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VANTAGE DATA CENTER - DUB 11-12
LONG-TERM BIRD HAZARD MANAGEMENT PLAN

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VANTAGE DATA CENTER
LONG-TERM BIRD HAZARD MANAGEMENT PLAN

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CONTENTS

TABLES

APPENDICES

Tables

Appendix 1
Landscaping Plan

1. INTRODUCTION

1.1 Background

Ramboll UK Limited ("Ramboll") was commissioned by Vantage date Centers DUB11 Limited (the "client") to prepare a Bird Hazard Management Plan (BHMP) in relation to the proposed development of DUB11/12 to cover the construction phase and operational (long-term) phase. The DUB11/12 site ("the site") is located within the local authority area of South Dublin County Council (SDCC) in the townlands of Ballybane and Kilbride.

It is understood that a BHMP has will be required to meet the conditions of a consented Planning Permission in Principle (PPP). Ireland, as a signatory to the Convention on International Civil Aviation, Chicago 19441, has adopted many of the provisions specified in Annex 14 to the Convention. This annex includes standards and recommended practices that address the risk of a bird strike and a potential increase in bird strike risk due to the presence of a development of bird attractant features on, or in the vicinity of, an aerodrome. The term 'in the vicinity' is taken to be land or water within 13 km of the aerodrome.

The proposed development comprises the demolition of the abandoned single storey dwelling and associated buildings (206 m^2), and the construction of 2 no. two storey data centers with plant at roof level of each facility and associated ancillary development that will have a gross floor area of 41,105 m^2. The proposed development will include a range of Sustainable Urban Drainage System (SuDs) features and enhancements to the existing Baldonnel Stream. This proposed development is located approximately 1.6km to the north of Runway 29 at Baldonnel (Casement) Aerodrome, and therefore falls within the 13 km safeguarding zone within which the Civil Aviation Authority (CAA) advise that a BHMP may be required by an appropriate authority.

As the proposed development includes SuDS features and the existing Baldonnel Stream, it is understood that SDCC requires the submission of a BHMP to demonstrate how potential risks to aviation at Baldonnel Aerodrome will be managed, given the potential presence of open water and the potential for that to cause aggregations of birds.

The BHMP for the proposed development will be submitted in order to address the requirements of condition 16 of the PPP consent reference SD21A/0241[2]. The condition is worded as follows:

(2) A bird hazard management plan for the construction phase should be established and communicated to the Irish Air Corps Bird Control Unit (BCU), in order to reduce the presence of any hazardous birds that may arrive during the construction phase of the development. BCU are contactable at bcu@birdcontrol.ie.

(3) A long-term bird hazard management plan that aims to disturb and prevent possible hazardous waterfowl nesting or rooftop gull nesting at the site should be established and communicated to the Irish Air Corps Bird Control Unit. Prior to the commencement of development, this shall be submitted for the written agreement of the Planning Authority.

(4) The selection of trees and shrubs should avoid plants that produce fruit and seed desired by wildlife. Avoid the creation of areas of dense cover for roosting by flocking species of birds.

[1] Chicago Convention. 1944. Convention on International Civil Aviation. Available from: https://www.icao.int/publications/Documents/7300_cons.pdf

[2] South Dublin County Council. 2022. Planning Reference: SD21A/0241. Vantage Data Centers Dub 11 Ltd. Available From: https://planning.agileapplications.ie/southdublin/application-details/61269

(5) Should negative effects of bird activity on Irish Air Corps operations arise during the construction or operation phase, the site owner must put measures in place to mitigate these effects to a level acceptable to the Irish Air Corps.

Reason*: In the interests of aviation safety.*

The following documents have been reviewed whilst preparing this Management Plan:

- CAP 738: Safeguarding of Aerodromes. Civil Aviation Authority[3];
- CAP 772: Wildlife Hazard Management for Aerodromes. Civil Aviation Authority[4];
- Bird and Wildlife Strike Management at Aerodromes. Irish Aviation Authority: National Bird and Wildlife Hazard Committee [5]; and
- All landscaping and drainage drawings for the proposed development provided to Ramboll from the client (specific plans referenced where appropriate).

1.2 Communication

The contents of this BHMP will be communicated to the client and all relevant personnel involved in the proposed development. Specific deterrent methods will be recommended for implementation by authorised persons. Should any other bird management issues arise on the site that the personnel feel is beyond their control, a suitably qualified ecologist (SQE) will be contacted.

2. THE SITE

2.1 Current Baseline

The site is located within Profile Park, Clondalkin in the townlands of Ballybane and Kilbride. The site's surrounding context is predominantly industrial to the north and west, agricultural to the south and west, with commercial and residential properties to the east and the Grange Castle Golf Club to the south-east. Geographically, the site is located in Profile Park, approximately 10 kilometres (km) to the south-west of Dublin city centre, within South Dublin County.

An ecological impact assessment (EcIA)[6] of the site was completed by Neo Environmental Ltd on behalf of Ramboll in December 2021. This involved an assessment of the ecological features present, or potentially present, within the site and its zone of influence. At the time of the assessment, the site comprised a small single-storey former residential dwelling with one outbuilding/shed and associated garden, with unmanaged agricultural grassland, treelines and the Baldonnel stream. Treelines, hedgerows and grassland habitats present within the site boundary were suitable to support breeding and nesting birds during the breeding bird season of March to August, inclusive.

The Baldonnel Stream runs through the site in a south-east to north-west direction, flowing towards the north-west. It will be incorporated into the proposed development as an enhanced ecological feature.

[3] Civil Aviation Authority (2020). Safeguarding of Aerodromes: CAP 738. https://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=576 [Accessed November 2022]

[4] Civil Aviation Authority (2014). Wildlife Hazard Management at Aerodromes, CAP 772 http://www.caa.co.uk/docs/33/CAP%20772%20Final.pdf [Accessed November 2022].

[5] Irish Aviation Authority. 2021. Bird and Wildlife Strike Management at Aerodromes. National Bird and Wildlife Hazard Committee. Issue 1

[6] Neo Environmental. 2021. Ecological Impact Assessment: Profile Park Data Centre. Technical Appendix 11.1:EIA

Breeding bird surveys were undertaken on the 18th June and 1st July 2020 to inform a previous EcIA for the site. A range of common bird species were noted using the site for foraging and breeding during these surveys. No nests were observed in vegetation or structures during the breeding bird surveys. No species specific results relating to the site have been supplied to Ramboll at the time of writing this report.

2.2 Target Bird Species

A number of species are considered to pose a risk to aviation from birdstrike. Gull flocks *Larus* sp. are the primary species of concern, along with other large species, such as geese and swans. Smaller species that form large flocks, including starling *Sturnus vulgaris*, fieldfare *Turdus pilaris* and redwing *T. iliacus*, also pose an aviation risk. Any culling should follow guidance in the Wildlife Act 1976 as set out in section 2.3.

2.3 Legal Requirements

The key legislation with respect to bird control measures is the Wildlife Act 1976[7], the Wildlife (Amendment) Act 2000[8] and the European Communities (Birds and Natural Habitats) Regulations 2011[9]. The key provisions of the Wildlife Act 1976 and 2000 amendment in relation to the management of bird populations within the proposed development are described below.

The Birds Directive (Directive 2009/147/EC) on the conservation of wild birds is implemented in Ireland, inter alia, under the Wildlife Act. Under the terms of the Directive, all Member States of the EU are bound to take measures to protect all wild birds and their habitats.

Under Article 9 of the Birds Directives, Member States may derogate from these terms for one or more of the following reasons:

- public health and safety;
- air safety;
- prevent serious damage to crops, livestock, forests, fisheries and water; and
- protection of flora and fauna.

If there is no other satisfactory course of action for preserving air safety, lethal methods can be an effective means of control. Schedule One of this act refers to the bird species which these conditions relate to. Schedule Two identifies the means for removal or lethal control authorised.

Lethal control can be defined as the hunting or trapping of wildlife/birds. One highly regulated activity at the state level is legal take (lethal removal) of wildlife.

There are several reasons for resorting to lethal methods:

- To reduce overall numbers and thus to decrease the problem;
- For the deterrent effect it has on surviving wildlife and to enhance the effect of other control techniques;

[7] ISB. 1986. S.I. No. 254/1986 – European Communities (Wildlife Act, 1976) (Amendment Regulations, 1986. Irish Statute Book. Available from: https://www.irishstatutebook.ie/eli/1986/si/254/made/en/print

[8] ISB. 2000. S. I. No. 38/2000 – European Communities (Wildlife (Amendment) Act 2000). Irish Statute Book. Available from: https://www.irishstatutebook.ie/eli/2000/act/38/enacted/en/print

[9] ISB. 2011. No. 477/2011 – European Communities (Bird and Natural Habitats) Regulations 2011. Irish Statute Book. Available from: https://www.irishstatutebook.ie/eli/2011/si/477/made/en/print

- To remove individual animals that do not depart in response to scaring action, either because of sickness or disability, or because of aberrant behaviour; and
- To deal with an immediate situation posing a hazard to flight safety.

Species referred to in the First Schedule can be controlled by lethal measures outlined above and include:

- Carrion Crow *Corvus corone*;
- Hooded (Grey) Crow *Corvus cornix*;
- Magpie *Pica pica*;
- Rook *Corvus frugilegus*;
- Jackdaw *Corvus Monedula;*
- Starling *Sturnus vulgaris;*
- Herring Gull *Larus Argentatus*;
- Greater Black-backed Gull *Larus Marinus*;
- Lesser Black-backed Gull *Larus fuscus*;
- Sparrow *Passer domesticus*;
- Feral Pigeon *Columba livia domestica*; and
- Wood Pigeon *Columba palumbus*.

The Second Schedule outlines the methods of removal or lethal control of the Schedule One species as outlined below:

- Shooting with rifle or shotgun;
- Poisoned or anaesthetic bait;
- Cage traps with or without live decoys; and
- Traps, snares or nets.

3. BIRD RISK EVALUATION

3.1 Review of Current Site Conditions

Habitats on the site include the Baldonnel stream, tree lines, hedgerow, and grassland suitable to support flocks of birds. The neighbouring golf course contains large ponds suitable to support large bird species.

3.2 Review of Proposed Development Plans

The proposed development, as shown in Appendix 1, has been reviewed in relation to its potential for supporting features that may attract aggregations of target bird species.

3.2.1 Landscape Design

The character of the proposed landscape plans [10], as shown in Appendix 1, is one of large trees and woodland copses, dense woodland planting, planted berms, stream habitat, wetland meadows and small areas of shrub and ornamental planting and formal clipped hedges.

- Wetland meadows created in the north of the site have **the potential to attract aggregations of target species post construction** during periods where surface water is not present due to a lack of rainfall or periods of hot weather.
- Large trees and woodland copses have been proposed in various parts of the site predominantly in boundary regions. Furthermore, some trees are to be retained as part of the development. **Woodland planting at this scale, once mature, is unlikely to support large aggregations of target arboreal species but may provide nesting opportunities once matured.**
- Shrub/hedge planting is proposed to bound the perimeter of the site. Some of this is retained native hedgerow and will be enhanced as part of development plans and other sections are new and will include common holly *Ilex aquifolium,* honeysuckle *Lonicera perclymenum* and blackthorn *Prunus spinosa* planting. As some of the noted hedgerow species bear berries for a portion of the year and provide potential nesting opportunities, there is a risk of attracting small aggregations of passerine birds and pigeons as well as nesting birds. **The hedge planting is unlikely to attract large aggregations of species. The hedge planting does have the potential to attract nesting bird species.**
- Planted berms to the north and south of the site are unlikely to be utilised by target bird species as aggregating regions post construction and are therefore **unlikely to attract large aggregations of birds.**

3.2.2 Site Drainage Design

SuDS plans[11] for the site were reviewed for features which had potential to create surface water features, which could potentially be attractive to aggregations of birds. A wetland corridor, consisting of the enhanced existing stream, flood attenuation basins (SuDS) and bioswale attenuation areas are proposed to the north and east of the site. Five SuDS are proposed as part of the development as well as ground water storage in permeable paving and the enhanced Baldonnel stream.

- The existing stream will be retained and enhanced within the proposed development. As this is a retained feature, it is unlikely to result in any increase in hazardous waterbird presence or aggregations of nesting birds compared with to the pre-development baseline. **This feature is not considered likely to attract additional birds that would pose a threat to air traffic.**
- Flood attenuation basins are proposed as part of the flood prevention scheme of the development. Storm water from the proposed buildings will be chanelled via rainwater pipes into the attenuation basins and bioswale attenuation areas. The Grange Castle Golf course located offsite beyond the east boundary of the site contains large ponds which would support aggregations of birds. This is considered to be a more desirable environment for nesting waterfowl than the flood attenuation basins proposed on the site, due to the size, level of surrounding vegetation and islands present. The proposed basins

[10] Landscape Architecture. 2022. RUK2022N00575-RAM-RP-00003 Landscape Report and Outline Landscape Specification.

[11] Pinnacle Conculting Engineers. 2021. Vantage Dublin Data Center: Volume 3: Technical Appendices, Technical Appendix 10.1: Engineering Planning Strategy

do not have islands, reducing the potential for nesting opportunities for larger hazardous waterfowl including mallard, feral geese or mute swans. **Whilst these features may provide further habitat to attract waterfowl, they are unlikely to attract large aggregations which would pose an increased risk to air traffic.**

- Bioswale attenuation areas are designed to extend the current riparian habitat through the proposed landscape plans. These areas are not expected to be wet all year round, but would be designed to hold standing water during periods of increased rainfall. These areas are likely to result in less overall open water, and would hold water for shorter periods of time, compared to water corridors and local natural flooding areas already present on and near the site. As such, the flood attenuation basins are unlikely to result in any increase in hazardous waterbird presence, although **these features are likely to attract birds** during drain down periods (e.g., the time for the water level to fall from full to half full).

3.2.3 Roof habitats

Roof design plans for each proposed structure were reviewed to determine suitability for aggregating birds. The rooftops are proposed within an area with several industrial estates present and is thus unlikely to add significantly to any attractant that already exists.

The flat roof areas of all buildings are likely to attract aggregations of loafing gull species. Furthermore, the flat nature of the roof area along with features such as the parapets and walkways, may attract nesting birds such as pigeon species, gull species and wading birds such as oystercatchers.

3.3 Risk Evaluation

The proposed development contains habitat features that that have the potential to be attractive to aggregations of large species or flocks of birds that are hazardous to aircraft. Large bird species or flocks of birds may relocate to the SuDS feature, though this is unlikely to be in significant numbers given the smaller size of the SuDS feature in comparison to the ponds on the neighbouring Grange Castle Golf course which will be more desirable to nesting waterfowl species due to the presence of islands and lower human disruption.

The data center buildings and associated infrastructure may be attractive to certain species for roosting, loafing and nesting, such as gulls and feral pigeon owing to the shallow or flat roof types. Refuse bins and feeding or littering by members of the public may also attract gull and pigeon species.

The new areas of trees, scrub and grassland are likely to attract small passerine birds, which are not considered a risk to aviation.

4. CONTROL MEASURES

The primary method of preventing target bird species from aggregating on the site is to reduce the attractiveness of the site for birds. This involves reducing the space and attractiveness of potential nesting and shelter areas on the site, eliminating potential sources of food (e.g. litter, open rubbish bins etc.) and performing sporadic and varied scaring techniques if birds are aggregating.

4.1 Preventing Flocks During Construction Works

Interim measures for preventing flocking birds during the construction works

Attraction of bird flocks during construction works could occur as result of soil disturbance (unearthing invertebrates) when constructing the proposed development. The contractor would ensure that enabling works occur in sections (cut/fill), reducing the area of land exposed (which may attract flocks of foraging birds) at any given time. The presence of humans and loud machinery on site is also likely to deter large flocks. The creation of any habitat likely to attract foraging birds will be small in area, and temporary. Birds will be discouraged from using any temporary SuDS features on the site during the construction phase by the deployment of bird floats, or bird scarers where required. Floating reflectors would be deployed within any areas of standing water as a means of deterrent.

4.2 Monitoring of Waterbodies on Site

Monitoring of any standing water within the site, both temporary and permanent

During construction, the contractor will undertake monitoring checks of any temporary construction SuDS features to verify that the bird diverter equipment referenced above is operating correctly. Monitoring will determine the usage of the permanent SuDS feature both at max and half levels and when fully drained. If aggregations of birds occur and persist, where possible, the SuDS feature would be proofed using exclusion methods, such as specialist floating balls (as deterrents). The following habitat controls may also reduce the attractiveness of the SuDS feature as part of the safeguarding process:

- In order to reduce nesting opportunities, there should be no development of islands. Attached promontories or spits can be used to reduce the open expanse of water bodies and prevent gull roosts forming;
- On smaller waterbodies, wires suspended above the surface may deter wildlife that requires long take-off and landing runs (e.g. swans and geese). The wires should be made visible with tags (10 x 6 cm minimum), to increase the visibility to wildlife; and
- Dense vegetation that provides nesting cover should be avoided. The water should be surrounded with long grass or a sterile substrate.

4.3 Prevention of Nesting and Loafing

Shallow-pitched and flat roofs and ledges/overhangs are attractive to birds for nesting and loafing. Proposed structures, including the data centres and ancillary buildings, could potentially provide nesting/loafing opportunities for birds, such as starling, gull species and pigeons. It is recommended that weekly inspections of all visible roof areas be undertaken by nominated personnel during the period of March-June. If bird activity is found to be high, a greater frequency of inspections will be required. Any roosting or loafing birds will be dispersed by nominated personnel using a hand-held distress call. Upon the discovery of nesting birds, a qualified ecologist will be consulted immediately. Any nests found during the inspections will be removed by a qualified ecologist or an authorised person under an appropriate licence.

Breeding behaviour can be detected easily and includes territorial and aggressive behaviour, persistent loafing in one location by a pair of birds, nest building, egg laying and incubation. At all times of the year, a common-sense approach will be encouraged, emphasising the need to prevent nesting, loafing and feeding and to be alert to significant populations of bird species that may be present from time to time.

A surveillance log will be maintained, recording details such as date and time of day that significant bird numbers are observed, the species of birds involved, the behaviours that have triggered particular actions or control measures, the actions employed and the effectiveness of these actions/control measures. A short visual guide will be prepared that would give details of the target species (e.g. herring gull) involved and allow their identification by the person carrying out roof inspections.

If nesting/loafing/breeding birds are found inhabiting the site in large numbers, bird deterrent measures will be adopted to disperse birds from the site. This will involve the purchasing and use of some/all of the following equipment:

- A portable distress call broadcasting unit equipped with a standard set of calls provided for aerodrome use;
- Night vision equipment to assist in detecting birds after dark; and
- Use of Irri-Tape or other similar bird-repellent tape, tied to tree branches to scare birds.

Static and automated devices will only be employed for limited times to achieve bird dispersal from small areas. All relevant personnel will be trained in the use of the above deterrent techniques.

4.4 Elimination of Feeding Opportunities

Signs to be erected to deter people from feeding the birds

If aggregations of birds persist, there will be a presumption against bird feeding on the site and outwith the site, either intentionally or by default (e.g. from discarded waste). Signs will be erected to deter people from feeding birds. If deemed appropriate, the management of the site will seek to ensure no littering, and regular waste collection will be undertaken. Waste storage will be in sealed, self-closing containers. Waste will not be brought onto the site.

Waste removal

Waste generated as a result of operation of the data centre should be localised to sealed, self-closing containers. Waste generated as a result of the use of amenity areas by workers is not likely to attract large aggregations of target species. Bins will be covered and emptied regularly by an appointed licensed contractor.

Hedgerow berry species

The planting regime does not require modification as it matches existing background habitats. At this distance from the airport, however, the species planted, should aim to have no more than 15% berry or fruit bearing trees or bushes as these may attract larger numbers of arboreal species.

4.5 Further Measures

Should it be found that the management measures described in the previous sections are ineffective, more involved measures will be considered. Such measures may include designed deterrent fixtures and should be fitted by experienced operators. These could include:

- The installation of wires, approximately 30 cm above the roof surfaces, such that birds attempting to land are prevented from doing so as they are unable to fold their wings easily;

- Bird spikes placed on roofs or ledges where birds are persistently loafing. They should completely cover the roof and be placed in such density so as to completely exclude birds from landing. Spikes may also be placed on the tops of external lights where birds are found to be loafing. Bird spikes are standard products and should be sited, fitted and maintained in accordance with manufacturers' recommendations; and
- Bird netting placed over the roofs. This should be sited, fitted and maintained in accordance with the manufacturers' recommendations. This method is unsightly and will be undertaken as a last resort.

In the event that breeding is attempted by target species despite all preventative measures having been undertaken, nests and eggs would be removed by the authorised person following Schedule 1 and 2 of the Wildlife Act 1976 as amended. All terms and conditions of the licence would be complied with, including reporting of all action taken.

5. MONITORING REQUIREMENTS

Regular inspections of the SuDS feature, and flat roofs will occur weekly (or sooner if bird activity dictates) during the breeding season (March to August, inclusive) by nominated personnel. For gull species, the breeding season is typically from March-June. Outwith the breeding season, regular monthly inspections will be carried out by nominated personnel.

6. SUMMARY

Table 6.1 below summarises the activities and actions of this BHMP.

Table 6-1 Summary of Activities

Activity	Action
Preventing flocks during construction stage	Cut/fill methods used to minimise area of exposed earth that may attract feeding gulls etc. Bird reflective floats/ scarers for any temporary SuDS features used if deemed appropriate.
Monitoring of target species usage of SuDS feature.	Once a week from March to August to coincide with the breeding season of target species (or March to June if only gull species present). Once a month from September to February to monitor outwith the breeding season (or July to February if only gull species present). Surveillance log to be maintained.
Installation of (if deemed applicable/necessary): Visual deterrent; Audible deterrent; Wire installation; Bird spikes; or Bird netting.	To be actioned if required i.e. if target species are found to be nesting/roosting on waterbodies or buildings.
Erection of signs warning against feeding birds	If aggregations persist, signs to prevent the public from feeding birds. Maintenance as required.
Waste management	Bins covered and emptied on a regular basis as required by an appropriately licensed contractor as part of the overall management of the site.
Removal of target species' nests and eggs	Last resort, in line with schedule 1 and 2 of the Wildlife act 1976 as amended, if all other measures fail.

APPENDIX 1
LANDSCAPING PLAN

Proposed development by Vantage Data Centers Dub 11 Ltd, Dublin, Ireland

Located at Profile Park, Grange Castle South Business Park, New Nangor Road, Dublin D22

Further Information Submission

Landscape Report & Outline Landscape Specification

6th January 2022

Registered Landscape Architect

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Landscape Report

Contents

Kevin Fitzpatrick Landscape Architecture Ltd. has been commissioned by the applicant Vantage Data Centers Dub 11 Ltd to provide landscape architectural consultancy in relation to a planning application for the proposed Data Centre at Grange Castle, Dublin. This report should be read in conjunction with the following documents:

Kevin Fitzpatrick Landscape Architecture Drawing, DUB11.1-DR-SP-C150-V0-WS2-KFA – Landscape Masterplan
Kevin Fitzpatrick Landscape Architecture Drawing, DUB11.1-DR-SP-C151-V0-WS2-KFA – Landscape Sections
Kevin Fitzpatrick Landscape Architecture Drawing, DUB11.1-DR-SP-C152-V0-WS2-KFA – Planting Plan and Schedule
Kevin Fitzpatrick Landscape Architecture Drawing, DUB11.1-DR-SP-C153-V0-WS2-KFA – Earthworks Modelling
Kevin Fitzpatrick Landscape Architecture Drawing, DUB11.1-DR-SP-C154-V0-WS2-KFA – Stream and Biodiversity Landscape

1. Existing Landscape

1.1 Overview

The proposed development is located to the south of the New Nangor Rd in Profile Park Business Park. The grange Castle Motor Company separates the proposed site from the three other Data Halls which are under construction and are located to the west. To the south of the site, there are agricultural fields with traditional hedgerow boundaries, with some recently constructed Data Centres. To the north on the opposite side of the New Nangor Rd. there are many large industrial buildings.

1.2 Landscape Character

The subject lands have the character of an agricultural field with a traditional hedgerow field boundary in the northern section of the site. The flat ground levels are characteristic of the wider landscape. The lands are separated by the stream that runs through the site. The stream has been affected by the agricultural processes and has very little riparian planting or riverside trees on its banks.

In terms of the wider landscape, the site is located within an area that is mostly industrial and commercial development. Beyond this to the west and south of the site is mostly traditional agricultural land with some low-density residential distribution. Grange Castle Golf Club lies to the east where it extends close to the edge of Profile Park.

The surrounding environment with its contrast of new built structures and remnants of historic field patterns would be considered a 'transitional landscape', as the area is undergoing a considerable amount of industrial and commercial development.

Other than the stream, which is degraded and of poor landscape quality, the landscape of the subject lands has no inherent aesthetic qualities of note. In the context of the surrounding landscape, landscape sensitivities and views of the lands would be considered of no aesthetic value.

1.3 Existing Trees and Vegetation

There is a significant amount of vegetation within and around the perimeter of the site. Native hedgerows run through and around the site and include many native species such as Hawthorn, Elm, Blackthorn, Elder, Ash and Bramble. The hedgerows are generally of reasonable quality and continuity, however there are some areas of hedgerow which have been affected by invasive species along with the loss of original species, which has led to gaps in certain areas. Despite there being a very generous amount of tree cover in the northern section of the site, much is of poor quality and will have to be removed.

1.3.1 – Invasive Species Management:
The management of invasive species will be carried out as per the arborists' advice and recommendation. Invasive species on the subject lands can be found predominantly in Hedge No. 4 as set out in the accompanying arborists report. Sycamore, an invasive, non-native tree species is noted as 'forming part of the bulking' of this mixed hedge. Management of this issue will be the removal of the Sycamore and replacement with appropriate native hedge/hedgerow species planted at 1.5 per square meter. Refer to Planting Plan and Schedule for details.

2 Landscape Strategy

2.1 General Aims

The landscape strategy aims to integrate the new built development with the existing landscape and create a network of habitats within an ecologically rich landscape. The character of the landscape proposed is one of large trees and woodland copses, dense woodland planting, planted berms, stream habitat, wetland meadows, and small areas of shrub and ornamental planting and formal clipped hedges. Wildflower meadows, wet meadows, riparian strips, woodland and native hedgerows will provide habitats and improve local biodiversity.

2.2 Protection and Enhancement of Existing Landscape

The protection and enhancement of the existing landscape is an important aspect of the overall landscape strategy.

The landscape strategy proposes to enhance and strengthen the existing hedgerows using native hedgerow and woodland species, while retaining the existing trees planted in and around the hedgerows where possible. There will also be significant habitat creation through the planting of woodland, hedgerows, wildflower meadow and wetland meadows which will connect to the existing vegetation around the site, enhancing green infrastructure links.

The retention of the existing stream which traverses the site is a central strategy within the overall landscape approach. The existing alignment of the stream is to remain the same, therefore the proposed earthworks, planting

proposals, attenuation areas and general site layout have been designed around it. Some parts of the stream banks are to be retained with no changes to the existing vegetation, this will provide areas for locally native flora to continue to grow. Other parts of the stream banks are to be enhanced with native riparian planting and wetland meadow, while ledges and shallow banks will be formed to create a high-quality riparian edge. Many of the existing trees along the stream are to be retained.

The stream is at a lower level than the proposed FFL of the data centre, a living willow wall is proposed to negotiate the level difference. The proposed willow walls have many advantages; they stabilise the modified banks of the stream, they provide a softer visual treatment which is consistent with the existing and proposed landscape and they eventually develop into banks of willow trees, providing additional green infrastructure and biodiversity benefits.

Fig 2 – Living willow wall

Fig 3 – Aquatic ledges and shelves and riparian planting

Fig 4 – Living willow wall installation

Fig 5 - Living willow wall 3 years after installation

2.3 Screening

Screening will be implemented primarily through the use of undulating, naturally shaped earth berms and tree planting, and is an essential part of the landscape scheme. Screening, in the case of this development, has a dual purpose. It provides internal privacy and security within the site as well as contributing to landscape sensitivity by blocking undesirable views and sounds to users outside the site such as nearby residents or street users. Berms will exist at varying heights, ranging from 2m to 5m, depending on location, and are situated in specific locations relating to existing views. Large native trees have been selected to give instant impact, rather than planting smaller trees which would take considerably longer to achieve the required screening.

A green wall located between the northern and southern data halls has also been proposed, this will provide additional screening and visual interest from 'Falcon Avenue' and the development entrance (refer to Section 2.6 for details).

2.4 Stream and Biodiversity Corridor as a Focal Landscape Space

A wetland corridor, consisting of the enhanced existing stream (refer to Section 2.2), flood attenuation basins and bioswale attenuation areas is proposed to the north and east of the site. It has been designed as a landscape feature, providing an aesthetic view from outside the site. The proposed landscape enhances the view from the New Nangor Road, adding aesthetic value to the overall landscape approach.

The design of this space is focused around using and modifying the existing topography and landform to create an ecologically functional and visually pleasing space. This improves local biodiversity, provides a visual connection from outside the site and creates a focal point in the landscape. Proposed visual screening belts have been designed with openings to create a visual connection between the road and the wetland. Meadows, small woodlands, hedgerows, and wetland planting create a habitat for local flora and fauna while also contributing to the aesthetic and natural qualities of the landscape. The design of this landscape allows for the wet meadow area to fill with rainwater in periods of heavy precipitation, while also functioning in dryer conditions.

Bioswales have been located at the upper level, above the living willow retaining walls. There are riparian edges composed of native wetland species proposed to all of the bioswales and attenuation ponds around the site, while wildflower meadow and small copses of trees make up in the intermediate areas.

Fig 5 – Existing stream and proposed biodiversity corridor

Fig 6 – Wetland meadow

Fig 7 – Bioswales

Fig 8 – Riparian zone

2.5 Ecology and Biodiversity

All of the various landscape spaces and typologies in this development have been designed to consider local biodiversity and ecology. Maintaining and creating natural habitats for native flora and fauna and creating ecological networks are essential elements of the landscape strategy.

Significant areas within the site will be seeded with wildflower which supports local flora and fauna, thus increasing local biodiversity. Retaining and strengthening existing native hedgerows, as well as proposing new native hedgerows, creates biodiverse native habitats and ecological green corridors which run through the site and link with external landscape features.

The stream corridor and flood attenuation basins establish unique ecological spaces, which provide contrasting ecological and environmental qualities to the other landscape spaces throughout the site and surrounding areas. The landscape typology will attract specific fauna such as certain types of birds and insects, while the planting strategy allows wetland flora to flourish.

Woodland planting along site boundaries and on earth berms create dense belts of native woodland spaces which act as native habitat and, similarly to the native hedgerows, form ecological corridors which connect with other landscape elements throughout the site.

The proposed security fencing is located within the site along internal road carriageways and has purposely set back from site boundaries. This strategy helps establish a continuous belt of woodland, hedgerow, wildflower and wetland planting around the data hall buildings which allows the free movement of fauna through the site along with fully connected green infrastructure links. Boundary fencing has also been proposed with openings accommodated to encourage the movement of fauna through the site.

2.6 Green Wall Strategy

-
-
- The green walls have been incorporated into the site design to soften the visual impact of the built structure. The design intent is to add a soft green texture to the façade that will provide relief to the visual built mass of the building. As shown in Figure 9 below the green wall is located along the southern elevation of the building. This arrangement is chosen as these are the facades that are visible from the access road and entrance. This also extends to and includes green walls located *along the lower half of part of the southern elevation of DUB 11 Along the lower half of the northern elevation of DUB11 to the west of the office element;*
- *Along the lower half of the screen to the north of the temporary generator yard serving DUB11;*
- *Along the lower half of the southern elevation of DUB12 to the west of the office element; and*
- *To the south of the temporary generator yard serving DUB12.*

Fig 9 – Green wall location example, please refer to architecture package for all locations these are additional and clearly indicated on the Architecture elevations .

Typology:

The type of green wall proposed is created using climbing plants supported on a tensile wire frame. A steel frame will be incorporated into the building or hard standing design from which the grid of tensile steel wires will be fixed. The planting will be planted at ground level and will gradually cover the full height of the tensile steel wire climbing support.

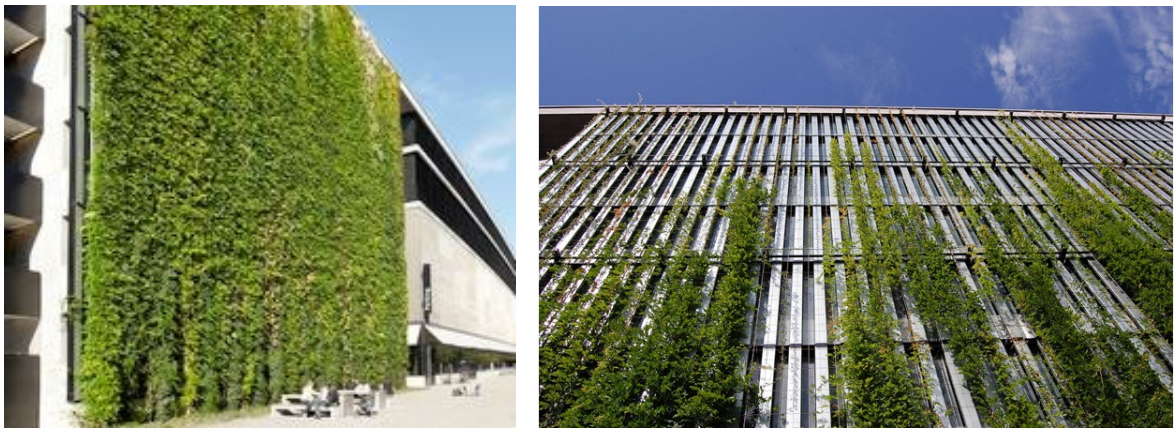


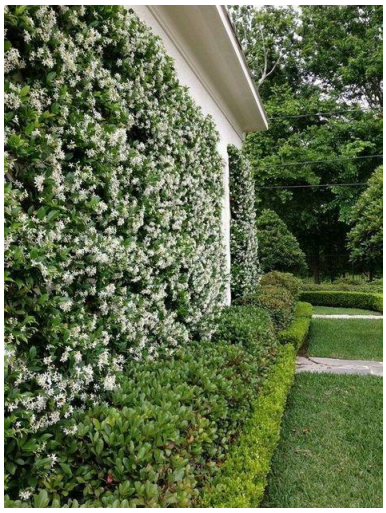
Fig 10 – Green wall typology precedents

Planting Design

The design intent is for the climbing plants to cover the full distance from the base to the roof. It is also the intention to provide year-round interest and coverage on the wall. In order to achieve this the planting choice has been carefully considered to provide a specific mix of plants to satisfy the requirements. A base plant has been chosen that is evergreen and flowering, this will account for 40% of the mix (Clematis armandii). This is to be complemented by two additional deciduous flowering climbers (Trachlyospermum and Lonicera). As these species are slightly smaller growing, they will mostly be visible in area A as shown in figure 3. In order to ensure the climbing plants cover the full wall a vine is to be included (Vitis). This is very vigorous and will reach the top of the wall and provide dramatic autumn colour.

Clematis armandii	350-400	-	35L	.35m ctrs
Lonicera Henrii	350-400	-	35L	.35m ctrs
Trachlyospermum jasminoides	150-200		15L	.35m ctrs
Vitis coignetiae	150-200		15L	.35m ctrs

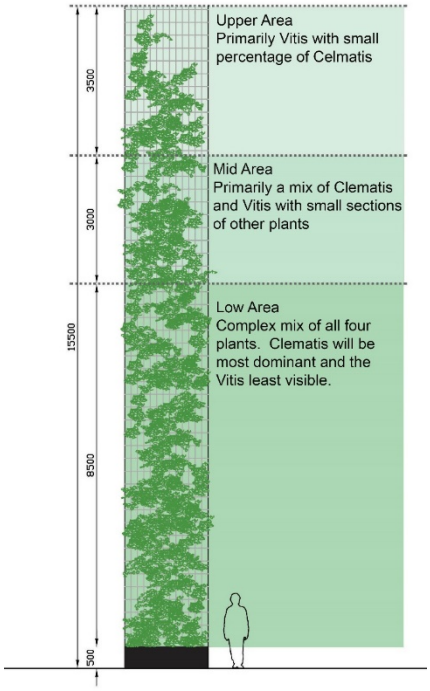
Clematis armandii Lonicera Henrii



Trachlyospermum jasminoides

Vitis coignetiae

Fig 11 – Climbing plant species



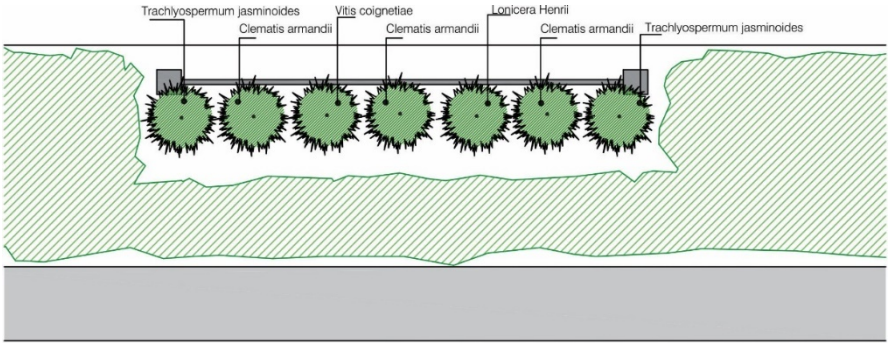


Fig 12 – Planting design concept and typical planting plan

Maintenence

Planting

Maintenance Objective

Maintain a full and complete coverage of the green wall with a complex mix of species. Promote healthy growth and prevent dominance of any single species . Keep planting clear of the building and windows.

Maintenance Operations

a) Prune in spring. Remove any wayward shoots and tie back shoots on to frame where needed. Thin out heavy hanging clumps. Thin out any weak or unwanted shoots.

b) Lightly cultivate the surface soil, to a depth of approximately 50 mm, remove or bury all annual weed or natural litter and break any surface capping. Take special care to avoid unnecessary damage to the plants and ensure that all are firmly bedded in the soil. Leave the surface with a fine and even tilth with soil crumbs of less than 50 mm in diameter. Once a year operation in early winter.

c) Maintain the soil surface substantially free of weeds (less than 10 per cent weed cover) by hand removal and spot treating with weed killer. Spot treatment at approximately four-weekly intervals in the main growing season, to a total of five times per season.

   Note: As an alternative the borders can be regularly hand-hoed at up to two-weekly intervals in the main growing season, to 6 times per year. This procedure is recommended for the first year after planting when the plants may be more sensitive to contact herbicide damage and residual herbicides may not be used.

d) Immediately after planting or, when and where subsequently directed, mulch the surface with a 50 mm layer of pulverised bark (maximum particle size 40 mm), or other approved equivalent. Thereafter, top dress the mulch as necessary and at least once a year to maintain effective cover. Spot treat or remove any emergent weeds as specified in c) above but do not cultivate or incorporate the mulch into the soil.

e) Replacement of plants at end of natural life or dead/damaged/vandalised plants:
   Use pits and plants to original specification or to match the size of the adjacent or nearby plants of the same species, which ever is the greater.

f) Removal of dead plant material
   At the end of the growing season, check all shrubs and remove dead foliage, dead wood, and broken or damages branches and stems.

2.7 Planting Strategy

The plant species are chosen to respect the local environment while providing suitable vegetation that is harmonious with the existing area and will be successful through all stages of its maturity. The primary function of the vegetation is ecological; therefore, the planting palette is made up predominantly of native species. Various types of planting are used to create different atmospheres for certain spaces, and to serve various functions throughout the site. Some non-native ornamental planting has been used in car parking areas and for proposed green walls creating more visual interest for employees and other users.

Common Alder, Birch, Pine and Oak are the dominant tree species proposed throughout the site, notably in the woodland areas and on berms. These trees will mature into large woodland specimens. When the trees mature, they will have a very strong visual impact and will define the character of the development, providing visual screening and aesthetic qualities.

Species in the wetland area are distinct from other species throughout the site and have been chosen specifically to function in wet, damp conditions and to enhance ecology and biodiversity in this area. Alder, Birch and Willow are the dominant tree species while riparian strips are composed of native wetland perennials, reeds, sedges and ferns.

Particular attention was given to introducing certain pollinator species to various plant mixes in woodland and hedgerow areas as outlined and in referral to the ***'Councils: actions to help pollinators; All Ireland Pollinator Plan 2021-2025'***

Boundary treatments include native hedgerows, formal hedges and woodland belts. Native hedgerow mixes are composed of native species chosen to provide habitat and increase other ecological qualities. Formal hedges form boundaries to more open public parts of the site.

Planting Schedule					
Nr	Plant Name	Ht/Sprd	Girth	Root	Density
	Trees				
110	Alnus glutinosa	400-450	14-16cm	RB	
76	Alnus glutinosa	300-350	10-12cm	B	
168	Alnus glutinosa	250-300	8-10cm	B	
110	Betula pendula	400-450	14-16cm	RB	
60	Betula pendula	300-350	10-12cm	B	
168	Betula pendula	250-300	8-10cm	B	
6	Malus sylvestris	250-300	10-12cm	B	
110	Quercus petraea	400-450	14-16cm	RB	
30	Quercus petraea	300-350	10-12cm	B	
168	Quercus petraea	250-300	8-10cm	B	
30	Salix alba	250-300	10-12cm	B	
18	Sorbus aria	250-300	10-12cm	B	
	Conifers				
110	Pinus Sylvestris	250-300cm		RB	
30	Pinus Sylvestris	200-250cm		RB	
425	Pinus Sylvestris	40-60cm	-	C	1/m2
213	Larix decidua	40-60cm	-	C	1/m2
	Woodland Transplants				
425	Alnus glutinosa	100-120cm	-	B	1/m2
950	Betula pendula	100-120cm	-	B	1/m2
1262	Corylus avellana	80-100cm	-	B	1/m2/3/m2
3360	Crataegus monogyna	80-100cm	-	B	1/m2/3/m2
790	Euonymus europaeus	40-60cm	-	C	1/m2/3/m2
1003	Ilex aquifolium	40-60cm	-	C	1/m2/3/m2
213	Prunus avium	100-120cm	-	B	1/m2/3/m2
213	Prunus padus	100-120cm	-	B	1/m2/3/m2
2098	Prunus spinosa	100-120cm	-	B	1/m2/3/m2
950	Quercus petraea	100-120cm	-	B	1/m2
790	Lonicera periclymenum	80-100cm	-	B	3/m2
790	Rosa canina	80-100cm	-	B	3/m2
1049	Viburnum opulus	80-100cm	-	B	3/m2
	Wetland Plants				
35	Apium nodiflorum	30-40cm	-	P9	1.5/m2
35	Caltha paulaustris	30-40cm	-	P9	1.5/m2
35	Iris pseudacorus	30-40cm	-	P9	1.5/m2
70	Myosotis scorioides	30-40cm	-	P9	1.5/m2
35	Myriophyllum spicatum	30-40cm	-	P9	1.5/m2
70	Sparganium spp.	30-40cm	-	P9	1.5/m2
	Native Grasses + Ferns				
140	Dryopteris filix-mas	30-40cm	-	P9	1.5/m2
140	Luzula nivea	30-40cm	-	P9	1.5/m2
140	Polystichum setiferum	30-40cm	-	P9	1.5/m2
	Climbers				
45	Clematis armandii	40-60cm	-	2L	2/linear m
45	Lonicera henryii	40-60cm	-	2L	2/linear m
45	Vitis coignetiae	40-60cm	-	2L	2/linear m
45	Trachylospermum jasminoides	40-60cm	-	2L	2/linear m
	Ornamental Planting				
465	Galium odoratum	40-60cm	-	2L	4/m2
465	Geranium 'Johnsons Blue'	40-60cm	-	2L	4/m2
465	Libertia grandiflora	40-60cm	-	2L	4/m2
700	Polystitchum setiferum	40-60cm	-	2L	4/m2
700	Prunus 'Otto Luyken'	40-60cm	-	2L	4/m2
465	Rudbeckia fugida 'Goldstrum'	40-60cm	-	2L	4/m2
700	Stipa arundincea	40-60cm	-	2L	4/m2
700	Sarcoccoca humilis	40-60cm	-	2L	4/m2
1100	Taxus baccata	40-60cm	-	2L	4/m2

Fig 13 – Planting Schedule

Proposed development by Vantage Data Centers Dub 11 Ltd, Dublin, Ireland

Located at Profile Park, Grange Castle South Business Park, New Nangor Road, Dublin D22

Further Information Submission

Appendix 1

Outline Landscape Specification

1.0 EARTHWORKS SPECIFICATION

1.1 STRIPPING AND STORAGE OF TOPSOIL

1.1.1 Weather and Soil Conditions

All work involving topsoil shall not be carried out, unless the engineer permits otherwise;

a) where areas have been exposed to a cumulative rainfall exceeding 60mm over the preceding 28 days measured at a point approved by the engineer;or
b) where moisture content is wetter than the Plastic Limit (PL) of the soil less 3%. The PL of the soil can be assessed in the field as the minimum moisture content at which the soil can be rolled and moulded into a thin thread approximately 3mm in diameter without breaking or cracking and in a laboratory according to BS 1377:Part 2.
c) when heavy rain is falling.

Topsoil shall not be stripped, excavated or worked in way when frozen or waterlogged.

1.1.2 Stripping

Prior to stripping existing, all vegetation will be cut to a maximum height of 100mm and sprayed with an approved systemic herbicide.

Existing topsoil to a maximum depth of 150mm shall be stripped from all areas liable to disturbance of any kind including building works, all temporary access routes, underground services, permanent mounding areas, ponds, compounds and storage areas.

Do not run machinery over ground before stripping. Strip the full depth of the sod and topsoil, but avoid extending the stripping into the subsoil layers. Doubling handling/working of all material shall be avoided.

1.1.3 Stockpiles

Stockpiles shall be kept as low as possible, and shall not exceed 1.5m metres in height. Avoid running machinery over stockpiles, if this is compatible with the operation of the machines employed. In all cases, minimise the running of machinery over stockpiles. Do not compact them. In formation of stockpiles, soil should be loosely dumped and stockpiles should be shaped to shed water. Any temporary stockpiles, made before loading, shall not exceed 1.5 metres in height. Do not run machinery over the surface of stockpiles.

Stockpiles shall be located on dry, free draining ground, not subject to temporary standing water. If water ponds against the stockpile, temporary drains shall be cut to relieve it.

Topsoil stockpiles shall not be covered or contaminated by subsoil, rock, rubble, remains of trees, site debris, fuel or chemical pollution. Any contaminated soil stripped from the site shall not be incorporated into the stockpile. Where space is short, or where there is any risk of contamination or of topsoil and subsoil stockpiles intermingling, the topsoil stockpile shall be surrounded with a temporary fence.

Temporary yards or hardstandings, or any area where fuel or chemicals are stored shall not drain towards topsoil stockpiles.

1.1.4 Maintenance of Topsoil Stockpiles

Stockpiles of One Year's Duration or less: Treat growing weeds with 'Roundup' applied to manufacturer's recommendation and to the approval of the Engineer, diluted and applied in accordance with the manufacturers recommendations for the equipment used, when they are growing strongly. Noxious weeds (Docks, Thistle, and Ragwort) shall be treated before they flower.

Stockpiles of up to Two Year's Duration: Roughly grade top and slopes of topsoil to reasonably even slopes (no flat areas). Sow Italian Ryegrass at 50 kg. per hectare as a temporary grass cover. Control noxious weeds (Docks, Thistle, Ragwort) with a proprietary selective weedkiller such as 'Bandock', diluted and applied in accordance with the manufacturer's instructions for the equipment in use, when they are growing strongly

1.2 SPREADING OF TOPSOIL

1.21 Decompaction

Prior to subsoiling or topsoiling all disturbed areas (excluding engineered slopes) shall be decompacted using a back-actor of a 'Hymac' to a depth of 450mm and only during dry weather condition

1.2.2 Subsoil Formation

Formation levels shall allow for the following depth of Class 5A topsoil, after settlement and cultivations:-

Grass Areas:	200 mm.
Shrub Planting	350 mm

Make up excessive depth with subsoil material before topsoiling. This material shall be clean subsoil (soil layer extending between the natural topsoil and the parent material), free draining, free from rubbish, building contamination, large stones/rocks greater than 250mm. Subsoiling operations shall be carried out in layers with each layer being lightly consolidated with a maximum depth of 250-300mm per layer.

Allow for topsoil to stand 30 mm proud of all kerbs, paths, edgings and manhole covers etc.

1.2.3 Topsoil - General

Topsoil for use in all landscape areas shall be subject to the inspection and approval of the landscape architect before spreading.

Topsoil will be premium grade topsoil of high intrinsic fertility, loamy texture and good structure and shall conform to BS3882. It shall be free from pernicious weeds including dock, thistle, stinging nettle, ragwort and couch grass. It shall not have been compacted and shall not be in an inert state.

It shall be acidic, pH 5.5-6.5 and free from stones over 50mm in diameter. It shall be free from subsoil, sods, roots of trees and shrubs, plastics, metals, paper, brick, concrete or any other foreign object. Topsoil shall be from the original surface layer of grassland or cultivated land, to a maximum depth of 200 mm. Soils from woodland, heathland, bog or contaminated land will not be acceptable. Do not strip from under the canopy of any tree, nor closer than 4 meters to a hedge.

The organic content shall not be less than 5% (dry weight). Where the soil contains more than 60% sand, the organic matter shall not be less than 6% (dry weight).

1.2.3 Topsoiling

Topsoil shall not be spread over any area of the site indicated until preliminary ripping operations are complete. Once the topsoil has been spread, **no access** will be allowed for construction plant and machinery. Site preparation and soiling operations shall take place only in suitable dry site and weather conditions.

Final grading is to be carried out to ensure a true specified level and slope and to avoid dishing or other depressions where water may collect.

The use of a heavy roller to roll out humps will not be permitted and any area that becomes unduly compacted during the grading operations shall be loosened by forcing or harrowing.
The level of the topsoil is to be at least 30 mm above all paved areas to allow for shrinkage or settlement.

1.3 Finished Levels

Localised hollows and mounds are to be levelled out and areas so finished that they drain to hard standing areas or elsewhere as indicated.

1.2.3 Topsoil for Tree Pits

Planting pits for standard trees will be dug and backfilled with Class 5B topsoil. Volume of topsoil to be as follows:-

Extra Heavy Standard Trees	1.2 cubic metres
Standard Standard Trees	1.0 cubic metres

1.2.6 Reinstatement Work

Reinstate all ground driven over and otherwise disturbed to even flowing gradients. Match reinstated levels to those of surrounding ground. Finished levels shall be free of humps, depressions and vehicle tracks. Rainwater shall not lie on reinstated ground nor on adjacent areas.

2.0 PLANTING SPECIFICATION

2.1 Materials

All plant material shall be good quality nursery stock, free from fungal, bacterial or viral infection, Aphis, Red Spider or other insect pest, and physical damage. It shall comply with the requirements of Part 1: 1965 Trees and Shrubs section of B.S. 3936, Specification for Nursery Stock.

All plants shall have been nursery grown in accordance with good practice and shall be supplied through the normal channels of the wholesale nursery trade. They shall have the habit of growth that is normal for the species.

Except for any cultivated varieties or exotic species which do not set viable seed in Ireland, all plants shall have been grown from seed.

2.2 Species

All plants supplied shall be exactly true to name as shown in the plant schedules. Unless stipulated, varieties with variegated or otherwise coloured leaves will not be accepted, and any plant found to be of this type upon leafing out shall be replaced

Bundles of plants shall be marked in conformity with the relevant part of B.S. 3936. Replace any plants that are found not to conform to the labels. An inspection of plants shall be undertaken prior to planting to ensure quality control.

2.3 Trees

Selected standard trees shall have a minimum girth as specified at 1.00 mm above ground level, a clear stem to 1.8m high and a total height of 3.0 to 3.5metres.

Selected standard trees shall have a minimum girth as specified at 1.00 mm above ground level, a clear stem to 2.0m high and a total height of 4.0 to 4.5 metres.

Trees shall have a sturdy, reasonably straight stem, a well defined and upright central leader, with branches growing out of the stem with reasonable symmetry, or a well balanced branching head according to the Schedule. The crown and root systems shall be well formed and in keeping with the nature of the species. Roots shall be in reasonable balance with the crown and shall be conducive to successful transplantation.

Trees shall be supplied rootballed unless otherwise scheduled. All trees shall have been regularly undercut or transplanted. Root balled trees shall be supplied with a rootball made from a mechanical 'Damcon' undercutter or similar approved, shall be 90cm diameter, wrapped in bio-degradable burlap and tightened with a 90cm diameter tempered steel root ball cage.

Bare root trees shall have been lifted carefully to avoid tearing of major roots and to preserve a substantial proportion of smaller and fibrous roots. Trees shall have been grown on their own roots. Budded or grafted trees will be rejected.

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2.4 Shrubs

Shrubs shall be of the minimum size specified in the schedules, with several stems originating from or near ground level and of reasonable bushiness, healthy, well grown, and with a good root system. Pots or containers shall be as scheduled. Plants shall not be pot bound, nor with roots deformed or restricted. Bare root material will only be accepted where specified.

2.5 Herbicides

All herbicides will be approved under current regulations and proof of compliance provided where requested by the Landscape Architect

2.6 Weedkiller Application

All weedkiller shall be applied with properly designed equipment, maintained in good working order and calibrated to deliver the specified volume, evenly and without local over-dosing. Measure all quantities of weedkiller with a graduated measuring vessel.

2.7 Bulky Organic Manure/ Mushroom Compost

Bulky organic manure shall consist either of spent peat compost, mushroom compost, as described above, spent hops, or of well rotted farm manure. Farm manure shall consist of predominantly of faecal matter and shall be free of loose, dry straw and of undigested hay. Manure shall be free of surplus liquid effluent. This shall be used on mounds only. Well spent mushroom compost shall be used in all ornamental planting areas.

2.8 Fertilisers

Controlled release fertiliser N:P:K 15:9:11 plus trace elements - Osmocote plus or similar approved applied at specified rates. Fertiliser shall be supplied in sealed bags or containers bearing the manufacturer's name, the net weight and analysis.

2.9 Stakes for Extra heavy StandardTrees

Stakes shall be of peeled Larch, Pine or Douglas Fir, preserved with water-borne copper-chrome-arsenic to I.S. 131, to a net dry salt retention of 5.3 kg per cubic metre of timber. Stakes shall be turned, and painted one end. Size shall be 2700 x 75 mm diameter.

Set stakes vertically in the pit and drive before planting. Drive stake with a drive-all, wooden maul or cast-iron headed mell, not with a sledge hammer.

2.10 Tree Ties

Tree ties shall be of rubber, P.V.C. or proprietary fabric laminate composition, and shall be strong and durable enough to hold the tree securely in all weather conditions for a period of three years. They shall be flexible enough to allow proper tightening of the tie.
Ties shall be min. 40 min. wide for standard trees. Provide a simple collar, free of rough or serrated edges, to prevent chafing. Provide for subsequent adjustment of the tie either by means of a buckle (nail tie to stake immediately behind it) or by leaving heads of securing nails slightly proud, to permit easy extraction and repositioning. All nails shall be galvanised.

2.11 Protection

The interval between the lifting of stock at the nursery and planting on site is to be kept to an absolute minimum. Plants shall be protected from drying out and from damage in transport. All stock awaiting planting on site shall be stored in a sheltered place protected from wind and frost, from drying out and from pilfering. Bare rooted plants not immediately required shall be heeled-in in a prepared trench, the bundles of plants first having being opened, the plants separated and each group separately heeled-in and clearly labelled. The roots shall be covered with moist peat or soil and shall be kept moist until planted. Pots shall not be removed until plants have been carried to their planting station. Plants packed in polythene must be stored in shade.

All forest transplants and bare root shrubs shall be wrapped in polythene from the time of lifting to conserve moisture. Except when heeled-in, they shall be protected in polythene at all times until planted into their final position on site.

Plants shall be handled with care at all times, including lifting in and despatch from the nursery. Plants or bundles of plants shall not be tossed, dropped of subjected to any stress likely to break fine roots.

2.12 Damage

Any roots damaged during lifting or transport shall be pruned to sound growth before planting. On completion of planting any broken branches shall be pruned.

2.13 Vine Weevil

Line out all container grown plants on level ground. Drench pots with 40 g of 40% Diazinon W.P. in 100 litres water. Allow to stand for at least three days before planting.

2.14 Setting Out

Setting out shall be from figured dimensions where indicated, and otherwise by scaling.

Shrubs and ground covers planted in mass shall be at the spacing indicated on the drawings. Shrubs shall not generally be planted closer to a kerb or to the edge of a planting area than a distance equal to half the spacing indicated for that species.

2.15 Site Preparation

Preliminary Weedkilling: To achieve weed free soil achieved within the current government guidelines.

Shrub Planting: Cultivate beds 225 mm deep, incorporating ameliorants evenly. Remove stones, rubbish over 50 mm dia.

2.16 Extra Heavy + Select Standard Tree Planting

Excavate tree pits to 1.2 cubic metres volume (1.2 m diameter x 1.0 m deep). The base of the pit shall be broken up to a depth of 15 cm and glazed sides roughened. Supply and drive 2nr stakes.

For planting in areas of made up ground, load and carry topsoil from stockpile on site. In undisturbed ground, backfill with excavated material. Mix the following ameliorants evenly throughout the topsoil while it is stacked beside the pit. (Quantities are calculated for a pit of the specified dimensions):-

Soil ameliorant: 0.047 cubic m (equivalent to manure 6 cm deep over 1 m dia. of tree pit). Osmocote plus: 250 gm

Trees shall be planted at the same depth as in nursery, as indicated by the soil mark on the stem of the trees. They shall be centred in the planting pit and planting upright. The roots shall be spread to take up their normal disposition. Fit tie.

2.17 Planting of Shrubs and C.G. Transplants

Remove all plastic and non-degradable wrappings and containers before planting. Make four vertical cuts with a sharp knife on the quadrants through the edge of C.G. rootballs to sever girdling roots. Excavate hole to min. 10 cm greater diameter than the root spread, and to a depth to allow planting to same depth as in the nursery. Spread out roots of bare root species. Backfill in layers of not more than 10 cm, firming each layer and on completion.

2.18 Replacements

The planting will be inspected in April and September following planting (refer to implementation programme). Any tree or shrub found to have died from any cause shall be replaced. Replacement planting shall conform in all respects with this Specification, including all specified excavation, provision and incorporation of all fertilisers and ameliorants, and weedkiller treatments.

2.19 IMPLEMENTATION PROGRAMME

Programme is subject to alteration dependent on progress of construction works of the site.
A **provisional** programme is as follows but is subject to review at time of appointment of the Landscape Contractor.

	Approx. Time	Element
CRITICAL DATE:	**Within first planting season**	**Start Planting**
CRITICAL DATE:	**Before March of first planting season**	**Complete Bareroot Planting**
CRITICAL DATE:	**March /September after completion of build**	**Start Seeding**
CRITICAL DATE	**First Growing Season**	**Assessment of Plant Establishment**
CRITICAL DATE	**First leaf out after 12 months from PC**	**End of Defects Liability Period**

Refer to item 2.18 on replacements

Landscape Management

1.0 Introduction

The initial maintenance contract will cover a period of two years. The contract will then be reviewed by the management company on an annual basis by the management company.

The specifications and operations are grouped under the following headings:

Grassland – General
Amenity/Ornamental Grass Areas
Natural/Wildflower Grass Areas
Shrub borders
Ground cover
Hedges
Newly planted trees
Woodland Planting
General litter clearance
Hard paved surfaces

2.0 GRASS AREAS

2.3.1 Natural / Wildflower Grass Areas

2.3.2 Maintenance Objective

To restrict the growth of the coarse species, in order to provide more room for the more desirable ones, through control of nutrition.

2.3.3 Maintenance Operations

a Cutting

Cutting should only be done when the sward is dry.

Use a strimmer with a blade attachment or a finger/sickle bar mower.

With Tractor driven machinery cut a meadow after mid-day when the grass gets stiffer.

Use metal blades, not plastic.

Start the cutting of the meadow from the middle outwards to allow wildlife to escape

b Gap creation

Similar to scarifying a lawn, gap creation is required to scrape open soil each autumn to allow new seedlings to replace plants that have died off.

Use a Chain harrow turned upside down or a rake to pull away the dead hay that is left after cutting. As most plants have stopped growing above the soil no harm will be done to them, but clump or rosette forming flowers like an ox-eye daisy can spread over areas of soil that other plants could be germinating on.

Rake these plants or cut them hard back with a grass strimmer (use blade). Remove the dead thatch of grass covering the soil, it kills seedlings and causes mould. Spot weed killing of grasses and weeds may be done at this time. Remove the hay every year.

After gap creation spray off or root out any creeping White Clover or creeping Buttercup, they ruin most meadows. Do not kill the larger leafed non-creeping Red Clover as we include it in the mixtures. Red Clover has a single non-spreading taproot, White Clover spreads or creeps very fast on certain soils.

c Long-term Meadow Maintenance

By the third year the meadow will settle down and does not require much maintenance. The general rule is to cut a meadow and remove cuttings once in late July or in the autumn. The meadow can be mown or topped between October and April during mild winters if growth exceeds 25cm.

d Spring meadows

To encourage spring flowering species cut spring meadows and all low growing areas once in spring, no later than 15th April and again when they have finished flowering after 21st June. Remove all cuttings & rake.

e Summer meadows

Cut a summer meadow before 21st May at the very latest and again when the meadow has finished flowering after 21st August again at the latest.

f Late summer meadows

Cut late summer meadows and tall growing meadows up to July 1st and cut back flowers after October 21st or leave it until early springtime the following year. Always remove 'cut' materials. Most wildflowers will die if grass cuttings are not removed.

g Where paths are required through meadow areas they should be mown regularly and kept at least 2m wide to prevent surrounding vegetation from obscuring the path.

3. PLANTING AREAS

3.1 Shrub Areas - General

Shrub areas must be kept weed free, particularly of perennial weeds, to allow planting to give early cover. However, the plants may be required to be thinned so that the shrubs that are retained are able to achieve an attractive form. This may involve removing the intermediate plants soon after shoots are touching.

3.1.1 Maintenance Objective

Maintain shrub growth to cover as much as possible of the border area and allowing the individual plants to achieve as nearly as possible their natural form. Maintain the borders free of visible weeds and shape and prune the shrubs to avoid obstructing pathways or blocking light to, or adhering to windows.

3.1.2 Maintenance Operations

a) After planting, if appropriate and in season for the species involved, prune shrubs to develop their desirable ornamental characteristics. At the same time remove intermediate plants that are restricting the natural and attractive development of their neighbours. Remove all arisings from site.

b) Lightly cultivate the surface soil, to a depth of approximately 50 mm, remove or bury all annual weed or natural litter and break any surface capping. Take special care to avoid unnecessary damage to the shrub plants and ensure that all the shrubs are firmly bedded in the soil. Leave the surface with a fine and even tilth with soil crumbs of less than 50 mm in diameter. Once a year operation in early winter.
Note: This operation is only essential where the soil is compacted or as a means of incorporating mulch. Not required where the areas are mulched.

c) Maintain the soil surface substantially free of weeds (less than 10 per cent weed cover) by hand removal and spot treating with Glyphosate, or approved equivalent. Spot treatment at approximately four-weekly intervals in the main growing season, to a total of five times per season.

Note: As an alternative the borders can be regularly hand-hoed at up to two-weekly intervals in the main growing season, to 6 times per year. This procedure is recommended for the first year after planting when the plants may be more sensitive to contact herbicide damage and residual herbicides may not be used.

g) Immediately after planting or, when and where subsequently directed, mulch the surface of the border with a 50 mm layer of pulverised bark (maximum particle size 40 mm), or other approved equivalent. Thereafter, top dress the mulch as necessary and at least once a year to maintain effective cover. Spot treat or remove any emergent weeds as specified in c) above but do not cultivate or incorporate the mulch into the soil.

h) Replacement of plants at end of natural life or dead/damaged/vandelised plants:
Use pits and plants to original specification or to match the size of the adjacent or nearby plants of the same species, which ever is the greater.

i) Removal of dead plant material
At the end of the growing season, check all shrubs and remove dead foliage, dead wood, and broken or damages branches and stems.

j) Pruning ornamental shrubs
General: prune to encourage healthy and bushy growth and desirable ornamental features, eg flowers, fruit, autumn colour, stem colour.

Suckers: Remove by cutting back level with the source stem or root.

h) Pruning times of flowering species of shrubs or roses:-
Winter flowering shrubs: Spring
Shrubs flowering between March and July: Immediately after flowering period
Shrubs flowering between July and October: Back to old wood in winter
Rose bushes: Early spring to encourage basal growths and a balanced, compact habit.

k) Thinning by removal / transplanting of surplus plants
Surplus plants should be removed during the winter period to prevent overcrowding.

3.2 Ground Cover - General

Described as dense, low-growing plants, which cover the ground and smother any weeds. Ground-cover needs careful establishment, to ensure that any perennial weeds are eliminated.

3.2.1 Maintenance Objective

Maintain a dense, weed free cover of healthy growth, clipped or pruned as necessary to give a neat and tidy finish and contained within the planted area.

3.2.2 Maintenance Operations

a) Maintain the area substantially free of weeds (less than 10 per cent of weed cover at maximum) by hand removal or spot treating any emergent weeds during the growing season with Glyphosate, or approved equivalent. Spot treatment or weed removal at approximately four-weekly intervals in the main growing season, to 5 times per year in total. Frequency of sprays to drop, as the plants establish.

b) Trim and tidy the plants once a year in the winter months, to remove dead vegetation or overgrowing branches. Remove all arisings from site. The amount of work will vary according to the species.

3.3 Hedges - General

3.3.1 Maintenance Objective

Regularly clip hedges to maintain a uniform and tidy appearance (according to the type of hedge and situation) and a well-developed cover of vegetation over the whole of the hedge surface. Control any weed or grass growth at the base of the hedge so that it does not detract from the overall appearance or adversely compete with the hedge.

3.3.2 Maintenance Operations

a) Clip the top and sides of the hedge to maintain true and even levels, with the width at the top less than that at the base, removing current growth rather than old wood and using suitable mechanical cutters to maintain the shape and height. Remove any cuttings lodged in the surface of the hedge and rake up and remove all arisings.

b) Trimming rapidly establishing hedges – Allow to reach planned height as rapidly as possible. Trim back lateral branches moderately to establish required shape

c) Trimming slowly establishing hedges – cut back hard in June and September to encourage bushy growth down to ground level, allow to reach planned dimensions only by gradual degrees, depending on growth rate and habit

Allow for the operation to be carried out to suit the species and position of the hedge.

- Formal ornamental or Yew hedge - once every 8 weeks in the main growing season (2 cuts per year).
- Hawthorn hedges - once a year in the autumn or winter but with an additional cut in early June where it overhangs footpaths. To a specified height and profile using suitable mechanical cutters.
- Beech hedge - once a year in late summer and additionally in July if deemed necessary.

b) Maintain weed free a 750 metre wide band at the base of the hedge (weeds at a maximum height of 100 mm and a maximum ground cover of 10%) by regular hand removal, hoeing or by the use of approved herbicide. Allow for control once every 6 weeks in the main growing season (4 times per year).

c) Replacement of plants through damage – plants that have died or are damaged should be replaced as soon as possible. If it is necessary to wait until the planting season to replace such plants, the dead or damaged plant should be removed and the area kept tidied up until such time as it is appropriate to perform the replacement operatons.

3.4 Care of Newly Planted Trees - General

Young trees will need regular attention to ensure establishment. The most important operation is to keep the soil around the base of the tree free from weeds or grass and to ensure secure and correct staking.

3.4.1 Maintenance Objective

Establish a stable and healthily growing tree with a well-shaped framework for future growth.

3.4.2 Maintenance Operations

a) Maintain a 1 m diameter circle of plant-free soil around the base of each isolated tree by hoeing *or* the use of approved herbicide other than a residual.

Allow for hoeing up of soil once every 4 weeks in the growing season (5 times per year). Allow for herbicide treatment once in the winter or spring and 3 additional treatments.

b) Cut back any tall vegetation that is threatening to shade or smother the young tree (i.e. taller vegetation growing from outside the 1 m weed free area). Allow for cutting back regularly (3/4 times a year).

c) Water the newly planted trees throughout the summer months (May to August) as required after any period of 4 weeks without significant rainfall (less than 5 mm). Apply sufficient water to thoroughly wet the top 150 mm of soil around the tree roots. This will normally require approximately 10 litres for a seedling or whip and 20 litres for a standard tree. Supply/transport of water to be agreed with the client.

d) Check stakes and ties for firmness and support and adjust as necessary. Allow for checking twice a year, preferably in late spring and late summer. Replace loose, broken or decayed stakes to original specification. Adjust, refix or replace defective ties, allowing for growth and to prevent chafing – where chafing has occurred, reposition or replace ties to prevent further chafing. Loose or defective guards Adjust, refix or replace to original specification and to prevent chafing

e) Firm the soil around the roots to ensure that the plant is securely planted in the ground and upright. Allow for firming once in the spring after planting.

f) Pruning:

- Formative prune to remove any dead, diseased or damaged shoots and create a balanced form for future growth. Allow for pruning once in the season after planting and again in the 3rd year.
- Do not prune during the late winter/early spring sap flow period.
- Young trees up to 4 metres high:
  Crown prune by removing dead branches and reducing selected side branches by one third to preserve a balanced head and ensure the development of a single strong leader.
  Remove duplicated branches and potentially weak or tight forks. In each case cut back to live wood
- Whips or feathered trees: do not prune in the first season after planting. Formative prune whips at the end of the second season after planting taking care to ensure that a strong leader is established.
- Pruning in accordance with good horticultural and arboricultural practice
- Removing branches: Do not damage or tear the stem
- Wounds: Keep as small as possible and cut cleanly back to sound wood
- Cutting: Make cuts above and sloping away from an outward facing healthy bud, angled so that water will not collect on cut area.
- Larger branches: Prune neither flush nor leaving a stub, but using the branch bark ridge or branch collar as a pruning guide.
- Appearance: Thin, trim and shape each specimen appropriately to species, location, season, and stage of growth, leaving a well-balanced natural appearance.
- Tools: use clean sharp secateurs, hand saws or other approved tools. Trim off ragged edges of bark or wood with a sharp knife.
- Disease or fungus: Give notice if detected.
- Growth retardants, fungicide or sealant: do not use unless instructed

g) Removal of tree guards, stakes, ties, rabbit guards: Remove at the end of the second planting season. Fill stake holes with lightly compacted soil

h) Replace trees that have died or are seriously damaged according to the original specification.

i) Tree/hedge guy wires
Operations – Replace or secure loose or missing guy wires
Adjust to suit stem growth and to provide correct and uniform tension

3.5 Woodland Planting

3.5.1 Maintenance Objective

The developer will take responsibility for the aftercare of the landscape development. The developer will ensure that there are inspections of the planting every second year thereafter for the first ten years.

3.5.2 Maintenance Operations

Five years after practical completion, the planting will be inspected and assessed on the basis that it is growing well, is self-supporting and has had the stake removed. During the 5-10 year period after practical completion, the planting will be kept clear of noxious weeds such as bramble, nettles etc.

At the ten-year stage, a thinning programme will commence selectively removing weak or poor trees thus helping the more healthy and vigorous trees develop unimpeded.

Thereafter the planting will be examined at 10-year intervals with thinning and coppicing carried out as required together with underplanting and interplanting as required.

Progress reports will be produced following each site visit analysing the success rate, health, vigour and maintenance performance of the planting. These reports will set out any measures required to ensure the successful establishment of the planting.

4. OTHER

4.1 Litter Clearance - General

4.1.1 Maintenance Objective

Collect and dispose of offsite, all extraneous litter and rubbish on a regular basis so that its presence is not detrimental to the appearance of the site. (This means that the site should be free from litter after each visit to site).

4.1.2 Maintenance Operations

a) Collect and dispose of offsite, all extraneous rubbish, not arising from maintenance works, which is detrimental to the appearance of the site. This rubbish to include stones (over 50mm dia. which may be buried), bricks, debris, paper, confectionery and other wrappings, bottles, cans and plastic containers.

This operation is to be carried out at regular intervals based in conjunction with other maintenance visits and operations.

c) Collect and dispose of offsite, all extraneous matter which has deliberately been deposited on the site by persons known or unknown (fly-tipping). Such matter to include bricks, rubble, garden and household refuse, discarded domestic appliances, furniture and scrap metal. Priced per occasion based on an estimate of the volume of material to be collected.

4.2 Paved Areas - General

4.2.1 Maintenance Objective

Regularly sweep or clean paved surfaces to keep it clear of litter or other debris that will detract from the appearance of the site. Keep the surface free from weed (including moss) growth and all associated drainage gullies in working order.

4.2.2 Maintenance Operations

a) Sweep all paved areas at regular intervals and remove all arisings from the site. Frequency may vary according to time of year or other maintenance operations. Hand or mechanical - sweeping may be used.
b) Control all annual weed (moss) growth by the application of residual weedkiller. A single application in March/April should normally be sufficient but follow-up spot treatment may be necessary in late summer.
c) Clear silt and extraneous matter from the drainage gullies, including the lifting and replacement of the drain cover. Programme for once every six months but more frequently where silting up is a particular problem.
f) When instructed grit all paths with 2mm down angular grit. When paths have cleared of ice, the Contractor will sweep up all grit and remove all arisings off site.