss On Ignition	2610	U	%	1.8	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.5	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.094	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0026	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	0.0066	0.066	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	0.0011	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.6	16	800	15000	25000
Fluoride	1220	U	0.12	1.2	10	150	500
Sulphate	1220	U	1.3	13	1000	20000	50000
Total Dissolved Solids	1020	N	32	320	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	5.5	55	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Project: 18-0577 - DAA Surveys

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666531						
Sample Location ID:	TP08						
Sample Ref:	ES1						
Top Depth(m):	0.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	2.0	3	5	6
Loss On Ignition	2610	U	%	6.0	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2700	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.011	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0011	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	< 0.0010	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	< 0.0010	< 0.010	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	1.6	16	800	15000	25000
Fluoride	1220	U	0.17	1.7	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	29	290	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	9.4	94	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	9.4

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste material is hazardous or non-hazardous.

Project: 18-0577 - DAA Surveys

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	18-23385						
Chemtest Sample ID:	666532						
Sample Location ID:	TP08						
Sample Ref:	ES2						
Top Depth(m):	1.5						
Bottom Depth(m):							
Sampling Date:	02-Aug-2018						
Determinand	**SOP**	**Accred.**	**Units**		**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Total Organic Carbon	2625	U	%	0.80	3	5	6
Loss On Ignition	2610	U	%	2.9	--	--	10
Total BTEX	2760	U	mg/kg	< 0.010	6	--	--
Total PCBs (7 Congeners)	2815	U	mg/kg	< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg	< 10	500	--	--
Total (Of 17) PAH's	2800	N	mg/kg	< 2.0	100	--	--
pH	2010	U		8.3	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.089	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1450	U	< 0.0010	< 0.050	0.5	2	25
Barium	1450	U	0.0049	< 0.50	20	100	300
Cadmium	1450	U	< 0.00010	< 0.010	0.04	1	5
Chromium	1450	U	< 0.0010	< 0.050	0.5	10	70
Copper	1450	U	< 0.0010	< 0.050	2	50	100
Mercury	1450	U	< 0.00050	< 0.0050	0.01	0.2	2
Molybdenum	1450	U	0.0029	< 0.050	0.5	10	30
Nickel	1450	U	< 0.0010	< 0.050	0.4	10	40
Lead	1450	U	< 0.0010	< 0.010	0.5	10	50
Antimony	1450	U	< 0.0010	< 0.010	0.06	0.7	5
Selenium	1450	U	0.0021	0.021	0.1	0.5	7
Zinc	1450	U	< 0.0010	< 0.50	4	50	200
Chloride	1220	U	6.2	62	800	15000	25000
Fluoride	1220	U	0.14	1.4	10	150	500
Sulphate	1220	U	5.2	52	1000	20000	50000
Total Dissolved Solids	1020	N	39	390	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	4.4	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	7.0

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Chemtest
The right chemistry to deliver results

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample ID:	Sample Location ID:	Sample Ref:	Sampled Date:	Deviation Code(s):	Containers Received:
666482	TP17	ES2	03-Aug-2018	C	Plastic Tub 500g

Chemtest
The right chemistry to deliver results

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk

Technical Appendix 12 – Noise and Vibration

12.1: Sound Level Meter Calibration Certificates

NICHOLAS O'DWYER

daa

Brüel & Kjær

The Calibration Laboratory
Skodsborgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2208400 Page 1 of 10

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250	No: 2620701	Id: - 2654662
Microphone:	Brüel & Kjær Type 4950	No: 2606551	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 6822	
Supplied Calibrator:	Brüel & Kjær Type 4231	No: 2460008	
Software version:	BZ7222 Version 2.1	Pattern Approval:	PTB1.63-4046158
Instruction manual:	BE1712-18		

CUSTOMER

Enfonic Ltd
Unit 2A
Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC61672-1:2002 class 1. Procedures from IEC 61672-3:2006 were used to perform the periodic tests. The accreditation assures the traceability to the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 4.9 - DB: 4.90) by using procedure 2250-4189.

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2022-02-18

Date of issue: 2022-02-18

M. Önder
Mikail Önder
Calibration Technician

Susanne Jørgensen
Susanne Jørgensen
Approved Signatory

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Brüel & Kjær

[redacted] Calibration Laboratory
[redacted]borgvej 307, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL. Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2106286

CALIBRATION OF

Sound Level Meter:	Brüel & Kjær Type 2250-Light	No: 3008423	Id: -
Microphone:	Brüel & Kjær Type 4950	No: 2697054	
Preamplifier:	Brüel & Kjær Type ZC-0032	No: 18175	
Supplied Calibrator:	None		
Software version:	BZ7222 Version 4.5.2	Pattern Approval:	PTB1.63-40478500 / 1.63-4078502
Instruction manual:	BE1712-22		

CUSTOMER

[redacted]

Enfonic Ltd
Unit 2A, Century Business Park
Dublin
D11 T0HV
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Sound Level Meter Brüel & Kjær Type 2250 has been calibrated in accordance with the requirements as specified in IEC6162-1:2013 class 1. Proceedures from IEC 61672-3:2013 were used perform the periodic tests. The accreditation assures the traceability of the international units system SI.

PROCEDURE

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System 3630 with application software type 7763 (version 7.3 - DB: 7.30) by using procedure B&K proc 2250, 4189 (IEC61672:2013)

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2021-05-21

Date of issue: 2021-05-21

[redacted]

M. Önder

Mikail Önder
Calibration Technician

Susanne Jørgensen

Susanne Jørgensen
Approved Signatory

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Brüel & Kjær

The Calibration Laboratory
S[redacted]orgvej 3 7, DK-2850 Nærum, Denmark

ilac-MRA DANAK CAL Reg.nr. 307

CERTIFICATE OF CALIBRATION

No: CDK2205023

CALIBRATION OF

Calibrator	Brüel & Kjær Type 4231	No: 2292707
1/2 inch adaptor	Brüel & Kjær Type UC0210	
Pattern Approval:	PTB-1.61-4057176	

CUSTOMER

[redacted]

Enfonic Ltd
Unit 2A
Century Business Park
D11 T0HV Dublin
Ireland

CALIBRATION CONDITIONS

Preconditioning: 4 hours at 23°C ± 3°C

Environment conditions: *See actual values in **Environmental conditions** sections.*

SPECIFICATIONS

The Calibrator Bruel & Kjaer Type 4231 has been calibrated in accordance with the requirements as specified in IEC60942:2003 Annex B Class 1. The accreditation assures the traceability to the international unit system SI.

PROCEDURE

The measurements have been performed with the assistance of Bruel & Kjaer acoustic calibrator calibration application software Type 7794 (version 2.4) by using procedure P 4231 D04.

RESULTS

Calibration Mode: **Calibration as received.**

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of calibration: 2022-08-18

Date of issue: 2022-08-18

[redacted]

M. Önder

Mikail Önder
Calibration Technician

Susanne Jørgensen

Susanne Jørgensen
Approved Signatory

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Technical Appendix 13 – Waste

13.1: Resources and Waste Management Plan

NICHOLAS O'DWYER

daa

awnconsulting

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RESOURCE AND WASTE MANAGEMENT PLAN FOR PROPOSED AIRFIELD DRAINAGE PROJECT

DUBLIN AIRPORT, CO.DUBLIN

Report Prepared For

DAA PLC

Report Prepared By

Niamh Kelly, Environmental Consultant
&
Chonaill Bradley, Principal Environmental Consultant

Our Reference

NK/227501.0571WMR01

Date of Issue

25 January 2023

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Signature		
Name	Niamh Kelly	Chonaill Bradley
Title	Environmental Consultant	Principal Environmental Consultant
Date	25 January 2023	25 January 2023

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1.0 INTRODUCTION

AWN Consulting Ltd. (AWN) has prepared this Resource and Waste Management Plan (RWMP) on behalf of Dublin Airport Authority (daa) PLC for the proposed airfield drainage project (ADP). The ADP proposes significant upgrades of the existing drainage infrastructure and also the construction of additional infrastructure to supplement the performance of the existing facilities.

This plan will provide information necessary to ensure that the management of construction and demolition (C&D) waste at the site is undertaken in accordance with all current legal and industry standards including the *Waste Management Act 1996* as amended and associated Regulations [1], *Environmental Protection Agency Act 1992* as amended [2], *Litter Pollution Act 1997* as amended [3] and the *Eastern-Midlands Region Waste Management Plan 2015 – 2021* [4]. In particular, this plan aims to ensure maximum recycling, reuse and recovery of waste with diversion from landfill, wherever possible. It also seeks to provide 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 RWMP includes information on the legal and policy framework for C&D waste management in Ireland, estimates of the type and quantity of waste to be generated by the proposed development and makes recommendations for management of different waste streams. The RWMP should be viewed as a live document and should be regularly revisited throughout a project's lifecycle so that opportunities to maximise waste reduction / efficiencies are exploited throughout, and that data is collected on an ongoing basis so that it is as accurate as possible.

2.0 C&D RESOURCE AND WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998, *Changing Our Ways* [5], which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this report 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 (i.e. 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 entitled '*Recycling of Construction and Demolition Waste*'[6] concerning the development and implementation of a voluntary construction industry programme to meet the Government's objectives for the recovery of C&D waste.

In September 2020, the Irish Government published a policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan, *'A Waste Action Plan for a Circular Economy'* [7] (WAPCE), replaces the previous national waste management plan, *"A Resource Opportunity"* (2012), and was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to an altered economical model, where climate and environmental challenges are turned into opportunities.

The WAPCE sets the direction for waste planning and management in Ireland up to 2025. This reorientates policy from a focus on managing waste to a much greater focus on creating circular patterns of production and consumption. Other policy statements of a number of public bodies already acknowledge the circular economy as a national policy priority.

The policy document contains over 200 measures across various waste areas including circular economy, municipal waste, consumer protection and citizen engagement, plastics and packaging, construction and demolition, textiles, green public procurement and waste enforcement.

One of the first actions to be taken was the development of the *Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less'* (2021) [8] to set a course for Ireland to transition across all sectors and at all levels of Government toward circularity and was issued in December 2021. It is anticipated that the Strategy will be updated in full every 18 months to 2 years.

The Circular Economy and Miscellaneous Provisions Act 2022 [9] was signed into law in July 2022. The Act underpins Ireland's shift from a "take-make-waste" linear model to a more sustainable pattern of production and consumption, that retains the value of resources in our economy for as long as possible and that will contribute to significantly reduce our greenhouse gas emissions. The Act defines Circular Economy for the first time in Irish law, incentivises the use of recycled and reusable alternatives to wasteful, single-use disposable packaging, introduces a mandatory segregation and incentivised charging regime for commercial waste, streamlines the national processes for End-of-Waste and By-Products decisions, tackling the delays which can be encountered by industry, and supporting the availability of recycled secondary raw materials in the Irish market, and tackles illegal fly-tipping and littering.

The Environmental Protection Agency (EPA) of Ireland issued '*Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects'* in November 2021 [10]. These guidelines replace the previous guidelines issued by The National Construction and Demolition Waste Council (NCDWC) and the Department of the Environment, Heritage and Local Government (DoEHLG) in 2006 [11]. The guidelines provide a practical approach which is informed by best practice in the prevention and management of C&D wastes and resources from design to construction of a project, including consideration of the deconstruction of a project. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted C&D wastes and procedures to prevent, minimise, recycle and reuse wastes;
- Design teams roles and approach;
- Relevant EU, national and local waste policy, legislation and guidelines;
- Waste disposal/recycling of C&D wastes at the site;
- Provision of training for Resource Manager (RM) and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of consultation with relevant bodies *i.e.*, waste recycling companies, Local Authority, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a RWMP for developments. The new guidance classifies developments on a two-tiered system. Developments which do not exceed any of the following thresholds may be classed as Tier 1 development:

- New residential development of less than 10 dwellings.
- Retrofit of 20 dwellings or less.
- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2.
- Retrofit of commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 2,000m^2; and
- Demolition projects generating in total less than 100m^3 in volume of C&D waste.

A development which exceeds one or more of these thresholds is classed as Tier-2 projects. This development requires a RWMP as a Tier 2 development as it is above following criterion:

- New commercial, industrial, infrastructural, institutional, educational, health and other developments with an aggregate floor area less than 1,250m^2.

Other guidelines followed in the preparation of this report include *'Construction and Demolition Waste Management – a handbook for Contractors and Site Managers'* [12], published by FÁS and the Construction Industry Federation in 2002 and the previous guildines, *'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects'* (2006).

These guidance documents 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.

2.2 Regional Level

The proposed development is located in the Local Authority area of Fingal County Council (FCC).

The *Eastern-Midlands Region Waste Management Plan 2015 – 2021* is the regional waste management plan for the FCC area published in May 2015. Currently the EMR and other regional waste management plans are under review and the Regional Waste Management Planning Offices expect to publish the draft plan in December 2022 and the final plan in 2023.

The Regional Plan sets out the strategic targets for waste management in the region and sets a specific target for C&D waste of *"70% preparing for reuse, recycling and other recovery of construction and demolition waste"* (excluding natural soils and stones and hazardous wastes) to be achieved by 2020.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy introduced under the *Waste Management (Landfill Levy) (Amendment) Regulations 2015.*

The *Fingal Development Plan 2017 – 2023* [13] came into effect on March 2017 and sets out a number of objectives for the Fingal region in line with the objectives of the regional waste management plan.

Objectives:

- Objective **WM03** Implement the provisions of the Eastern Midlands Region Waste Management Plan 2015-2021 or any subsequent Waste Management Plan applicable within the lifetime of the Development Plan. All prospective developments in the County will be expected to take account of the provisions of the Regional Waste Management Plan and adhere to the requirements of that Plan.
- Objective **WM07** Promote the increased re-use of waste in accordance with the Eastern Midlands Region Waste Management Plan 2015 -2021 (or any subsequent plan).
- 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.

With regards to C&D waste specifically, the development plan requires that a 70% target for the re-use, recycling and recovery of man-made C&D waste in Ireland by 2020 is required in compliance with the EC (Waste Directive) Regulations 2011.

The draft *Fingal Development Plan 2023– 2029* (2022) [14] sets out a number of policies and objectives for the Fingal region in line with the objectives of the regional waste management plan, including the following:

- In assessing development proposals for, or including, waste recovery and waste disposal facilities, the Planning Authority will have regard to the policies, actions, targets and provisions of the Eastern-Midlands Region Waste Management Plan (2015-2021) or any superseding document, planning legislation, the Development Plan and other relevant planning documents.
- The Construction and Demolition Waste Management Plan, as a minimum, should include provision for the management of all construction and demolition waste arising on site, and make provision for the reuse of said material and/or the recovery or disposal of this waste to authorised facilities by authorised collectors. Where appropriate, excavated material from development sites is to be reused on the subject site.
- **Objective DMS0217 Guidance for Construction and Demolition Waste Management Plans**
  Require that Construction and Demolition Waste Management Plans be submitted as part of any planning application for projects in excess of thresholds [outlined in Section 2.1 of this report].
- **Objective DMSO241 Guidance for Construction and Demolition Waste Management Plans**
  Require that Construction and Demolition Waste Management Plans include the following:
  - The management of construction and demolition waste included as part of a Construction and Demolition Waste Management Plan.
  - Containment of all construction-related fuel and oil within specially constructed bunds to ensure that fuel spillages are fully contained (such bunds shall be roofed to exclude rainwater).

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the development are:

- Waste Management Act 1996 as amended.
- Environmental Protection Agency Act 1992 as amended.
- Litter Pollution Act 1997 as amended.
- Planning and Development Act 2000 as amended [15].
- Circular Economy and Miscellaneous Provisions Act 2022.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the Waste Management Act 1996, as amended, 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 through until its legal recycling, recovery or disposal (including its method of disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final destination. 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 transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the Developer ensures that the waste contractors engaged by the construction contractors are legally compliant with respect to waste transportation, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and recycle/recover/dispose of waste in a manner that ensures that no significant adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007 and Amendments* or a Waste or Industrial Emissions Licence granted by the EPA. The COR / permit / licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

3.0 DESIGN APPROACH

The client and the design team have integrated the *'Best Practice Guidelines for the Preparation of Resource & Waste Management Plans for Construction & Demolition Projects'* into the design workshops, to help review processes, identify and evaluate resource reduction measures and investigate the impact on cost, time, quality, buildability, second life and management post demolition and construction. Further details on these design principals can be found within the aforementioned guidance document.

The design team has undertaken the design process in line with the international best practice principles to firstly prevent wastes, reuse where possible and thereafter sustainably reduce and recover materials. The below sections have been the focal point of the design process and material selections and will continued to be analysed and investigated throughout the design process and when selecting material.

The approaches presented are based on international principles of optimising resources and reducing waste on construction projects through:

- Prevention;
- Reuse;
- Recycling;
- Green Procurement Principles;
- Off-Site Construction;
- Materials Optimisation; and
- Flexibility and Deconstruction.

3.1 Designing For Prevention, Reuse and Recycling

Undertaken at the outset and during project feasibility and evaluation, the Client and Design Team considered:

- Establishing the potential for any reusable site assets (buildings, structures, equipment, materials, soils, etc.);
- The potential for refurbishment and refit of any existing structures or buildings rather than demolition and new build;
- Assessing any existing buildings on the site that can be refurbished either in part or wholly to meet the Client requirements; and
- Enabling the optimum recovery of assets on site.

3.2 Designing for Green Procurement

Waste prevention and minimisation pre-procurement have been discussed and will be further discussed in this section. The Design Team will discuss proposed design solutions, encourage innovation in tenders and incentivise competitions to recognise sustainable approaches. They should also discuss options for packaging reduction with the main Contractor and subcontractors/suppliers using measures such as 'Just-in-Time' delivery and use ordering procedures that avoid excessive waste. The Green procurement extends from the planning stage into the detailed design and tender stage and will be an ongoing part of the long-term design and selection process for this development.

3.3 Designing for Off-Site Construction

Use of off-site manufacturing has been shown to reduce residual wastes by up to 90% (volumetric building versus traditional). The decision to use offsite construction is typically cost led but there are significant benefits for resource management. Some further considerations for procurement which are being investigated as part of the planning stage design process are listed as follows:

- Modular buildings as these can displace the use of concrete and the resource losses associated with concrete blocks such as broken blocks, mortars, etc.;
    - Modular buildings are typically pre-fitted with fixed plasterboard and installed insulation, eliminating these residual streams from site.
- Use of pre-cast structural concrete panels which can reduce the residual volumes of concrete blocks, mortars, plasters, *etc.*;
- The use of prefabricated composite panels for walls and roofing to reduce residual volumes of insulation and plasterboards;
- Using pre-cast hollow-core flooring instead of in-situ ready mix flooring or timber flooring to reduce the residual volumes of concrete/formwork and wood/packaging, respectively; and
- Designing for the preferential use of offsite modular units.

3.4 Designing for Materials Optimisation During Construction

To ensure manufacturers and construction companies adopt lean production models, including maximising the reuse of materials onsite as outlined in section 2.1, structures should be designed with the intent of designing out waste. This helps to reduce the environmental impacts associated with transportation of materials and from waste management activities. This includes investigating the use of standardised sizes for certain materials to help reduce the amount of offcuts produced on site, focusing on promotion and development of off-site manufacture.

3.5 Designing for Flexibility and Deconstruction

Design flexibility has and will be investigated throughout the design process to ensure that where possible products (including buildings) only contain materials that can be recycled and are designed to be easily disassembled. Material efficiency is being considered for the duration and end of life of a building project to produce; flexible, adaptable spaces that enable a resource-efficient, low-waste future change of use; durability of materials and how they can be recovered effectively when maintenance and refurbishment are undertaken and during disassembly/deconstruction.

4.0 DESCRIPTION OF THE PROJECT

4.1 Size and Scale of the Development

The ADP proposes significant upgrades of the existing drainage infrastructure and also the construction of additional infrastructure to supplement the performance of the existing facilities.

It is proposed to achieve this through a series of drainage system enhancement measures and infrastructure proposals. These proposals include the implementation of an enhanced contamination detection and response system, provision of additional pollution storage facilities and the upgrade of the surface water network including the provision of local attenuation facilities. The network enhancements also intend to intercept greenfield inflows, at points upstream of the airport campus, and convey them directly to the receiving waters. This proposal would segregate these clean flows from the potentially contaminated airfield drainage network. It is also proposed to provide upgrades to the network in order to provide the required connectivity to facilitate the proposed segregation of flows as well as alleviating historic capacity issues.

Figure 3.1 Proposed location of site (illustrated by redline boundary)

4.2 Details of the Non-Hazardous Wastes to be produced

Significant groundworks are required at the proposed pipelines and storage tanks (CPCF and West Apron). Large scale open excavations will be required along the routes of the proposed pipelines. At the proposed CPCF tank, a large deep excavation will be required. The estimated volume of excavation for this tank will be 220,000m^3. It is envisaged that the majority (c. 75%) of material will be immediately removed from the site for appropriate offsite reuse, recovery, recycling and / or disposal.

The West Apron Pollution Tank and the West Apron Attenuation Tank also involve large deep excavations with a combined estimated excavation volume of 116,000m^3. It is envisaged that c. 51,000m^3 will be removed from the site for appropriate offsite reuse, recovery, recycling and / or disposal. It is envisaged that the remainder of the excavated material will be reused onsite for backfilling.

During the construction phase there may be a surplus of building materials, such as timber off-cuts, broken concrete blocks, plastics, metals and tiles generated. There may also be excess concrete during construction which will need to be disposed of. Plastic and cardboard waste from packaging and oversupply of materials will also be generated.

Waste will also be generated from construction workers *e.g.* organic/food waste, dry mixed recyclables (waste paper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided onsite during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

4.3 Potential Hazardous Wastes to be Produced

4.3.1 Contaminated Soil

Site investigations were undertaken by Causeway Geotech between July and August 2018.

For consideration of material to be removed from site, a Waste Acceptance Criteria Test Suite of the solid soil samples was completed in line with European Council Directive 1999 131/EC Article 16 Annex II, "Criteria and procedures for the acceptance of waste at landfills".

Of the forty (40 no.) samples assessed, the results indicate that the material is suitable for acceptance at inert landfill.

Previous surveys detected asbestos in existing buildings in the vicinity of North Runway (Farmlands), which is outside the works area. The data available for the existing pipes in the works area do not indicate the presence of asbestos cement (AC) pipes. No works to existing buildings and no demolition works are proposed as part of the construction of the proposed drainage infrastructure. It is therefore not anticipated that Asbestos Containing Material (ACM) will be encountered during the construction works for the proposed drainage infrastructure.

If any potentially contaminated material is encountered, it will need to be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled *'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous'* [18] using the *HazWasteOnline* application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the *EC Council Decision 2003/33/EC* [17], which establishes the criteria for the acceptance of waste at landfills.

If Asbestos or ACMs are identified, the removal of asbestos will be carried out by a suitably qualified contractor in accordance with *S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010.* All asbestos will be taken to a suitably licensed or permitted facility.

4.3.2 Fuel/Oils

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded (or stored in double-skinned tanks) and located in a dedicated, secure area of the site. Provided that these requirements are adhered to and site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil wastage at the site.

4.3.3 Japanese Knotweed and Other Invasive Plant Species

An invasive species survey has been undertaken as part of the Baseline Ecology Report for the EIAR for the proposed development. The Baseline Ecology Report notes that:

'No plant species protected under the Flora Protection Order, and no rare or threatened species identified on the national Red Lists were recorded during field survey. No scheduled invasive non-native plant species were identified. However, winter heliotrope Petasites fragrans*, a low impact, non-scheduled invasive nonnative species, was recorded in the survey areas for South Apron PBZ and in the Eastlands. The non-scheduled, non-native species, Himalayan honeysuckle* Leycesteria formosa *and fuschia* Fuchsia magellanica *were recorded in Airport Roundabout and Corablis Road. Cherry laurel* Prunus laurocerasus*, weigela* Weigela florida *and laurustinus* Viburnum tinus*, were recorded in Old Airport Road. Cherry laurel was also abundant in North Apron Module 2. These non-scheduled invasive and non-native species do not require further mitigation measures*'.

As noted in the Preliminary Construction Environmental Management Plan prepared by Nicholas O'Dwyer, the proposed works areas encroach on a known area of invasive species, Japanese Knotweed, at the south west corner of the development site. Japanese Knotweed (*Fallopia japonica*) is an alien invasive species listed under the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 as amended. A further survey of works areas will be required prior to construction commencing, to assess if there is a risk of causing potential spread of invasive species to other areas.

If Japanese Knotweed or any Third Schedule invasive species are located within the areas of the proposed works an invasive species management plan will be prepared and agreed with in writing with FCC.

4.3.4 Asbestos

It is not envisaged that any Asbestos or Asbestos Containing Material will be encountered onsite as there is no requirement for demolition.

If encountered, however, removal of asbestos or ACMs will be carried out by a suitably qualified contractor and ACMs will only be removed from site by a suitably permitted / licenced waste contractor, in accordance with *S.I. No. 589 of 2010 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010.* All material will be taken to a suitably licensed or permitted facility.

4.3.5 Other Known Hazardous Substances

Paints, glues, adhesives, oily rags, small oil containers and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, WEEE (containing hazardous components), printer toner/cartridges, batteries (Lead, Ni-Cd or Mercury) and/or fluorescent tubes and other mercury containing waste may be generated from during C&D activities or temporary site offices. These wastes (if encountered) will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

5.0 ROLES AND RESPONSIBILITIES

The *Best Practice Guidelines on the Preparation of Resource Waste Management Plans for Construction and Demolition Projects* promotes that a RM should be appointed. The RM may be performed by a number of different individuals over the life-cycle of the Project, however it is intended to be a reliable person chosen from within the Planning/Design/Contracting Team, who is technically competent and appropriately trained, who takes the responsibility to ensure that the objectives and measures within the Project RWMP are complied with. The RM is assigned the requisite authority to meet the objective and obligations of the RWMP. The role will include the important activities of conducting waste checks/audits and adopting construction and demolition methodology that is designed to facilitate maximum reuse and/or recycling of waste.

5.1 Role of the Client

The Client is the body establishing the aims and the performance targets for the project.

- The Client has commissioned the preparation and submission of a RWMP as part of the design and planning submission;
- The Client is to commission the preparation and submission of an updated RWMP as part of the construction tendering process;
- The Client will ensure that the RWMP is agreed on and submitted to the local authority prior to commencement of works on site;
- The Client is to request the end-of-project RWMP from the Contractor.

5.2 Role of the Client Advisory Team

The Client Advisory Team or Design Team is formed of architects, consultants, quantity surveyors and engineers and is responsible for:

- Drafting and maintaining the RWMP through the design, planning and procurement phases of the project;
- Appointing a RM to track and document the design process, inform the Design Team and prepare the RWMP.
- Including details and estimated quantities of all projected waste streams with the support of environmental consultants/scientists. This should also include data on waste types (*e.g.* waste characterisation data, contaminated land assessments, site investigation information) and prevention mechanisms (such as by-products) to illustrate the positive circular economy principles applied by the Design Team;
- Managing and valuing the demolition work with the support of quantity surveyors;
- Handing over of the RWMP to the selected Contractor upon commencement of construction of the development, in a similar fashion to how the safety file is handed over to the Contractor;
- Working with the Contractor as required to meet the performance targets for the project.

5.3 Future Role of the Contractor

The future construction Contractors have not yet been decided upon for this RWMP. However, once selected, they will have major roles to fulfil. They will be responsible for:

- Updating the RWMP, as required, throughout the demolition and construction phases (including the management of all suppliers and sub-contractors) as per the requirements of these guidelines;
- Identifying a designated and suitably qualified RM who will be responsible for implementing the RWMP;
- Identifying all hauliers to be engaged to transport each of the resources / wastes off-site;
- Implementing waste management policies whereby waste materials generated on site are to be segregated as far as practicable;
- Renting and operating a mobile-crusher to crush concrete for temporary reuse onsite during construction and reduce the amount of HGV loads required to remove material from site;
- Applying for the appropriate waste permit to crush concrete onsite;
- Identifying all destinations for resources taken off-site. As above, any resource that is legally classified as a 'waste' must only be transported to an authorised waste facility;
- End-of-waste and by-product notifications addressed with the EPA where required;
- Clarification of any other statutory waste management obligations, which could include on-site processing;
- Full records of all resources (both wastes and other resources) should be maintained for the duration of the project; and
- Preparing a RWMP Implementation Review Report at project handover.

6.0 KEY MATERIALS & QUANTITIES

6.1 Project Resource Targets

Project specific resource and waste management targets for the site have not yet been set and this information should be updated for these targets once these targets have been confirmed by the client. However, it is expected for projects of this nature that a minimum of 70% of waste is fully re-used, recycled or recovered. Target setting will inform the setting of project-specific benchmarks to track target progress. Typical Key Performance Indicators (KPIs) that may be used to set targets include (as per guidelines):

- Weight (tonnes) or volume (m^3) of waste generated per construction value;
- Weight (tonnes) or volume (m^3) of waste generated per construction floor area (m^2);
- Fraction of resource reused on site;
- Fraction of resource notified as by-product;
- Fraction of waste segregated at source before being sent off-site for recycling/recovery; and
- Fraction of waste recovered, fraction of waste recycled, or fraction of waste disposed.
-

6.2 Main C&D Waste Categories

The main non-hazardous and hazardous waste streams that could be generated by the construction and demolition activities at a typical site are shown in Table 6.1. The List of Waste (LoW) code (as effected from 1 June 2015) (also referred to as the European Waste Code or EWC) for each waste stream is also shown.

Table 6.1 Typical waste types generated and EWCs (individual waste types may contain hazardous substances)

Waste Material	LoW/EWC Code
Concrete, bricks, tiles, ceramics	17 01 01-03 & 07
Wood, glass and plastic	17 02 01-03
Treated wood, glass, plastic, containing hazardous substances	17-02-04*
Bituminous mixtures, coal tar and tarred products	17 03 01*, 02 & 03*
Metals (including their alloys) and cable	17 04 01-11
Soil and stones	17 05 03* & 04
Gypsum-based construction material	17 08 01* & 02
Paper and cardboard	20 01 01
Mixed C&D waste	17 09 04
Green waste	20 02 01
Electrical and electronic components	20 01 35 & 36
Batteries and accumulators	20 01 33 & 34
Liquid fuels	13 07 01-10
Chemicals (solvents, pesticides, paints, adhesives, detergents etc.)	20 01 13, 19, 27-30
Insulation materials	17 06 04
Organic (food) waste	20 01 08
Mixed Municipal Waste	20 03 01

6.3 Demolition Waste Generation

There is no demolition associated with the proposed development.

6.4 Construction Waste Generation

Table 6.2 shows the breakdown of C&D waste types produced on a typical site based on data from the EPA *National Waste Reports* [18], *the joint EPA and GMIT study* [19] and other research reports.

Table 6.2 Waste materials generated on a typical Irish construction site

Waste Types	%
Mixed C&D	33
Timber	28
Plasterboard	10
Metals	8
Concrete	6
Other	15
Total	**100**

Table 6.3 shows the predicted construction waste generation for the proposed development based on the information available to date along with the targets for management of the waste streams. The predicted waste amounts are based on an average large-scale development waste generation rate per m^2, using the waste breakdown rates shown in Table 6.2.

Table 6.3 Estimated off-site reuse, recycle and disposal rates for construction waste

Waste Type	Tonnes	Reuse		Recycle/Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	480.0	10	48.0	80	384.0	10	48.0
Metals	581.3	5	29.1	90	523.1	5	29.1
Concrete	3324.0	30	997.2	65	2160.6	5	166.2
Plastic	70.0	20	14.0	79	55.3	1	0.7
Bituminous Materials	598.0	43	257.1	57	340.9	0	0.0
Total	5053.3		1345.4		3463.9		244.0

In addition to the information in Table 6.3, significant groundworks are required at the proposed pipelines and storage tanks (CPCF and West Apron). Large scale open excavations will be required along the routes of the proposed pipelines. At the proposed CPCF tank, a large deep excavation will be required. The estimated volume of excavation for this tank will be 220,000m^3. It is envisaged that the majority (c. 75%) of material will be immediately removed from the site for appropriate offsite reuse, recovery, recycling and / or disposal.

The West Apron Pollution Tank and the West Apron Attenuation Tank also involve large deep excavations with a combined estimated excavation volume of 116,000m^3. It is envisaged that c. 51,000m^3 will be removed from the site for appropriate offsite reuse, recovery, recycling and / or disposal. It is envisaged that the remainder of the excavated material will be reused onsite for backfilling.

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process.

6.5 Proposed Resource Waste Management Options

Waste materials generated will be segregated on site, insofar as possible. Where the on-site segregation of certain waste types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source. The appointed waste contractor will collect and transfer the waste streams as receptacles are filled. There are numerous waste contractors in the FCC Region that provide this service.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit. All waste arisings requiring disposal off-site will be reused, recycled, recovered or disposed of at a facility holding the appropriate registration, permit or licence, as required.

Some of the sub-contractors on site will generate waste in relatively low quantities. The transportation of non-hazardous waste by persons who are not directly involved with the waste business, at weights less than or equal to 2 tonnes, and in vehicles not designed for the carriage of waste, are exempt from the requirement to have a waste collection permit (Ref. Article 30 (1) (b) of the Waste Collection Permit Regulations 2007 as amended). Any sub-contractors engaged that do not generate more than 2 tonnes of waste at any one time can transport this waste offsite in their work vehicles (which are not designed for the carriage of waste). However, they are required to ensure that the receiving facility has the appropriate COR / permit / licence.

Written records will be maintained by the contractor(s) detailing the waste arising throughout the C&D phases, the classification of each waste type, waste collection

permits for all waste contactors who collect waste from the site and COR/permit or licence for the receiving waste facility for all waste removed off site for appropriate reuse, recycling, recovery and/or disposal.

Dedicated bunded storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals, *etc*, if required.

The management of the main waste streams is outlined as follows:

Top Soil & Sub Soil

The waste hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling/recovery, energy recovery (*i.e.* incineration) and, least favoured of all, disposal. The excavations are required to facilitate construction works so while prevention cannot be accommodated, minimisation will be achieved through the on-site reuse of excavated materials.

It is anticipated that c. 75% of material excavated for the CPCF tank (c. 165,000 m^3), and c. 44% of material excavated for the West Apron Pollution Tank and the West Apron Attenuation (c. 51,000 m^3) will be immediately removed from the site for appropriate offsite reuse, recovery, recycling and/or disposal. When this material is removed off-site it could be reused as a by-product (and not as a waste). If this is done, it will be done in accordance with Regulation 27 (By-products), as amended, of S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2011-2020, (Previously Article 27 of the European Communities (Waste Directive) and referred to as Article 27 in this report), which requires that certain conditions are met and that by-product notifications are made to the EPA via their online notification form. The potential to reuse material as a by-product will be confirmed during the course of the excavation works, with the objective of eliminating any unnecessary disposal of material.

The next option (beneficial reuse) may be appropriate for the excavated material pending environmental testing to classify the material as hazardous or non-hazardous in accordance with the EPA *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* publication. Clean inert material may be used as fill material in other construction projects or engineering fill for waste licensed sites. Beneficial reuse of surplus excavation material as engineering fill may be subject to further testing to determine if materials meet the specific engineering standards for their proposed end-use.

Any nearby sites requiring clean fill/capping material will be contacted to investigate reuse opportunities for clean and inert material. If any of the material is to be reused on another site as a by-product (and not as a waste), this will be done in accordance with Article 27. Similarly, if any soils/stones are imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27. Article 27 will be investigated to see if the material can be imported onto this site for beneficial reuse instead of using virgin materials.

If the material is deemed to be a waste, then removal and reuse/recovery/disposal of the material will be carried out in accordance with the *Waste Management Act 1996* as amended, the *Waste Management (Collection Permit) Regulations 2007* as amended and the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended. Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any non-hazardous material. It will

require off-site treatment at a suitable facility or disposal abroad via Transfrontier Shipment of Wastes (TFS).

Bedrock
It is not anticipated that bedrock will be encountered during the excavation phase of this development. However, if encountered it is envisaged that all bedrock will be removed offsite and will not be crushed onsite unless the appropriate waste permit is obtained from FCC.

Silt & Sludge
During the construction phase, silt and petrochemical interception should be carried out on runoff and pumped water from site works, where required. Sludge and silt will then be collected by a suitably licensed contractor and removed offsite.

Concrete Blocks, Bricks, Tiles & Ceramics
The majority of concrete blocks, bricks, tiles and ceramics generated as part of the construction works are expected to be clean, inert material and should be recycled, where possible.

Hard Plastic
As hard plastic is a highly recyclable material, much of the plastic generated will be primarily from material off-cuts. All recyclable plastic will be segregated and recycled, where possible.

Timber
Timber that is uncontaminated, *i.e.* free from paints, preservatives, glues *etc.*, will be disposed of in a separate skip and recycled off-site.

Metal
Metals will be segregated into mixed ferrous, aluminium cladding, high grade stainless steel, low grade stainless steel etc., and stored in skips. Metal is highly recyclable and there are numerous companies that will accept these materials.

Plasterboard
There are currently a number of recycling services for plasterboard in Ireland. Plasterboard from the construction phase will be stored in a separate skip, pending collection for recycling. The site manager will ensure that oversupply of new plasterboard is carefully monitored to minimise waste.

Glass
Glass materials will be segregated for recycling, where possible.

Waste Electrical and Electronic Equipment (WEEE)
Any WEEE will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling.

Other Recyclables
Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed off-site.

Non-Recyclable Waste
C&D waste that is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be examined by a member of the waste team (see Section 9.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

Other Hazardous Wastes

On-site storage of any hazardous wastes produced (*i.e.* contaminated soil if encountered and/or waste fuels) will be kept to a minimum, with removal off-site 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.

It should be noted that until a construction contractor is appointed it is not possible to provide information on the specific destinations of each construction waste stream. Prior to commencement of construction and removal of any construction waste offsite, details of the proposed destination of each waste stream will be provided to FCC by the project team.

6.6 Tracking and Documentation Procedures for Off-Site Waste

All waste will be documented prior to leaving the site. Waste will be weighed by the contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the nominated project RM (see Section 9.0).

All movement of waste and the use of waste contractors will be undertaken in accordance with the *Waste Management Act 1996* as amended, *Waste Management (Collection Permit) Regulations 2007* as amended and *Waste Management (Facility Permit & Registration) Regulations 2007* and amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The nominated project RM (see Section 9.0) will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority waste COR/permit or EPA Waste/IE Licence for that site will be provided to the nominated project RM (see Section 9.0). If the waste is being shipped abroad, a copy of the Transfrontier Shipping (TFS) notification document will 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 (COR, permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

All information will be entered in a waste management recording system to be maintained on site.

7.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below.

The total cost of C&D waste management will be measured and will take into account handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

7.1 Reuse

By reusing materials on site, there will be a reduction in the transport and recycle/recovery/disposal costs associated with the requirement for a waste contractor to take the material off-site.

Clean and inert soils, gravel, stones *etc.* that cannot be reused on site may be used as access roads or capping material for landfill sites, *etc.* This material is often taken free of charge or a reduced fee for such purposes, reducing final waste disposal costs.

7.2 Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips.

Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will charge considerably less to take segregated wastes, such as recyclable waste, from a site than mixed waste.

Timber can be recycled as chipboard. Again, waste contractors will charge considerably less to take segregated wastes such as timber from a site than mixed waste.

7.3 Disposal

Landfill charges in the Leinster region are currently at around €130 - €150 per tonne which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015*. In addition to disposal costs, waste contractors will also charge a collection fee for skips.

Collection of segregated C&D waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a licensed or permitted facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill. Clean soil, rubble, etc. is also used as fill/capping material, wherever possible.

8.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the project RM to ensure commitment, operational efficiency and accountability during the C&D phases of the project.

8.1 Resource Manager Training and Responsibilities

The nominated RM will be given responsibility and authority to select a waste team if required, *i.e.* members of the site crew that will aid them in the organisation, operation and recording of the waste management system implemented on site. The RM will have overall responsibility to oversee, record and provide feedback to the client on everyday waste management at the site. Authority will be given to the RM to delegate responsibility to sub-contractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The RM will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The RM will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this RWMP.

8.2 Site Crew Training

Training of site crew is the responsibility of the RM and, as such, a waste training program should be organised. A basic awareness course will be held for all site crew to outline the RWMP and to detail the segregation of waste materials at source. This

may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the Waste Storage Areas (WSAs). A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

9.0 TRACKING AND TRACING / RECORD KEEPING

Records should be kept for all waste material which leaves the site, either for reuse on another site, recycling or disposal. A recording system will be put in place to record the waste arisings on site.

A waste tracking log should be used to track each waste movement from the site. On exit from the site the waste collection vehicle driver should stop at the site office and sign out as a visitor and provide the security personnel or RM with a waste docket (or Waste Transfer Forms (WTF) for hazardous waste) for the waste load collected. At this time, the security personnel should complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by e.g. Contractor or subcontractor
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC/LoW

The waste vehicle will be checked by security personal or the RM to ensure it has the waste collection permit number displayed and a copy of the waste collection permit in the vehicle before they are allowed to remove the waste from the site.

The waste transfer dockets will be transferred to the RM on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the FCC Waste Regulation Unit when requested.

Each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets / WTF maintained on file and available for inspection on site by the main contractor as required. These subcontractor logs will be merged with the main waste log.

Waste receipts from the receiving waste facility will also be obtained by the site contractor(s) and retained. A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times and will be periodically reviewed by the RM. Subcontractors who have engaged their own waste contractors, should provide the main contractor with a copy of the waste collection permits and COR / permit / licence for the receiving waste facilities and maintain a copy on file, available for inspection on site as required.

A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be sent to the FCC Waste Regulation Unit prior to any material being removed from site.

10.0 OUTLINE WASTE AUDIT PROCEDURE

10.1 Responsibility for Waste Audit

The appointed RM will be responsible for conducting a waste audit at the site during the C&D phase of the development. Contact details for the nominated RM will be provided to the FCC Waste Regulation Unit after the main contractor is appointed and prior to any material being removed from site.

10.2 Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported off-site should be undertaken mid-way through the project. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system has not been maintained. The waste records will be compared with the established recovery/reuse/recycling targets for the site.

Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

Waste management costs will also be reviewed.

Upon completion of the construction phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total recycling/reuse/recovery figures for the development.

11.0 CONSULTATION WITH RELEVANT BODIES

11.1 Local Authority

Once construction contractors and waste contractors have been appointed, and prior to removal of any C&D waste materials offsite, details of the proposed destination of each waste stream will be provided to the FCC Waste Regulation Unit.

FCC will also be consulted, as required, throughout the excavation and construction phases in order to ensure that all available waste reduction, reuse and recycling opportunities are identified and utilised and that compliant waste management practices are carried out.

11.2 Recycling/Salvage Companies

Companies that specialise in C&D waste management will be contacted to determine their suitability for engagement. Where a waste contractor is engaged, each company will be audited in order to ensure that relevant and up-to-date waste collection permits and facility COR/permits/licences are held. These permit details will be sent to the FCC Waste Regulation Unit. In addition, information regarding individual construction materials will be obtained, including the feasibility of recycling each material, the costs of recycling/reclamation and the means by which the wastes will be collected and transported off-site, and the recycling/reclamation process each material will undergo off site.

12.0 REFERENCES

1. Waste Management Act 1996 (No. 10 of 1996) as amended.
2. Environmental Protection Agency Act 2003 1992 as amended.
3. Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended.
4. Eastern-Midlands Region Waste Management Plan 2015 – 2021 (2015).
5. Department of Environment and Local Government (DoELG) *Waste Management – Changing Our Ways, A Policy Statement* (1998).
6. Forum for the Construction Industry – *Recycling of Construction and Demolition Waste.*
7. Department of Communications, Climate Action and Environment (DCCAE), *Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025* (Sept 2020).
8. DCCAE, *Whole of Government Circular Economy Strategy 2022-2023 'Living More, Using Less'* (2021).
9. Circular Economy and Miscellaneous Provisions Act 2022.
10. Environmental Protection Agency (EPA) *'Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects' (2021).*
11. Department of Environment, Heritage and Local Government, *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects* (2006).
12. FÁS and the Construction Industry Federation (CIF), *Construction and Demolition Waste Management – a handbook for Contractors and* site *Managers* (2002).
13. Fingal County Council (FCC), Fingal Development Plan 2017-2023 (2017).
14. FCC, Draft Fingal Development Plan 2023-2029 (2023).
15. Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended.
16. EPA, *Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous* (2015).
17. 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.
18. Environmental Protection Agency (EPA), *National Waste Database Reports 1998 – 2020.*
19. EPA and Galway-Mayo Institute of Technology (GMIT), *EPA Research Report 146 – A Review of Design and Construction Waste Management Practices in Selected Case Studies – Lessons Learned* (2015).

Technical Appendix 16:
Archaeology & Cultural Heritage

NICHOLAS O'DWYER

daa

Appendix 16.1

Summary of Relevant Legislation

NICHOLAS O'DWYER

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National Monuments Legislation (1930-2004)

The National Monument Act, 1930 (as amended) provides the formal legal mechanism to protect monuments in Ireland. Protection of a monument is provided via:

- Record of Monuments and Places (RMP);
- National Monument in the ownership or guardianship of the Minister for Arts, Heritage, Regional, Rural & Gaeltacht Affairs or a Local Authority;
- National Monument subject to a Preservation Order (or temporary Preservation Order);
- National Monument subject to a Preservation Order (or temporary Preservation Order);
- Register of Historic Monuments (RHM).

The definition of a monument is specified as:

any artificial or partly artificial building, structure or erection or group of such buildings, structures or erections;

- any artificial cave, stone or natural product, whether forming part of the ground, that has been artificially carved, sculptured or worked upon or which (where it does not form part of the place where it is) appears to have been purposely put or arranged in position;
- any, or any part of any, prehistoric or ancient tomb, grave or burial deposit, or (ii) ritual, industrial or habitation site; and
- any place comprising the remains or traces of any such building, structure or erection, any cave, stone or natural product or any such tomb, grave, burial deposit or ritual, industrial or habitation site.

Under Section 14 of the Principal Act (1930):

It shall be unlawful...

to demolish or remove wholly or in part or to disfigure, deface, alter, or in any manner injure or interfere with any such national monument without or otherwise than in accordance with the consent hereinafter mentioned (a licence issued by the Office of Public Works National Monuments Branch),

or

to excavate, dig, plough or otherwise disturb the ground within, around, or in the proximity to any such national monument without or otherwise than in accordance...

Under Amendment to Section 23 of the Principal Act (1930):

A person who finds an archaeological object shall, within four days after the finding, make a report of it to a member of the Garda Síochána...or the Director of the National Museum...

The latter is of relevance to any finds made during a watching brief.

In the 1994 Amendment of Section 12 of the Principal Act (1930), all the sites and 'places' recorded by the Sites and Monuments Record of the Office of Public Works are provided with a new status in law. This new status provides a level of protection to the listed sites that is equivalent to that accorded to 'registered' sites [Section 8(1), National Monuments Amendment Act 1954] as follows:

The Commissioners shall establish and maintain a record of monuments and places where they believe there are monuments and the record shall be comprised of a list of monuments and such places and a map or maps showing each monument and such place in respect of each county in the State.

The Commissioners shall cause to be exhibited in a prescribed manner in each county the list and map or maps of the county drawn up and publish in a prescribed manner information about when and where the lists and maps may be consulted.

In addition, when the owner or occupier (not being the Commissioners) of a monument or place which has been recorded, or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Commissioners and shall not, except in the case of urgent necessity and with the consent of the Commissioners, commence the work for a period of two months after having given the notice.

The National Monuments Amendment Act enacted in 2004 provides clarification in relation to the division of responsibilities between the Minister of Environment, Heritage and Local Government, Finance and Arts, Sports and Tourism together with the Commissioners of Public Works. The Minister of Environment, Heritage and Local Government will issue directions relating to archaeological works and will be advised by the National Monuments Section and the National Museum of Ireland. The Act gives discretion to the Minister of Environment, Heritage and Local Government to grant consent or issue directions in relation to road developments (Section 49 and 51) approved by An Bord Pleanála and/or in relation to the discovery of National Monuments.

14A. (1) The consent of the Minister under section 14 of this Act and any further consent or licence under any other provision of the National Monuments Acts 1930 to 2004 shall not be required where the works involved are connected with an approved road development.

14A. (2) Any works of an archaeological nature that are carried out in respect of an approved road development shall be carried out in accordance with the directions of the Minister, which directions shall be issued following consultation by the minister with the Director of the National Museum of Ireland.

Subsection 14A (4) Where a national monument has been discovered to which subsection (3) of this section relates, then the road authority carrying out the road development shall report the discovery to the Minister subject to subsection (7) of this section, and pending any directions by the Minister under paragraph (d) of this subsection, no works which would interfere with the monument shall be carried out, except works urgently required to secure its preservation carried out in accordance with such measures as may be specified by the Minister.

The Minister will consult with the Director of the National Museum of Ireland for a period not longer than 14 days before issuing further directions in relation to the national monument.

The Minister will not be restricted to archaeological considerations alone, but will also consider the wider public interest.

Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999

This Act provides for the establishment of a national inventory of architectural heritage and historic monuments.

Section 1 of the act defines "architectural heritage" as:

(a) all structures and buildings together with their settings and attendant grounds, fixtures and fittings,

(b) groups of such structures and buildings, and,

(c) sites

which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

Section 2 of the Act states that the Minister (for Arts, Heritage, Gaeltacht and the Islands) shall establish the NIAH, determining its form and content, defining the categories of architectural heritage, and specifying to which category each entry belongs. The information contained within the inventory will be made available to planning authorities, having regard to the security and privacy of both property and persons involved.

Section 3 of the Act states that the Minister may appoint officers, who may in turn request access to premises listed in the inventory from the occupiers of these buildings. The officer is required to inform the occupier of the building why entry is necessary, and in the event of a refusal, can apply for a warrant to enter the premises.

Section 4 of the Act states that obstruction of an officer or a refusal to comply with requirements of entry will result in the owner or occupier being guilty of an offence.

Section 5 of the Act states that sanitary authorities who carry out works on a monument covered by this Act will as far as possible preserve the monument with the proviso that its condition is not a danger to any person or property, and that the sanitation authority will inform the Minister that the works have been carried out.

The provisions in the Act are in addition to and not a substitution for provisions of the National Monument Act (1930–94), and the protection of monuments in the National Monuments Act is extended to the monuments covered by the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act (1999).

Appendix 16.2

Methodology

Glossary of Impacts

Types of Impacts

Potential impacts on the receiving cultural heritage[1] environment can be described as direct physical impacts, indirect physical impacts, and impacts on setting (i.e. the surroundings in which a cultural heritage asset can be experienced; Historic England 2017).

Direct physical impacts are those development activities that directly cause damage to the fabric of a cultural heritage asset. Typically, these activities are related to construction works (e.g. they could include excavation of foundations, earthmoving / site preparation creation of access roads, cycle paths, and the excavation of service trenches).

Indirect physical impacts are those processes, triggered by development activity, that lead to the degradation of cultural heritage assets.

Impacts on the setting of cultural heritage assets describe how the presence of a development changes the surroundings of an asset in such a way that it affects (positively or negatively) the heritage significance of that asset. Visual impacts are most commonly encountered. Such impacts may be encountered at all stages in the life cycle of a development, but they are only likely to be considered significant during the prolonged operational life of the development.

Types of impact (now referred to as effects), as defined by the EPA Guidelines on Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022):

- *Cumulative Impact* – The addition of many minor or insignificant effects, including effects of other projects, to create larger, more significant, effects.
- *Do Nothing Impact* – The environment as it would be in the future should the subject project not be carried out.
- *Indeterminable Impact* – When the full consequences of a change in the environment cannot be described.
- Irreversible Impact – When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.
- *Residual Impact* – The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
- '*Worst case' Impact* – The effects arising from a project in the case where mitigation measures substantially fail; and
- *Indirect or Secondary Impacts* – Effects on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.

[1] Cultural Heritage includes archaeology, architectural heritage, and folklore and history

Quality of Impacts

Impacts on the cultural heritage environment are assessed in terms of their quality, i.e. positive, negative, neutral:

- Negative Impact: A change that will detract from or permanently remove an cultural heritage asset from the landscape;
- Neutral Impact: A change that does not affect cultural heritage; and
- Positive Impact: A change that improves or enhances the setting of a cultural heritage asset.

Duration of Impacts

The duration of an impact can be as follows:

- Temporary Impact: Impact lasting for one year or less;
- Short-term Impact: Impact lasting one to seven years;
- Medium-term Impact: Impact lasting seven to fifteen years;
- Long-term Impact: Impact lasting fifteen to sixty years; and
- Permanent Impact: Impact lasting over sixty years.

Assessment Methodology

Introduction

This assessment methodology has regard to the EPA assessment criteria (EPA 2022) and to the National Roads Authority (NRA) Guidelines for the Assessment of Archaeological Heritage Impact of National Road Schemes (hereafter referred to as the NRA Guidelines) (NRA 2005).

Cultural heritage sites are a non-renewable resource and such assets are generally considered to be location sensitive. In this context, any change to their environment, such as construction activity and ground disturbance works, could adversely affect these sites.

Significance / Sensitivity Criteria

In accordance with EPA Guidelines (EPA 2022), the context, character, significance and sensitivity of each cultural heritage asset requires evaluation and the significance of the impact is then determined by considering the significance / sensitivity of the asset and the predicted magnitude of the impact.

The significance / sensitivity can be ascertained by looking at the following criteria: the existing status (level of protection), condition or preservation, documentation or historical significance, group value, rarity, visibility in the landscape, fragility or vulnerability, and amenity value (Table A1). While these criteria contribute to the significance of a feature they should not be treated as definitive. These criteria are indicators which contribute to a wider judgement based on the individual circumstances of these cultural heritage assets.

Table A1: Explanation of Cultural Heritage Asset Assessment Criteria

Criteria	Explanation
Existing Status	The level of protection associated with a cultural heritage asset is an important consideration.
Condition / Preservation / Integrity	The survival of a cultural heritage asset's archaeological potential both above and below ground is an important consideration and should be assessed in relation to its present condition and surviving features. Well-preserved sites should be highlighted, this assessment can only be based on a field inspection.
Documentation / Data	The significance of a a cultural heritage asset may be enhanced by the existence of records of previous investigations or contemporary documentation supported by written evidence or historic maps. Sites with a definite historical association or an example of a notable event or person should be highlighted.
Group Value / Character	The value of a single a cultural heritage asset may be greatly enhanced by its association with related contemporary monuments or with monuments from different periods indicating an extended time presence in any specific area. In some cases it may be preferable to protect the complete group, including associated and adjacent land, rather than to protect isolated monuments within that group.
Rarity / Character	The rarity of some a cultural heritage asset types can be a central factor affecting response strategies for development, whatever the condition of the individual feature. It is important to recognise sites that have a limited distribution.
Visibility in the landscape/ Character / Integrity	Cultural heritage assets that are highly visible in the landscape have a heightened physical presence. The inter-visibility between monuments may also be explored in this category.
Fragility / Vulnerability / Integrity	It is important to assess the level of threat to a cultural heritage asset from erosion, natural degradation, agricultural activity, land clearance, neglect, careless treatment or development.
Amenity Value / Character	Regard should be taken of the existing and potential amenity value of a a cultural heritage asset.

An evaluation of the significance / sensitivity of cultural heritage assets is based on their designation and on the extent to which these assets contribute to the cultural heritage environment, though their individual or group qualities, either directly or potentially. Table A2 presents the scale of significance / sensitivity together with criteria. It has been compiled by Courtney Deery Heritage Consultancy Ltd, based on standard authorities and guidelines as listed at the end of this appendix. Undesignated cultural heritage sites can be assigned a low, medium or high sensitivity value, taking into consideration the criteria cited in Table A1 (e.g. condition, character, integrity or preservation, data, group value, rarity, visibility in the landscape, fragility or vulnerability, and amenity value).

Table A2: Significance / Sensitivity criteria

Sensitivity / Significance	Criteria
Very high	World Heritage Properties and properties on the Tentative List. Built heritage assets, historic gardens and designed landscapes rated as being of international importance by the National Inventory of Architectural Heritage (NIAH).
High	National Monuments. Protected Structures, built heritage assets, historic gardens and designed landscapes, rated as being of national importance by the NIAH, and structures within an Architectural Conservation Area (ACA). Undesignated cultural heritage sites considered to be of national importance.
Medium	Recorded Monuments (RMP sites, and SMR sites scheduled for inclusion in the next revision of the RMP). Protected Structures / NIAH sites and ACAs. Newly identified archaeological sites, confirmed through archaeological investigation, to be added to the SMR. Undesignated cultural heritage sites considered to be of regional importance.
Low	Assets compromised by poor preservation and/or poor survival of contextual associations. Sites listed in the County or City Industrial Heritage Records, Record of Protected Structures (RPS) and NIAH Building for which there are no upstanding remains. Upstanding sites listed in the County or City Industrial Heritage Records considered to be of local importance. Undisturbed greenfield areas and riverine environs, which have an inherent archaeological potential. Undesignated cultural heritage sites considered to be of local importance.
Negligible	Assets with very little or no surviving cultural heritage interest.
Unknown	The importance of the asset has not yet been ascertained (e.g. a LiDAR or geophysical survey feature that may or may not be archaeological). In such cases, the significance of effect will be 'Indeterminable'.

Table A3: Description of Criteria

Criteria	Description
World Heritage Properties	World Heritage Properties as designated by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and properties on the Tentative List.
National Monuments	The National Monuments Act (1930, Section 2) defines a 'National Monument' as 'a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto'. The National Monuments legislation legally protects access to and the visual amenity associated with National Monuments and requires consent from the Minister for invasive works in their vicinity.
Recorded Monuments	The primary source of information for archaeology is the Record of Monuments and Places (RMP) maintained by the Department of Housing, Local Government and Heritage (DHLGH). The RMP documents known upstanding archaeological monuments, their original location (in cases of destroyed monuments) and the position of possible sites in rural areas identified as cropmarks on vertical aerial photographs dating to before 1700 AD (with some

Criteria	Description
	later ones also being included). It is based on a comprehensive range of published and publicly available documentary and cartographic sources. For the purpose of the assessment, the Sites and Monument Record (SMR) data and mapping as updated by the Archaeological Survey of Ireland (www.archaeology.ie) was also examined.
Protected Structures	A 'Protected Structure' is a structure that a planning authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social, or technical point of view and is included in its Record of Protected Structures (RPS). It may be a building or part of a building which is of significance because of its architectural or artistic quality, or its setting, or because of its association with commercial, cultural, economic, industrial, military, political, social, or religious history.
Architectural Conservation Areas	An Architectural Conservation Area (ACA) is a place, area, group of structures or townscapes that is of special interest and that has been afforded statutory protection by the planning authority in accordance with Section 81 of the Planning & Development Act.
NIAH	The National Inventory of Architectural Heritage (NIAH) is a state initiative established on a statutory basis, to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. NIAH surveys provide the basis for the recommendations of the Minister for Housing, Local Government and Heritage to the planning authorities for the inclusion of particular structures in their Record of Protected Structures (RPS).
Undesignated Sites	Newly identified archaeological sites that have been confirmed through archaeological investigation (monitoring, testing, excavation, geophysical survey) are considered to be of medium importance. Such sites are undesignated as they have yet to be added to the SMR.
	Potential or undesignated cultural heritage sites identified through aerial photography, historic mapping, stray finds are considered to be of low sensitivity, as they have yet to be ground-truthed through archaeological investigation. Similarly, undisturbed greenfield areas and riverine environs, which have an inherent but as yet unproven archaeological potential are considered to be of low sensitivity.
	Zones of archaeological potential (ZAP) can be defined as areas within the urban and rural landscape that possess the potential to contain archaeological remains due to the settlement history of a place and or to the presence of topographical features such as rivers, lakes and high, defendable ground
	Sites / features recorded in county / city industrial heritage surveys, where these are not designated assets.

Magnitude of Impact

When assessing the impact magnitude, the following criteria need to be considered:

- Extent – size, scale and spatial distributions of the impact;
- Duration – period of time over which the impact will occur;
- Frequency – how often the impact will occur; and
- Context – how will the extent, duration and frequency contrast with the accepted baseline conditions (see Table A1).

Table A4: Magnitude of Impact Criteria

Impact Magnitude	Criteria
High	These impacts arise where a cultural heritage asset is completely and irreversibly destroyed by a proposed development. A change such that the value of the asset is totally altered or destroyed, leading to a complete loss of character, integrity and data about the site.
Medium	An impact which, by its magnitude, duration or intensity alters an important / significant aspect of the environment. An impact like this would be where a cultural heritage asset would be impacted upon leading to a significant loss of character, integrity and data about the site. Or an impact which by its magnitude results in the partial loss of a historic structure (including fabric loss or alteration) or grounds including the part removal of buildings or features or part removal of demesne land (e.g. severance, visual intrusion or degradation of setting and amenity). A permanent positive impact that enhances or restores the character and / or setting of an upstanding cultural heritage site in a clearly noticeable manner.
Low	A low impact arises where a change to the site is proposed which though noticeable is not such that the cultural heritage character / integrity of the site is significantly compromised, and where there is no significant loss of data about the site. A positive impact that results in partial enhancement of the character and / or setting of an upstanding cultural heritage site in the medium to long-term.
Negligible	An impact which causes very minor changes in the character of the environment and does not directly impact a cultural heritage asset, or affect the appreciation or significance of the asset. There would be very minor changes to the character and integrity of the asset and no loss of data about the site.

Significance of Effect

The EPA Revised Guidelines on the Information to be Contained in Environmental Impact Statements (EIS) (EPA 2017) contained two additional levels of significance of effect: Very Significant and Not Significant (Table A5 and Figure A1). These levels have been retained in the current EPA Guidelines (2022).

Table 5: Significance of Effects (EPA 2022)

Significance of Impact	Description
Very Significant	An impact which by its character, magnitude, duration or intensity significantly alters the majority of a sensitive aspect of the environment, for example in this case a monument
Not Significant	An impact which causes noticeable changes in the character of the environment but without noticeable consequences.

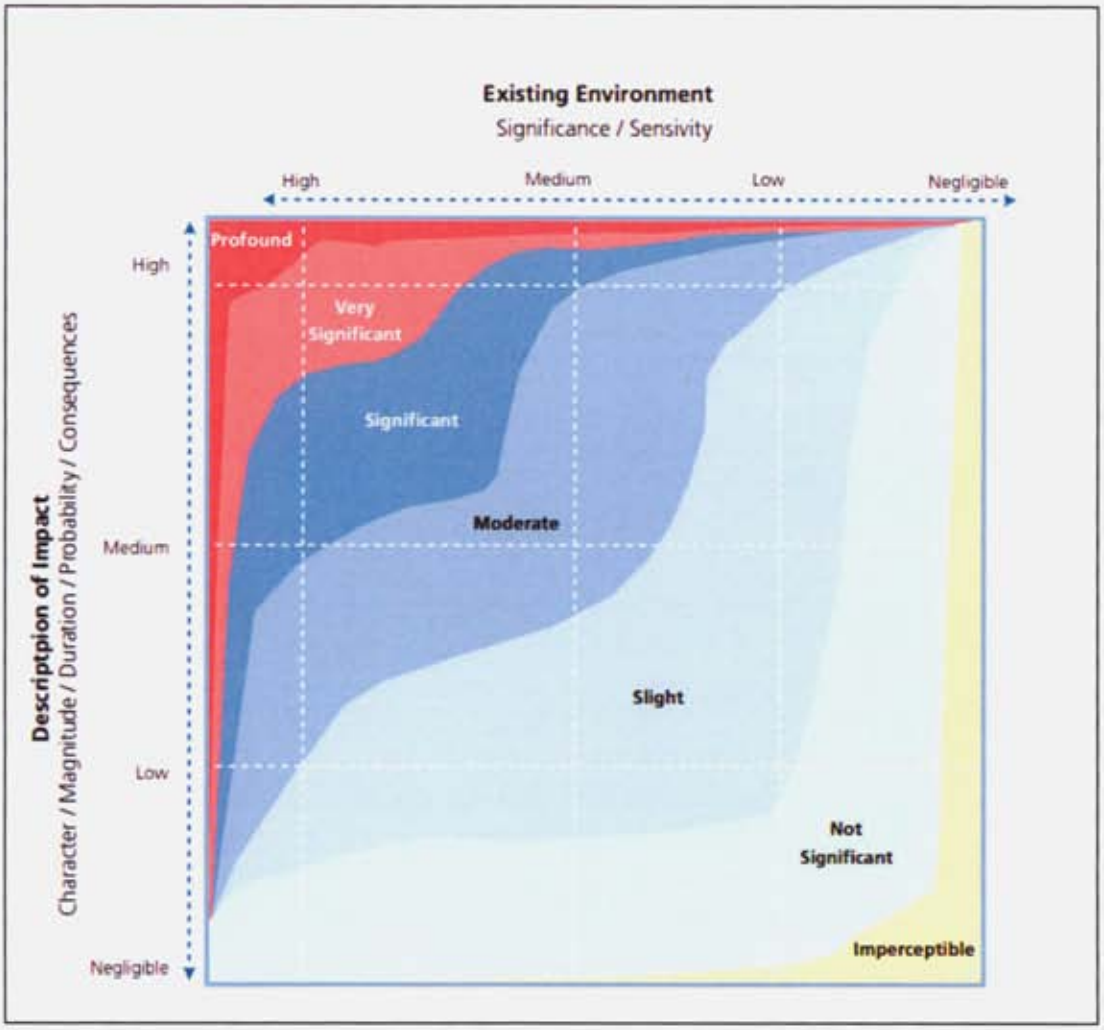

Figure A1: Chart Showing Typical Classifications of the Significance of Effects, from the EPA Guidelines on Information to be Contained in EIAR (Figure 3.4 in EPA 2022).

The likely significance of impacts is determined by considering the baseline rating or sensitivity value of the asset upon which the impact has an impact and the magnitude of the impact (Figure A1). The impact significance is defined as Imperceptible, Not Significant, Slight, Moderate, Significant, Very Significant, or Profound (Table A5).

Table 5: Defining Significance of Effects

Impact	Definition
Imperceptible	An impact capable of measurement but without noticeable consequences.
Not Significant	An impact which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An impact which causes minor changes in the character of the environment and does not affect a cultural heritage asset in a moderate or significant manner.
Moderate	A moderate impact arises where a change to the site is proposed which though noticeable, does not lead to a significant loss of character, integrity and data about the cultural heritage asset.
Significant	An impact which, by its magnitude, duration or intensity, alters an important aspect of the environment. An impact like this would be where part or all of a

	site would be permanently impacted upon, leading to a significant loss of character, integrity and data about the cultural heritage asset.
Very Significant	An impact which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	Applies where mitigation would be unlikely to remove adverse impacts. Reserved for adverse, negative impacts only. These impacts arise where a cultural heritage asset is completely and irreversibly destroyed by a proposed development.

Relevant Guidelines and Standards

EPA (2015). Revised Guidelines on the information to be contained in Environmental Impact Statements, Draft September 2015.

EPA (2022). Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Historic England (2017). The Setting of Heritage Assets. Historic Environment Good Practice Advice in Planning No. 3 (Second Edition). Historic England.

National Monuments Act, 1930 to 2014.

National Roads Authority (NRA) (2005). Guidelines for the Assessment of Architectural Heritage Impact of National Road Schemes.

NRA (2005). Guidelines for the Assessment of Archaeological Heritage Impact of National Road Schemes.

Permanent Delegation of Ireland to the OECD and UNESCO (2010). UNESCO World Heritage Tentative List [Online]. Available from https://whc.unesco.org/en/tentativelists/5523/

Code of Practice for Archaeology agreed between the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs and Transport Infrastructure Ireland, 2017.

Code of Practice for Archaeology agreed between the Minister for Environment, Heritage and Local Government and EirGrid, 2009.

Council of Europe (2005). Framework Convention on the Value of Cultural Heritage for Society, 'Faro Convention'.

EirGrid (2015). Cultural Heritage Guidelines for Electricity Transmission Projects: A Standard Approach to Archaeological, Architectural and Cultural Heritage Impact Assessment of High Voltage Transmission Projects. EirGrid.

Department of Arts, Heritage, Gaeltacht and the Islands (1999). Framework and Principles for the Protection of the Archaeological Heritage.

DAHG (2015). National Landscape Strategy for Ireland 2015-2025.

Department of Arts, Heritage and the Gaeltacht (2011). Architectural Heritage Protection Guidelines for Planning Authorities.

Technical Appendix 17: Landscape and Visual Amenity

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Appendix 17.1

Methodology

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APPENDIX 1: METHODOLOGY

Introduction

1. "*Landscape and Visual Impact Assessment is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and people's views and visual amenity.*" (GLVIA3, paragraph 1.1). Wherever possible, identified effects are quantified, but the nature of landscape and visual assessment requires interpretation using professional judgement. In order to provide a level of consistency to the assessment, the prediction of magnitude and assessment of significance of the residual landscape and visual effects have been based on pre-defined criteria.

2. Guidelines for Landscape and Visual Assessment (Third Edition) (GLVIA3) states that "*professional judgement is a very important part of the LVIA*" (paragraph 2.23) and that "*in all cases there is a need for the judgements that are made to be reasonable and based on clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others.*" (paragraph 2.24).

3. Landscape and Visual Assessments are separate, though linked processes which GLVIA3 notes are "*related but very different considerations*". The assessment of the potential effect on the landscape is carried out as an effect on the environmental resource (i.e. the landscape). Visual effects are assessed as an inter-related effect on people.

4. Landscape effects derive from changes in the physical landscape elements which may give rise to changes in its distinctive character and how this is experienced, including consideration of aesthetic and perceptual aspects.

5. Visual effects relate to changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes and to the overall effects with respect to visual amenity.

Establishing the Baseline

6. The **baseline** for consideration of landscape and visual effects is evaluated through desk study and site work and is the current situation at the time of the assessment, unless noted otherwise. Operational developments and those under construction are considered as part of the baseline and included as part of the assessment of landscape and visual effects.

7. The **future baseline** is considered to be changes to the landscape which are considered certain or likely to happen – including consented proposals which are not yet present in the landscape but are expected to be constructed. These may or may not be included as part of the landscape and visual baseline depending on individual project circumstances and the approach and reasoning is set out within the assessment.

8. For mineral workings the precise baseline for each assessment is stated and ideally agreed with the Local Planning Authority.

Landscape Effects

9. The starting point for any assessment is a desk-based assessment of published landscape studies, which may include landscape character assessments, sensitivity and capacity studies and/or landscape designation reviews. These documents are listed in the assessment references and relevant extracts may be included as appendices where this is judged appropriate.

10. The landscape effects of the proposed development are considered against the key characteristics of the receiving landscape. The degree to which the proposed development changes "*distinct and recognisable pattern of elements, or characteristics, in the landscape that make one landscape different from another, rather than better or worse*" ('An Approach to Landscape Character Assessment', Natural England, 2014), enables a judgement to be made as to the significance of the effect in landscape character terms.

11. Direct and indirect landscape effects are defined in GLVIA3. Direct effects may be defined as resulting *"directly from the development itself"* (paragraph 3.22). An indirect (or secondary) effect is one that results *"from consequential change resulting from the development"* (paragraph 3.22) and is often produced away from the site of the proposed development or as a result of a complex pathway or secondary association. The direct or physical landscape effects of the proposed development would generally be limited to within the planning application boundary. The indirect landscape effects are concerned with the visual effects and relate to effects associated with the introduction of the development seen in the context of the existing landscape and visual character of the view.

12. In order to reach an understanding of the effects of development upon the landscape resource it is necessary to consider different aspects of the landscape baseline including:

    - **Landscape Fabric/Elements**: The individual features of the landscape, such as hills, valleys, woods, hedges, tree cover, vegetation, buildings and roads for example which can usually be described and quantified.
    - **Landscape key characteristics**: The particularly notable elements or combinations of elements which make a particular contribution to defining or describing the character of an area, which may include experiential characteristics such as wildness and tranquillity.

13. The **sensitivity** (high, medium, low) of the landscape to a particular development is considered on a case by case basis and considers the susceptibility of the landscape, which varies depending on the type of development proposed and the particular site location, and the landscape value (identified as national, regional, or community). As stated in GLVIA3, '*LVIA sensitivity is similar to the concept of landscape sensitivity used in the wider arena of landscape planning, but is not the same*'.

14. **Landscape value**: The importance attached to a landscape, often used as a basis for designation or recognition which expresses national or local authority consensus, because of its special qualities/attributes. The factors which are considered in landscape include aesthetic or perceptual aspects such as scenic beauty, tranquillity or wildness or cultural associations as well as recreational/community value, conservation interests, landscape character and condition and representativeness/rarity.

15. **Landscape susceptibility** according to GLVIA3 means "*the ability of the landscape to accommodate the proposed Development without undue consequences for maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies*". Judgements on landscape susceptibility (high, medium, low) include references to both the physical and aesthetic characteristics and the potential scope for mitigation.

16. Susceptibility of landscape character areas are influenced by their characteristics and are often considered (though often recorded as 'sensitivity' rather than susceptibility) within landscape character assessments and capacity studies.

17. Susceptibility of designated landscapes is influenced by the nature of the special qualities and purposes of designation and/or the valued elements, qualities or characteristics, indicating the degree to which these may be unduly affected by the development proposed.

18. Sensitivity is judged taking into account the component judgments about the value and susceptibility of the receptor as illustrated by the table below. Where sensitivity is judged to lie between levels, an intermediate assessment will be adopted.

		Susceptibility		
		High	Medium	Low
Value	National	High	High/Medium	Medium
	Regional	High/Medium	Medium	Medium/Low
	Community	Medium	Medium/Low	Low

19. The **magnitude of landscape change** arising from the proposed development at any particular location is assessed in terms of its size or scale, geographic extent of the area or receptor that is influenced and its duration and reversibility.

20. The **scale** of the change takes account of:

- degree of loss or alteration to key landscape features/elements; characteristics; and for designated areas – special qualities and/or purposes of designation;
- distance from the development;
- landscape context to the development;

21. The approach to assessing effects on landscape character is to consider the key characteristics for the Landscape Character Type (LCT) within which the proposed development is located (host) and the adjacent LCT's (non-host) and identify which of these the proposed development would affect. For the host LCTs, a large scale change in landscape character is likely to occur where key characteristics would be lost or substantially changed. Where particular views are a key characteristic of a landscape type, large or medium scale landscape character effects may occur where the proposed development becomes a key feature of those views. A similar approach applies to designated landscapes, for which the effects on the defined purposes of designation and special qualities are considered.

22. Having established the size/scale of change (large, medium, small, negligible) to the landscape baseline, the geographic **extent** of the change can be identified (wide, intermediate, localised or limited) and a judgement made as to the degree of change for each landscape receptor.

23. **Duration** and reversibility can be linked depending on the nature of the development. Reversibility is a judgement about the ability and practicality of the proposed development to be reversible (such as wind farms which are predominantly reversible), partially reversible to something similar (such as mineral extraction[1]) or a permanent change in the landscape (such as housing). Duration reflects how long the change will last. The duration of the change would be considered short term when lasting less than 2 years; medium term when lasting between 2 and 10 years; or long term when lasting between 10 and 25 years, and permanent for more than 25 years.

24. Magnitude is considered taking into account the three contributory factors as illustrated by the diagrams included below.

[1] GLVIA3 page 91, paragraph 5.52

Visual Effects

25. In order to identify the significance of a visual effect it is necessary to establish the relative sensitivity of the viewers and the magnitude of the change they experience. In this case sensitivity is a combination of both susceptibility of the viewer to the proposed change and the value of the views.

26. Those living within view of the scheme are usually regarded as the highest susceptibility group as well as those engaged in outdoor pursuits for whom landscape experience is the primary objective. The susceptibility of potential visual receptors will also vary depending on the activity of the receptor. For visual receptors susceptibility and value are closely linked - the most valued views are also likely to be those where viewer's expectations will be highest.

27. The **value** of public views, which is the focus of GLVIA3, is identified as national, regional or community and will vary depending on the nature, location and context of the view and the recognised importance of the view. Considerations include cultural associations; designation or policy protection; views of or from landmarks; and/or the scenic quality of the view. The value attributed relates to the value of the view, e.g. a National Trail is nationally valued for access, but not always for the available views from every section.

28. Visual receptor **susceptibility** is defined as in accordance with the criteria below.

    - **High** - Local residents; users of outdoor recreation focussed on the appreciation of views including footpaths, beauty spots and picnic areas; people experiencing views to or from important features of physical, visual, cultural or historic interest.
    - **Medium** - Local road users and travellers on trains. People engaged in outdoor recreation with some appreciation of the landscape e.g. road cycling, nature conservation, golf and water based recreation.
    - **Low** - Workers, users of facilities and commercial buildings (indoors) experiencing views from buildings. Road and rail users on fast moving commuting or trunk routes. Visual receptors where views are incidental to the activity and/or location.

29. Sensitivity is judged taking into account the component judgments about the value and susceptibility of the receptor as illustrated by the table below. Where sensitivity is judged to lie between levels, an intermediate assessment will be adopted.

		Susceptibility		
		High	Medium	Low
Value	National	High	High/Medium	Medium
	Regional	High/Medium	High/Medium	Medium/Low
	Community	High/Medium	Medium	Low

30. The **magnitude of visual change** arising from the proposed development at any particular location is assessed in terms of its size or scale (large, medium, small, negligible), geographic extent of the area or receptor that is influenced (wide, localised, limited) and its duration (short, medium, long, permanent).

31. The representative viewpoints are used as 'samples' on which to base judgements of the scale of effects on visual receptors. The wider extent of the effect and its duration are not captured in the viewpoint analysis (as a viewpoint cannot capture these factors for an entire route or area). As duration and extent are necessary considerations in determining magnitude of change; magnitude and

significance judgements are provided for visual receptors and not for all representative viewpoints. The exceptions to this are specific viewpoints – where people visiting that location to look at the view are assessed as a visual receptor group.

32. With the exception of specific viewpoints, each route and receptor group will encompass a range of possible views, which might vary from no view of the development to very clear, close views. Therefore effects are described in such a way as to identify where views towards the development are likely to arise and what the scale and duration and **extent** (wide, intermediate, Localised, Limited) of those views are likely to be. In some cases this will be further informed by a nearby viewpoint and in others it will be informed with reference to ZTV studies, aerial photography and site visits. Each of these individual effects are then considered together in order to reach a judgement of the effects on the visual receptors along that route, or in that place.

33. The **scale of effect** arising from the proposed development at any particular viewpoint reflects the degree to which the nature of the views from that location would be changed and is taking into account:

- The distance of the viewpoint from the development;
- the degree to which the development is visible or screened;
- the angle of view in relation to main receptor activity or main focus of the view;
- the horizontal and vertical field of view occupied by the development; and
- the extent and nature of other built development visible.

34. The approach to assessing effects on views is to consider the full 360 degree view from any given receptor – not just those towards the development and/or shown in visualisations. It is assumed that the change would be seen in clear visibility and the assessment is carried out on that basis. Where there are operational (and consented) developments considered as part of the baseline, the visual effects consider the effects of adding the proposed development to that baseline. Where appropriate, comment may be made on lighting and weather conditions.

35. **Duration** reflects how long the change will last and are rated in the same way as described above for landscape effects. The effects as a result of the proposed development would be considered short term when lasting less than 2 years; medium term when lasting between 2 and 10 years; or long term when lasting between 10 and 25 years, and permanent for more than 25 years. For visual receptors moving through the landscape (e.g. road and rail users), the length of their journey during which they would see the development is reflected in the judgement of the geographic extent of effects.

36. Magnitude is considered taking into account the three contributory factors as illustrated by the diagrams included below.

Magnitude of Landscape and Visual Change

37. Scale of effect is the first factor in determining magnitude; which may be higher if the effect is particularly widespread and/or long lasting, or lower if it is constrained in geographic extent and/or timescale. The tables below illustrate how this judgement is considered as a two-step process. Firstly, scale and extent are considered, for which the outcomes are illustrated by the first part of the table; the second part of the table illustrates the influence of duration on this initial judgement. Where magnitude is judged to lie between levels, an intermediate assessment will be adopted.

Scale / extent	Large	Medium	Small	Negligible
Wide	Substantial			
Intermediate		Moderate		
Localised			Slight	
Limited				Negligible

Stage 1 Result / Duration	Substantial	Moderate	Slight	Negligible
Permanent	Substantial			
Long-term		Moderate		
Medium-term			Slight	
Short-term				Negligible

Significance of Landscape and Visual Effects

38. The significance of any identified landscape or visual effect is assessed as major, moderate, minor or negligible. These categories are based on the consideration of sensitivity with the predicted magnitude of change. The table below is not used as a prescriptive tool and illustrates the typical outcomes, allowing for the exercise of professional judgement. In some instances a particular parameter may be considered as having a determining effect on the analysis.

		Magnitude of Change			
		Substantial	Moderate	Slight	Negligible
Receptor Sensitivity	High	Major	Major/ Moderate	Moderate	Minor
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor/ Negligible
	Low	Moderate	Moderate/ Minor	Minor	Negligible

39. Where the effect has been classified as Major or Major/Moderate this is considered to be equivalent to likely significant effects referred to in the EIA Regulations. Where 'Moderate' effects are predicted, professional judgement will be applied to ensure that the potential for significant effects arising has been thoroughly considered.

Beneficial/Adverse

40. Landscape and visual effects can be beneficial or adverse and in some instances may be considered neutral. Neutral effects are those which overall are neither adverse nor positive but may incorporate a combination of both. Whether an effect is beneficial, neutral or adverse is identified based on professional judgement. GLVIA 3rd edition indicates at paragraph 2.15 that this is a "*particularly challenging*" aspect of assessment, especially in the context of a changing landscape.

Cumulative Effects

41. In a broad generic sense, cumulative impacts "*result from the incremental changes caused by other past, present or reasonably foreseeable actions together with the project*"[2] However, an assessment of cumulative effects should focus on whether there are any potential cumulative impacts which are reasonably foreseeable and which are likely to influence the decision making of the proposed development, rather than an assessment of every potential cumulative effect[3] which in practice means focussing on other nearby development proposals and the effects that might arise from the combined influence of those developments on landscape and visual receptors.

42. As recommended by the NatureScot cumulative guidance, this assessment focusses on the "*additional cumulative change which would be brought about by the proposed development*"[4].

43. As noted above, operational developments are included in the baseline, Consented development which are expected to be constructed, form part of the future baseline and will be included as such.

[2] GLVIA3 page 120, paragraph 7.1 quoting Hyder, 1999 ' *Guidelines for the assessment of indirect and cumulative impacts as well as impact interactions*'

[3] GLVIA3 page 121 paragraph 7.5.

[4] Assessing the Cumulative Impact of Onshore Wind Energy Developments, NatureScot, 2021

However, where there is some uncertainty regarding the future construction of consented developments, they may be considered as the first scenario of the cumulative assessment.

44. Proposals in planning are considered where there is good reason to assume that the timing of decisions may be similar and significant cumulative effects are likely. The assessment of effects is considered within the cumulative assessment.

45. Proposals in scoping are noted but not considered within the cumulative assessment, as there is no certainty that these proposals will progress to planning submissions and the nature of the proposed schemes may be subject to change.

46. The assessment is based on the same landscape and visual baseline and receptor groups as the main LVIA, and the methodology is also the same in terms of forming and expressing judgements.

47. Cumulative effects on landscape receptors arise from combined direct and/or indirect effects on the same receptor – such as two developments within the same character area; or one development within, and one visible from, a designated area.

48. Cumulative effects on visual receptors arise either from two (or more) developments both being visible from the same place; or from sequential views as people travel.

49. In order to simplify what may otherwise be a complex assessment, the following approaches are also used:

    - The cumulative assessment considers scenarios within which developments may be 'grouped' - for instance two nearby cumulative proposals may be considered in one scenario if it is considered that the cumulative effects arising if one or both are developed are likely to be similar.
    - Receptors judged to receive Negligible or Slight-Negligible magnitude effects are not considered for cumulative effects on the basis that any significant effects arising would primarily be caused by the cumulative developments and would be unlikely to be contributed to by the proposed development.
    - Only those receptors judged likely to experience effects from the cumulative development(s) being considered within a given scenario are described within that scenario.

50. Qualitative assessment of design and aesthetic considerations arising as a result of cumulative development, and/or considerations set out within local guidance provided in relation to cumulative development, is also provided where relevant.

ANNEX 1: GLOSSARY OF TERMS

Term	Definition
CLVIA	Cumulative Landscape and Visual Impact Assessment.
Cumulative Effects	Cumulative effects are the additional effects arising from changes caused by a development in conjunction with other past, present or reasonably foreseeable actions.
Direct Effect	A direct (or primary) effect may be defined as an effect that is directly attributable to the development.[5]
GLVIA3	*'Guidelines for Landscape and Visual Impact Assessment, Third Edition'*, published jointly by the Landscape Institute and Institute of Environmental Management and Assessment 2013.
Indirect Effect	An indirect (or secondary) effect is an effect that results indirectly from the proposed project as a consequence of the direct effect, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects. [6]
Key Characteristics	Those combinations of elements which are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
LVIA	Landscape and Visual Impact Assessment.
Landscape Capacity	The amount of change which a particular landscape character type or area is able to accommodate without significant detrimental effects on its character. Capacity is likely to vary according to the type and nature of change proposed.
Landscape Character	The distinct and recognisable pattern of elements in the landscape that makes one landscape different from another, rather than better or worse. 7
Landscape Character Areas	These are single unique areas which are the discrete geographical areas of a particular landscape type. [8]
Landscape Character Types	These are distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur, they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern, and perceptual and aesthetic attributes.
Landscape Effects	Effects on the landscape as a resource in its own right. [9]
Landscape Elements	Individual components which make up the landscape such as trees and hedges.

[5] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p155

[6] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p156

[7] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p156

[8] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p157

[9] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p157

Term	Definition
Landscape Features	Particularly prominent or eye-catching elements, like tree clumps, church towers or wooded skylines.
Landscape Quality or Condition	This is a measure of the physical state of the landscape. It may include the extent to which a typical character is represented in individual areas, the intactness of the landscape and the condition of individual elements. [10]
Landscape Receptor	Defined aspects of the landscape resource that have the potential to be affected by a proposal.
Landscape Resource	The combination of elements that contribute to landscape context, character and value.
Landscape Value	The relative value or importance attached to different landscapes by society on account of their landscape qualities. [11]
Level of Effect	Determined through the combination of sensitivity of the receptor and the proposed magnitude of change brought about by the development.
Magnitude (of effect)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration.
Mitigation	Measures including any process, activity or design to avoid, reduce, remedy or compensate for adverse environmental impact or effects of a development.
Photomontage	A visualisation which superimposes an image of a proposed development upon a photograph or series of photographs.
Residential Visual Amenity	A collective term describing the views and visual amenity from a residential property, relating to the type, nature, extent and quality of views that may be experienced from the property and its 'domestic curtilage' including gardens and access driveway. Residential Visual Amenity is only one component of the overall Residential Amenity, others being for example noise, shadow flicker and access amongst others.
Residual Effects	Potential environmental effects remaining after mitigation.
Sense of Place	The essential character and spirit of an area: *genius loci* literally means 'spirit of the place'.
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor. [12]
Significant Effects.	It is a requirement of the EIA Regulations to determine the likely significant effects of development on the environment which should relate to the level of an effect and the type of effect. Where possible significant effects should be mitigated. The significance of an effect gives an indication as to the degree of importance (based on the magnitude of the effect and sensitivity of the receptor) that should be attached to the impact described. Whether an effect should be considered significant is not absolute and requires the application of professional judgement.

[10] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p157

[11] The Landscape Institute; Technical Guidance Note 02/21 Assessing Landscape Value Outside National Designations

[12] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p157

Term	Definition
Type or Nature of Effect	Whether an effect is direct, indirect, temporary or permanent, positive (beneficial), neutral or negative (adverse) or cumulative.
Visual amenity	Value of a particular place in terms of what is seen by visual receptors taking account of all available views and the total visual experience.
Visual Effect	Effects on specific views and on the general visual amenity experienced by people. [13]
Visual Receptors	Individuals and/or defined groups of people who have the potential to be affected by a proposal.
Visualisation	Computer simulation, photomontage or other technique to illustrate the appearance of a development. [14]
Wildness	A quality of appearing to be remote, inaccessible and rugged with little evidence of human influence.
Wireframe or Wireline	A computer generated line drawing of the DTM (Digital Terrain Model) and the proposed development from a known location.
Zone of Theoretical Visibility (ZTV)	Area within which a proposed development may have an influence or an effect on visual amenity. [15]

[13] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p158

[14] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p158

[15] The Landscape Institute/Institute of Environmental Management and Assessment; *Guidelines for Landscape and Visual Impact Assessment*; Spon; 2013; p158

Appendix 17.2

Photopanels

NICHOLAS O'DWYER

daa

Viewpoint 1

Eastern Site Boundary on Airport Parking Access Road

0383 Dublin Airport Drainage

SH Projects 300s - 0383 - Dublin Airport Drainage LVA\05 Working Files\05 Visuals

Date	By
Oct 2023	RF
Paper Size	QA
420 x 297mm	RA
Status	Rev
Planning	-
0383 - Dublin Airport Drainage Photosheets	

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Viewpoint 2

Western Site Boundary on R132

0383 Dublin Airport Drainage

SH Projects 300s - 0383 - Dublin Airport Drainage LVA\05 Working Files\05 Visuals

Date	By
Oct 2023	RF
Paper Size	QA
420 x 297mm	RA
Status	Rev
Planning	-
0383 - Dublin Airport Drainage Photosheets	

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Viewpoint 3

Southern SIte Boundary at Dardistown Cemetery

0383 Dublin Airport Drainage

SH Projects 300s - 0383 - Dublin Airport Drainage LVA\05 Working Files\05 Visuals

Date	By
Oct 2023	RF
Paper Size	QA
420 x 297mm	RA
Status	Rev
Planning	-
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