9.0 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

9.1 Introduction

This chapter assesses the potential effects of the proposed development on the landscape character and views/visual amenity of the receiving environment. It should be read in conjunction with the verified photomontages contained in Appendix 9.1 of the EIAR (under separate cover).

9.1.1 Expertise and Qualifications

The chapter was prepared by Richard Butler (BSc Landscape Architecture, MSc Spatial Planning, MILI MIPI), Director of Model Works Ltd. Richard has degrees in Landscape Architecture and Town Planning and is a member of the Irish Landscape Institute and the Irish Planning Institute. He has over 20 years' experience in development and environmental planning, specialising in Landscape and Visual Impact Assessment (LVIA).

9.2 Methodology

9.2.1 Introduction

The assessment was carried out with reference to:

- *Guidelines for Landscape and Visual Impact Assessment*, 3rd edition, 2013 (GLVIA), published by the Landscape Institute;
- *Technical Information Note on Townscape Character Assessment*, 2016, published by the Landscape Institute;
- *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*, 2017, published by the Environmental Protection Agency;
- *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*, 2018, published by the Department of Housing, Planning and Local Government.

The draft Environmental Protection Agency (EPA) guidelines provide a general methodology and impact ratings for all environmental topics covered in an EIAR; the GLVIA provides specific guidelines for landscape and visual impact assessment. Therefore, a combination of the draft EPA guidelines and the GLVIA has informed the methodology for this assessment.

The GLVIA requires that effects on views and visual amenity be assessed separately from the effects on townscape, although the two topics are inherently linked.

'Landscape' (or 'townscape' in built up areas) results from the interplay between the physical, natural and cultural components of our surroundings. Different combinations and spatial distribution of these elements create variations in landscape/townscape character. Landscape/townscape impact assessment identifies the changes to this character which would result from the proposed development, and assesses the significance of those effects on the landscape/townscape as a resource.

Visual impact assessment is concerned with changes that arise in the composition of available views, the response of people to these changes and the overall effects on the area's visual amenity - with particular focus on public views and public visual amenity.

9.2.2 Methodology for Assessment of Townscape Effects

Assessment of potential townscape effects involves (a) classifying the sensitivity of the townscape resource, and (b) describing and classifying the magnitude of townscape change which would result from the development. These factors are then combined to arrive at a classification of significance of the effects.

9.2.2.1 Townscape Sensitivity

The sensitivity of the townscape is a function of its land use, patterns and scale, visual enclosure and the distribution of visual receptors, and the value placed on the townscape. The nature and scale of the development in question is also taken into account, as are any trends of change, and relevant policy. Five categories are used to classify sensitivity, as set out in Table 9.1.

Sensitivity	Description
Very High	Areas where the townscape exhibits very strong, positive character with valued elements, features and characteristics that combine to give an experience of unity, richness and harmony. The townscape character is such that its capacity to accommodate change is very low. These attributes are recognised in policy or designations as being of national or international value and the principal management objective for the area is protection of the existing character from change.
High	Areas where the townscape exhibits strong, positive character with valued elements, features and characteristics. The townscape character is such that it has limited/low capacity to accommodate change. These attributes are recognised in policy or designations as being of national, regional or county value and the principal management objective for the area is the conservation of existing character.
Medium	Areas where the townscape has certain valued elements, features or characteristics but where the character is mixed or not particularly strong, or has evidence of alteration, degradation or erosion of elements and characteristics. The townscape character is such that there is some capacity for change. These areas may be recognised in policy at local or county level and the principle management objective may be to consolidate townscape character or facilitate appropriate, necessary change.
Low	Areas where the townscape has few valued elements, features or characteristics and the character is weak. The character is such that it has capacity for change; where development would make no significant change or would make a positive change. Such townscapes are generally unrecognised in policy and the principal management objective may be to facilitate change through development, repair, restoration or enhancement.
Negligible	Areas where the townscape exhibits negative character, with no valued elements, features or characteristics. The character is such that its capacity to accommodate change is high; where development would make no significant change or would make a positive change. Such townscapes include derelict industrial lands, as well as sites or areas that are designated for a particular type of development. The principal management objective for the area is to facilitate change in the townscape through development, repair or restoration.

Table 9.1: Categories of Townscape Sensitivity

9.2.2.2 Magnitude of Townscape Change

Magnitude of change is a factor of the scale, extent and degree of change imposed on the townscape by a development, with reference to its key elements, features and characteristics and the affected surrounding character areas (collectively termed 'townscape receptors'). Five categories are used to classify magnitude of change, as set out in Table 9.2.

Magnitude	Description
Very High	Change that is large in extent, resulting in the loss of or major alteration to key elements, features or characteristics of the townscape, and/or introduction of large elements considered totally uncharacteristic in the context. Such development results in fundamental change in the character of the townscape.
High	Change that is moderate to large in extent, resulting in major alteration to key elements, features or characteristics of the townscape, and/or introduction of large elements considered uncharacteristic in the context. Such development results in change to the character of the townscape.
Medium	Change that is moderate in extent, resulting in partial loss or alteration to key elements, features or characteristics of the townscape, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context. Such development results in change to the character of the landscape.
Low	Change that is moderate or limited in scale, resulting in minor alteration to key elements, features or characteristics of the townscape, and/or introduction of elements that are not uncharacteristic in the context. Such development results in minor change to the character of the landscape.
Negligible	Change that is limited in scale, resulting in no alteration to key elements features or characteristics of the townscape, and/or introduction of elements that are characteristic of the context. Such development results in no change to the townscape character.

Table 9.2: Categories of Magnitude of Townscape Change

9.2.2.3 Significance of Effects

To classify the significance of effects (for both townscape and visual impacts) the magnitude of change is measured against the sensitivity of the receiving environment/ receptor using the guide in Table 15.3 below.

Magnitude of Townscape/Visual Change	Sensitivity of the Townscape/View: Very High	High	Medium	Low	Negligible
Very High	Profound	Profound to Very Significant	Very Significant to Significant	Moderate	Slight
High	Profound to Very Significant	Very Significant	Significant	Moderate to Slight	Slight to Not Significant
Medium	Very Significant to Significant	Significant	Moderate	Slight	Not Significant
Low	Moderate	Moderate to Slight	Slight	Not significant	Imperceptible
Negligible	Slight	Slight to Not Significant	Not significant	Imperceptible	Imperceptible

Table 9.3: Guide to Classification of Significance of Townscape and Visual Effects

This matrix is derived from the EPA's Draft *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*, 2017 (specifically Figure 3.5 of the Guidelines – see Figure 9.1 below).

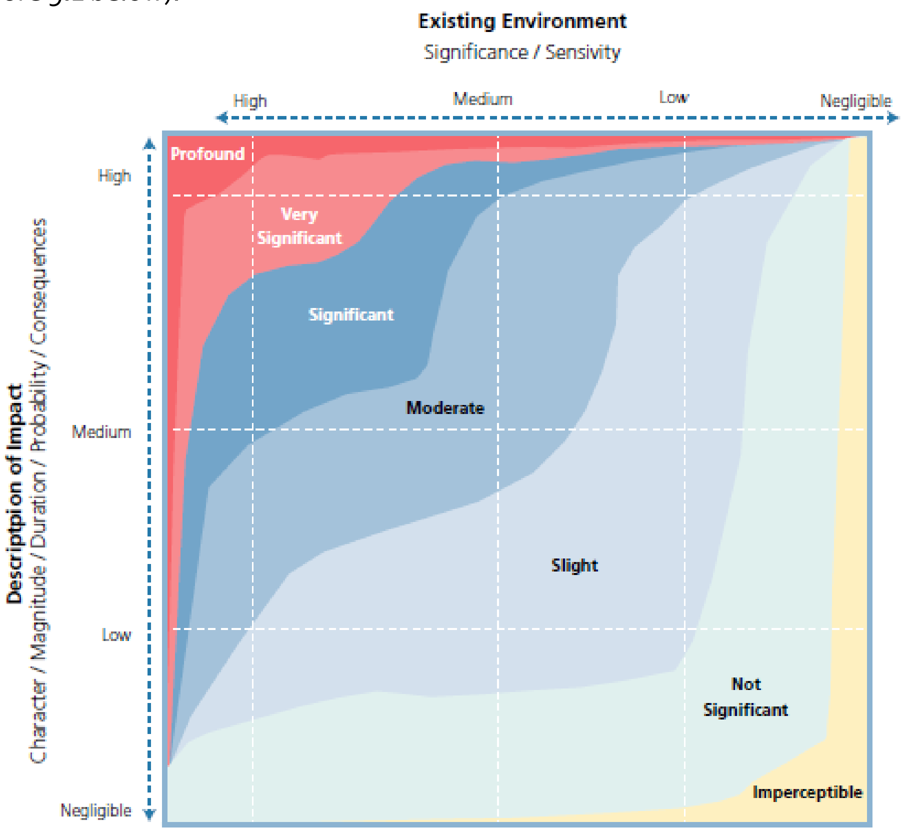


Figure 9.1: 'Chart showing typical classifications of the significance of impacts'

(Source: Figure 3.5 of the EPA's Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2017)

The matrix (Table 9.3) and the EPA's chart (Figure 9.1) are only a guide to the classification of impact significance. The assessor also uses professional judgement informed by their expertise, experience and common sense to arrive at a classification of significance that is reasonable and justifiable. In the EPA guidelines the chart above is accompanied by a footnote that states: *"The depiction of significance classifications is indicative and should not be relied on as being definitive. It is provided for general guidance purposes"* (EPA draft guidelines Section 3, page 53).

Having classified the sensitivity of the receptor and the magnitude of change (using the definitions in Tables 9.1, 9.2, 9.5 and 9.6), the matrix and chart above are used by the assessor as a starting point for the impact significance classification – using their judgement to arrive at a classification that is reasonable and sensible. For example, according to the EPA chart a change of high magnitude affecting a receptor of medium sensitivity may be classified as either 'significant' or 'moderate'. That judgement is made by the assessor.

The impact significance classifications, i.e. imperceptible to profound, are taken from the EPA Draft *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports*, 2017. The Guidelines defines the classifications as follows (Table 9.4):

Significance	Description
Imperceptible	An effect capable of measurement but without significant consequences.
Not significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
Significant	An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Very Significant	An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
Profound	An effect which obliterates sensitive characteristics.

Table 9.4: Impact Significance Classifications

(Source: Table 3.3 of the EPA's Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2017)

9.2.3 Methodology for Assessment of Visual Effects

Assessment of visual effects involves identifying a number of key/representative viewpoints in the receiving environment, and for each one of these: (a) classifying the viewpoint sensitivity, and (b) classifying the magnitude of change which would result in the view (informed by verified photomontages – included in Appendix 9.1, Volume 3 of the EIAR). These factors are combined to arrive at a classification of significance of the effects on each viewpoint.

9.2.3.1 Viewpoint/Visual Receptor Sensitivity

Viewpoint sensitivity is a function of two main considerations:

- Susceptibility of the visual receptor to change. This depends on the occupation or activity of the people experiencing the view, and the extent to which their attention is focused on the views or visual amenity they experience at that location. Visual receptors most susceptible to change include residents at home, people engaged in outdoor recreation focused on the landscape (e.g. trail users), and visitors to heritage attractions and places of congregation where the setting contributes to the experience. Visual receptors less sensitive to change include travellers on road, rail and other transport routes (unless on recognised scenic routes), people engagedin outdoor recreation where the surrounding landscape does not influence the experience, and people in their place of work or shopping.

- Value attached to the view. This depends to a large extent on the subjective opinion of the visual receptor but also on factors such as policy and designations (e.g. scenic routes, protected views), or the view or setting being associated with a heritage asset, visitor attraction or having some other cultural status (e.g. by appearing in arts).

Five categories are used to classify a viewpoint's sensitivity, as set out in Table 9.5.

Sensitivity	Description
Very High	Iconic viewpoints (views towards or from a townscape feature or area) that are recognised in policy or otherwise designated as being of national value. The composition, character and quality of the view are such that its capacity for change is very low. The principle management objective for the view is its protection from change.
High	Viewpoints that are recognised in policy or otherwise designated as being of value, or viewpoints that are highly valued by people that experience them regularly (e.g. views from houses or outdoor recreation amenities focused on the townscape). The composition, character and quality of the view may be such that its capacity to accommodate change may or may not be low. The principle management objective for the view is its protection from change that reduces visual amenity.
Medium	Views that may not have features or characteristics that are of particular value, but have no major detracting elements, and which thus provide some visual amenity. These views may have capacity for appropriate change and the principle management objective is to facilitate change to the composition that does not detract from visual amenity, or which enhances it.
Low	Views that have no valued feature or characteristic, and where the composition and character are such that there is capacity for change. This category includes viewsexperienced by people involved in activities with no particular focus on the landscape. For such views the principle management objective is to facilitate change that does not detract from visual amenity or enhances it.
Negligible	Views that have no valued feature or characteristic, or in which the composition may be unsightly (e.g. in derelict landscapes). For such views the principle management objective is to facilitate change that repairs, restores or enhances visual amenity.

Table 9.5: Categories of Viewpoint Sensitivity

9.2.3.2 Magnitude of Visual Change

Classification of the magnitude of change takes into account the size or scale of the intrusion of development into the view (relative to the other elements and features in the composition, i.e. its relative visual dominance), the degree to which it contrasts or integrates with the other elements and the general character of the view, and the way in which the change will be experienced (e.g. in full view, partial or peripheral view, or in glimpses). Five categories are used to classify magnitude of visual change to a view, as set out in Table 9.6.

Magnitude	Description
Very High	Full or extensive intrusion of the development in the view, or partial intrusion that obstructs valued features or characteristics, or introduction of elements that are completely out of character in the context, to the extent that the development becomes dominant in the composition and defines the character of the view and the visual amenity.
High	Extensive intrusion of the development in the view, or partial intrusion that obstructs valued features, or introduction of elements that may be considered uncharacteristic in the context, to the extent that the development becomes co-dominant with other elements in the composition and affects the character of the view and the visual amenity.
Medium	Partial intrusion of the development in the view, or introduction of elements that may be prominent but not necessarily uncharacteristic in the context, resulting in change to the composition but not necessarily the character of the view or the visual amenity.
Low	Minor intrusion of the development into the view, or introduction of elements that are not uncharacteristic in the context, resulting in minor alteration to the composition and character of the view but no change to visual amenity.
Negligible	Barely discernible intrusion of the development into the view, or introduction of elements that are characteristic in the context, resulting in slight change to the composition of the view and no change in visual amenity.

Table 9.6: Categories of Magnitude of Visual Change

9.2.3.3 Significance of Visual Effects

As with townscape effects, to classify the significance of visual effects, the magnitude of change to the view is measured against the sensitivity of the viewpoint, using the guidance in Table 9.3 and Figure 9.1 above.

9.2.4 Quality of Effects

In addition to predicting the significance of the effects, EIA methodology [draft EPA Guidelines Table 3.3, p.50] requires that the quality of the effects be classified as positive, neutral, or negative. For townscape to a degree, but particularly for visual effects, this is an inherently subjective exercise. This is because townscape and visual amenity are *perceived* by people and are therefore subject to variations in the attitude and values - including aesthetic preferences - of the receptor. One person's attitude to a development may differ from another person's, and thus their response to the effects of a development on a townscape or view may vary.

Additionally, in certain situations there might be policy encouraging a particular development in an area, in which case the policy is effectively prescribing townscape and visual change. If a development achieves the objective of the policy, the resulting effect might be considered positive, even if the townscape character or views are profoundlychanged. The classification of quality of townscape and visual effects should seek to take these variables into account and provide a reasonable and robust assessment.

9.2.5 Photomontage Methodology

The photomontages were produced by 3D Design Bureau. The methodology for photomontage production is included in the A3 booklet of verified views contained in Appendix 9.1 to this EIAR.

9.3 Description of Receiving Environment

9.3.1 The Site

The application site is c. 4.74 ha (Figure 9.2). This includes (1) the principal development site of c. 4.26 ha; (2) two areas of proposed road works (c. 0.16 ha in total) outside the two proposed vehicular entrances to the scheme; (3) an area of Eglinton Road (c. 0.32 ha) in which drainage works are proposed.

The c. 4.28 ha principal development site (hereafter referred to as the site) is formerly part of the Milltown Park Jesuit Centre. It is comprised of two main parts:

- A complex of buildings (Milltown Park House, the 'Extension', Tabor House, the Chapel, Finlay Wing and the Archive) in the southern part of the site near the existing Milltown Park entrance off Milltown Road;
- A large area of parkland character, through which an access road leads from Sandford Road to the buildings. This area includes grassland fields, a hard standing area, and - most significantly - a broad belt of mature woodland inside the east and north boundaries (along Milltown Road and Sandford Road respectively). There is also a line of mature trees inside the north boundary (shared with the neighbouring estate, Norwood Park), and a line of maturing trees inside the west boundary (shared with a row of houses fronting Cherryfield Avenue).

Figure 9.2: Aerial photograph of the site context

A notable feature of the site is the tall (2m+) boundary wall along the north and east boundaries. The wall is of cement render along Sandford Road and a combination of cement render and exposed stone along the Milltown Road frontage (see Photo 9.1).

The character and presence of the site in the townscape are largely determined by the woodland belt and boundary wall. Even in winter with the trees out of leaf, these screen most of the interior of the site from view from the surrounding roads and the properties. The building complex is partly exposed to view along a stretch of Milltown Road to the south east, where the road passes the existing entrance to Milltown Park.

Photo 9.1: A view into the site from Mount Sandford across Milltown Road, showing the stone boundary wall and the deciduous trees filtering the view of Tabor House (to the left)

9.3.2 Strategic Location

The site is located in the southern suburbs of Dublin, less than 3km by road from St Stephen's Green/Grafton Street, less than 1km from Ranelagh, 1.5km from Ballsbridge and 1km from the Richview entrance to UCD. It is thus favourably located for pedestrian and cycle access to the city. Additionally, Sandford Road and Milltown Road are served byDublin Bus routes, and the Beechwood Luas stop is 1km from the site.

9.3.3 Evolution of the Townscape

The Ordnance Survey 6 inch map (Figure 9.3a overleaf), surveyed between 1837 and 1842, shows that the area was peri-urban in character at that time, mostly occupied by large houses in demesnes (including Milltown Park), and agricultural fields. A concentration of development is visible in Ranelagh to the north west, this being the southern extent of the city at that time. There is intermittent development fronting Ranelagh Road/ SandfordRoad, leading to another concentration of development along the banks of the Dodder to the south and east (mostly industrial buildings and labourers' housing).

The 25 inch map (Figure 9.3b), surveyed between 1888 and 1913, shows the effects of the suburbanisation which took place in the Victorian and Edwardian eras. Large estates of terraced houses had been built around Ranelagh and Donnybrook and along Marlborough Road. Notable changes around the site were the development of the residential streets Belmont Avenue, Hollybank Avenue, Eglinton Road and Clonskeagh Road. Also of note was the construction of the Dublin & South Eastern Railway, passing to the west of the site (now the Luas Green Line). Milltown Park and the neighbouring Sandford Hill and Sandford Grove remained intact.

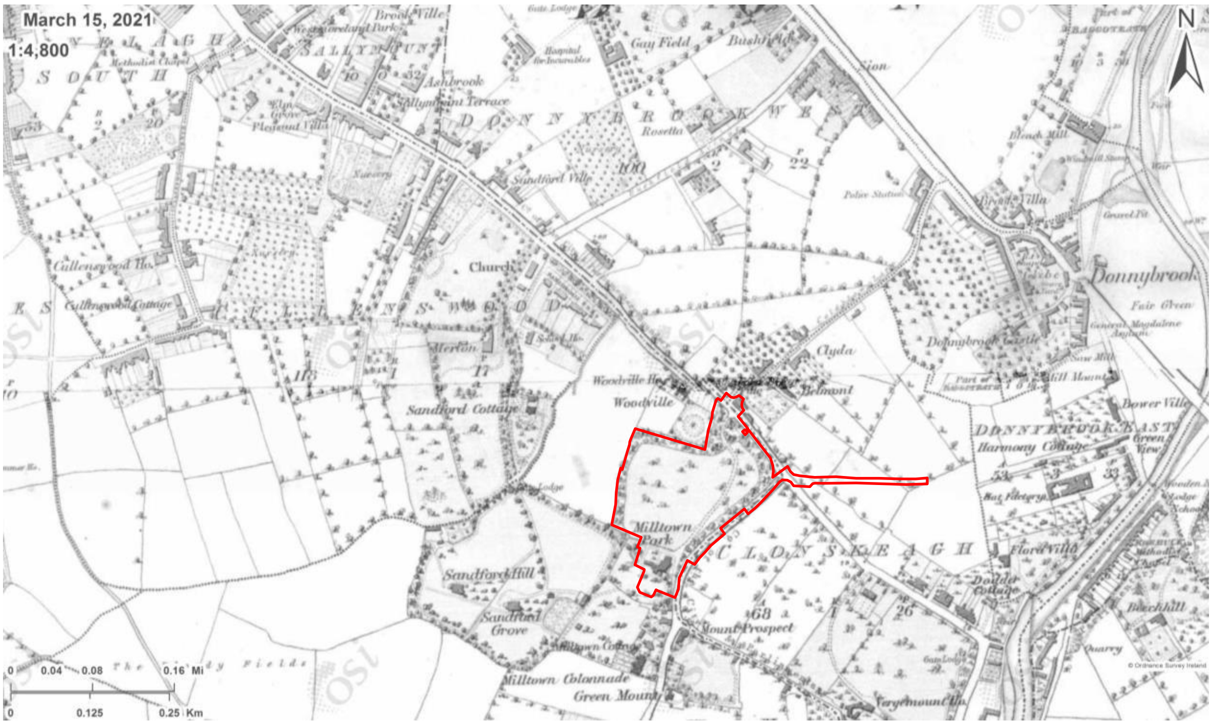


Figure 9.3a: Ordnance Survey 6 Inch Map (surveyed 1837-1842)

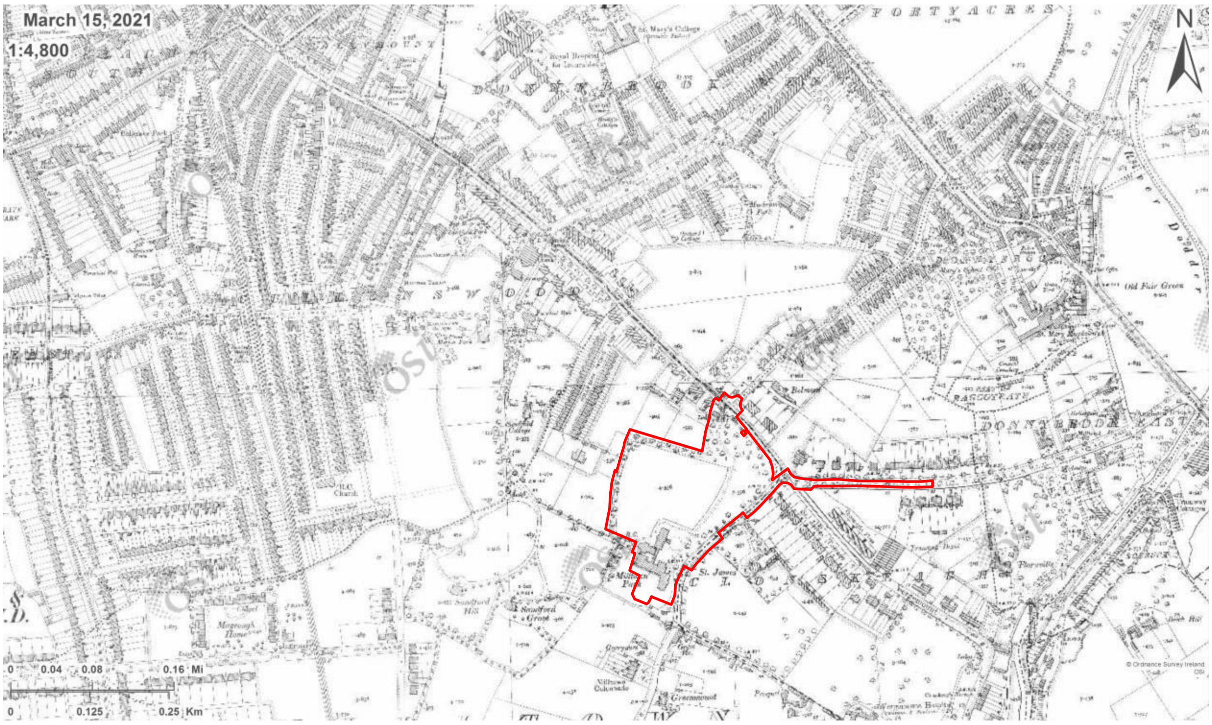


Figure 9.3b: 25 Inch Map (surveyed 1888-1913)

Over the course of the 20th century the remaining agricultural lands were developed mostly for residential use, at low density typical of the time. The big house estates/demesnes were either similarly developed or repurposed for institutional use, including Milltown Park (the site) for the Jesuit Community, Sandford Hill and Sandford Lodge as Gonzaga College, Muckross Park as a college, and Vergemount House as a hospital (now Clonskeagh Hospital).

Around the turn of the 20th century a further phase of evolution in the townscape tookplace with the start of the densification of the suburban area (see Figure 9.4). Immediately to the east of the site, across Milltown Road, two apartment developments were built, Cedar Hall and Grove House, both six storeys. The four storey Sandford Lodge apartment complex was built a short distance to the west. To the south along Milltown Road the former Mount St Anne's Convent was redeveloped as a mixed use residential and office complex incorporating the retained chapel and convent (repurposed for office use) and residential buildings of up to six storeys.

9.3.4 Present Townscape Context

The character of the site environs is mixed, with a distinct difference in townscape character between the Sandford Road area to the north, and the Milltown Road area to the south and east. The following are the main local character areas surrounding the site - and the main potential receptors of townscape and visual change:

- Sandford Road corridor:
  - Sandford Road and Clonskeagh Road;
  - Belmont Avenue;
  - Eglinton Road
  - Norwood Park;
  - Cherryfield Avenue and Hollybank Avenue;
- Milltown Road corridor:
  - Mount Sandford;
  - Cedar Hall;
  - Grove House;
  - Garrynure;
- Milltown Park and Gonzaga College.

These areas are identified on Figure 9.4 overleaf, and briefly described on the following pages.

- Sandford Road and Clonskeagh Road: Despite being a relatively wide urban thoroughfare (the 25 inch map shows a tramway at the centre of the wide street), Sandford Road is primarily a residential street. It is lined on both sides by large houses, up to three storeys, detached, semi-detached and terraced, mostly in large, mature gardens. (One notable deviance from the character is the petrol filling station diagonally across Sandford Road from the northern site entrance – Photo 9.2.) Many of the houses are zoned Residential Conservation Area, and a number are protected structures. The protected structures include two pairs of semi-detached houses directly across Sandford Road from the site, and a row of semi-detached houses (St. James' Terrace) on the south side of Clonskeagh Road, the westernmost directly across Milltown Road from the site (see Photo 9.3).

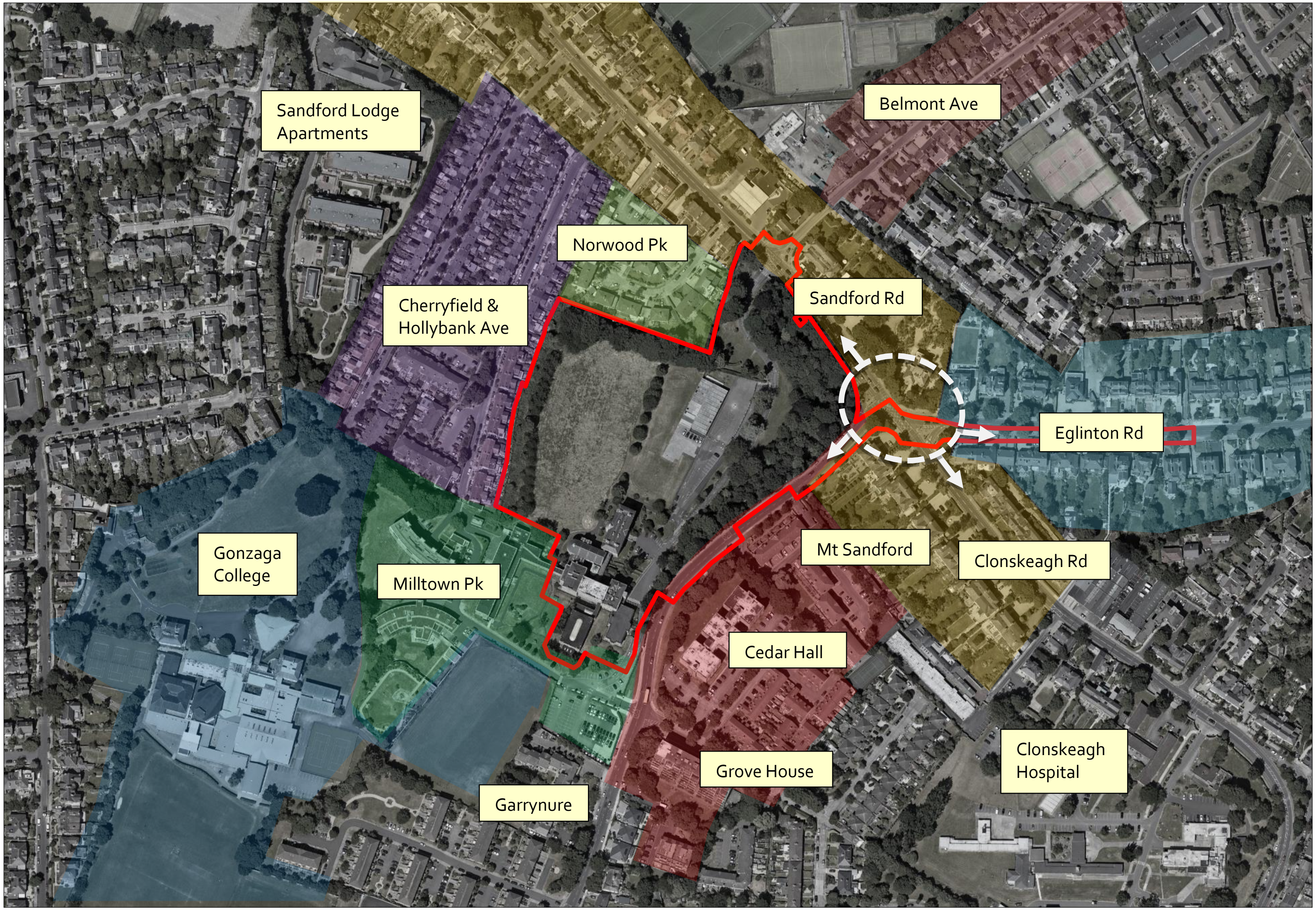


Figure 9.4: Main character areas (and potential receptors of townscape and visual change) in the receiving environment

Photo 9.2: The houses fronting Sandford Road just to the west of the site, across the road from the petrol filling station

Photo 9.3: The houses (St James's Terrace) fronting Clonskeagh Road to the east of the site across Milltown Road

- <u>Belmont Avenue</u>: Belmont Avenue is a narrow residential street leading north from Sandford Road. The street is an Architectural Conservation Area (ACA). At the southern end of the street approaching Sandford Road and the site, Belmont Avenue is lined on both sides with a wide variety of houses, less consistent in design than some of the other local streets, and less impressive in scale. While the street is aligned so as to provide a view south towards the site, it is not visible from any ofthe houses' front or back rooms/windows.

Photo 9.4: A view towards the site along Belmont Avenue

- Eglinton Road: The street is lined with particularly large houses, detached and semi-detached, mostly of red brick and with a high degree of consistency in design. The street also features an avenue of mature London Plane trees, which contribute both to the street's visual amenity and to the high degree of visual enclosure. As on Belmont Avenue, the street alignment frames a view west towards the site but the houses do not have views towards the site from the front or back rooms/windows.

Photo 9.5: A view towards the site along Eglinton Road

- Norwood Park: Norwood Park is a small estate of semi-detached houses immediately to the north and west of the site, accessed from Sandford Road a shortdistance from the site entrance. The single road of the estate is parallel with the doglegged northern site boundary. The houses south of the road back onto the site and the houses on the north side of the road face the site. Being adjacent to the site and effectively enclosed on two sides by the site, Norwood Park has a high degreeof visual exposure to the site.

Photos 9.6 & 9.7: Views from Norwood Park showing the trees inside the site's northern boundary protruding above the estate houses

- Cherryfield Avenue and Hollybank Avenue: To the west of Norwood Park and extending along the site's western boundary is the residential street of Cherryfield Avenue Upper and Lower (zoned Residential Conservation Area). The terraced two storey houses along the southern half of the street back onto the site and have a high degree of visual exposure to the site (from rear gardens and windows) although there is a belt of trees inside the site's western boundary behind the houses. Hollybank Avenue runs parallel to Cherryfield one block to the west. It is less exposed to the site due to the greater separation distance.

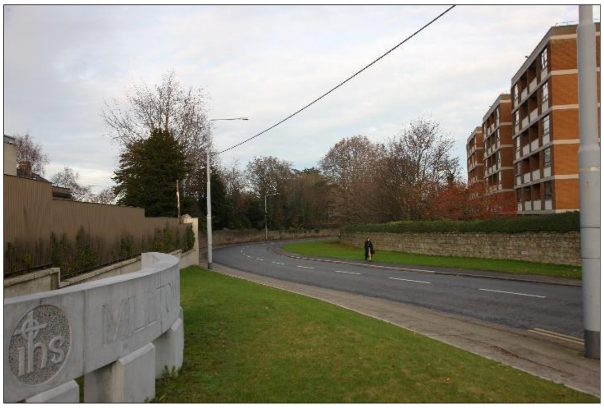
Photo 9.8: A view along Cherryfield Avenue showing the architectural uniformity and visual enclosure on the northern part of the street

Photo 9.9: A view between two houses in the southern part of Cherryfield Avenue, with the roof of Tabor House visible

- Milltown Road: Across Milltown Road to the east of the site are several modern residential developments:

  - Mount Sandford is a complex of three storey duplex terraces, one of which faces the site across Milltown Road (the others are arranged to the rear of this front terrace and have no visual exposure to the site). The front terrace is set back behind a roughly 2m boundary wall and a narrow garden in which there isa row of maturing trees. These provide a visual screen additional to the belt of woodland inside the site's eastern boundary across the street. Nonetheless the terrace has a high degree of visual exposure to the site.
  - Cedar Hall is an apartment development directly across Milltown Road from the existing complex of buildings (chapel, etc.) in the southern part of the site. The linear apartment building is six storeys, set back behind a strip of open space featuring a line of mature trees inside the tall boundary wall. Due to their aspect and elevation, the apartments (particularly the upper storeys) have a relatively high degree of visual exposure to the site (50m) and there are two belts of mature trees (either side of Milltown Road) providing some screening.
  - Grove House (Photo 9.12) is an apartment building south of Cedar Hall, diagonally across Milltown Road from the site's south eastern corner. The linear apartment building is six storeys. It is aligned east-west and specifically designed to exploit the aspect and the view south towards the DublinMountains, although the site is visible from the north facing windows.

These modern, higher density developments on Milltown Road form a distinct local character area, very different from the residential streets to the north and west of the site. The Milltown Road character area contributes, along with the institutional buildings, on the Milltown Park site), to a diversity of townscape character in the site environs. It is one of the factors, in addition to the site vegetation and its position at a junction in the urban structure, contributing to the site's capacity to accommodate large buildings.

Photos 9.10 & 9.11: The front terrace of Mount Sandford and the neighbouring Cedar Hall apartments, both facing the site across Milltown Road


Photos 9.12 & 9.13: Grove House and Cedar Hall across Milltown Road from the site, and aphoto representing the view from Garrynure, across the parking area towards the complex of buildings in the southern part of the site

- <u>Garrynure</u>. Directly to the south of the site (west of Milltown Road) beyond the existing buildings and surface parking area retained for the Milltown Park Community, is a small development of two storey terraced houses. One of the terraces faces the retained Jesuit lands across an internal estate road and the parking area. The estate is bounded by a high wall and a row of trees, but from the first floor windows, views towards the site are afforded.

- <u>Milltown Park and Gonzaga College</u>: Although the larger part of Milltown Park was sold for development, the residential core of the Jesuit Centre was retained and will remain in institutional use. The remaining centre, adjacent and to the south west of the site, comprises (a) a red brick accommodation block (currently attached to the site buildings but proposed to be separated from the development site as part of the application) and adjacent courtyard garden (Photo 9.14); (b) two modern buildings, one a four storey accommodation block and one a two storey care home; (c) access road and parking areas, and (d) extensive gardens contiguous with the grounds of Gonzaga College. Being adjacent to the site, the red brick building is visually exposed to the site, while the modern buildings are rather focussed on the grounds of Gonzaga College, away from the site.

Photo 9.14: The site buildings to the right, and the Milltown Park accommodation block to the left of the garden in the foreground

9.3.5 Relevant Planning Policy

The following city level policies are most relevant to the subject site and theassessment of the proposed development's townscape and visual effects.

9.3.5.1 Dublin City Development Plan 2016-2022

Zoning

The land use zoning objective for the site is Z15 "*To protect and provide for institutional and community uses.*"

DCDP Section 14.8.14: "*With any development proposal on these lands, consideration should be given to their potential to contribute to the development of a strategic green network… and to the delivery ofhousing in the city…*

"In addition, development at the perimeter of the site adjacent to existing residential development shall have regard to the prevailing height of existing residential development and to standards in Section 16.10 (standards for residential accommodation) in relation to aspect, natural lighting, sunlight, layout and private open space, and in Section 14.7 in relation to the avoidance of abrupt transitions of scale between zonings…

"The masterplan must incorporate landscape features which retain the essential open character of the lands zoned Z15. It must also ensure that the space will be provided in a manner designed to facilitate potential for future public use… The 25% public open space shall not be split up, unless site characteristics dictate otherwise, and shall comprise mainly of soft landscaping suitable for recreational and amenity purposes and should contribute to, and create linkages with, the strategic green network."

Urban Density

In Section 4.5.3 of the DCDP (Making a more Compact Sustainable City) it is stated: "*This plan will continue to physically consolidate the city and to optimise the efficient use of urban land. This will minimize wastage of scarce urban land, reduce urban sprawl and provide for a compact city with attractive mixed-use neighbourhoods, a variety of housing types and tenure, and adaptable housing, where people of all ages will choose to live as a matter of choice...*

Regarding Integrated Land-use and Transportation, Objective MTO1 states: "*To encourage intensification and mixed-use development along existing and planned public transport corridors and at transport nodes where sufficient public transport capacity and accessibility exists to meet the sustainable transport requirements of the development, having regard to conservation policies... and the need to make best use of urban land.*"

Policy SC13: "*To promote sustainable densities, particularly in public transport corridors, which will enhance the urban form and spatial structure of the city, which are appropriate to their context, and which are supported by a full range of community infrastructure such as schools, shops and recreational areas, having regard to the safeguarding criteria set out in Chapter 16 (development standards), including the criteria and standards for good neighbourhoods, quality urban design and excellence in architecture. These sustainable densities will include due consideration for the protection of surrounding residents, households and communities*".

Building Height

The site is located in a part of the city categorised as 'Low-rise' in the DCDP, where a maximum height limit of 16m applies.

Architecture

SC25: "*To promote development which incorporates exemplary standards of high-quality, sustainable and inclusive urban design, urban form and architecture befitting the city's environment and heritage and its diverse range of locally distinctive neighbourhoods, such that they positively contribute to the city's built and natural environments. This relates to the design quality of general development across the city, with the aim of achieving excellence in the ordinary, and which includes the creation of new landmarks and public spaces where appropriate.*"

Section 16.2.1: "*In the appropriate context, imaginative contemporary architecture is encouraged, provided that it respects Dublin's heritage and local distinctiveness and enriches its city environment. Through its design, use of materials and finishes, development will make a positive contribution to the townscape and urban realm.*"

Protected Structures and Conservation Areas

The site does not include any protected structures. Nor is it covered by any Conservation Area (CA) or Architectural Conservation Area (ACA) designation. However, there are numerous protected structures in the immediate environs, and the Belmont Avenue/Mount Eden Road ACA extends to within 40m of the site on the opposite side of Sandford Road from the site's main entrance.

Regarding protected structures the DCDP states: *"Any development which has an adverse impact on the setting of a protected structure will be refused planning permission."*

CHC1: *"To seek the preservation of the built heritage of the city that makes a positive contribution to the character, appearance and quality of local streetscapes and the sustainable development of the city."*

Section 11.1.5.6 of the DCDP states: "*<u>Development outside Conservation Areas can also have an impact on their setting</u>. Where development affects the setting of a Conservation Area, an assessment of its impact on the character and appearance of the area will be required… Any development which adversely affects the setting of a Conservation Area will be refused planning permission and the City Council will encourage change which enhances the setting of Conservation Areas*."

Key Views and Prospects

There are no views or prospects identified for protection in the site's receiving environment.

9.4 Characteristics of the Proposed Development

The proposed development is described in detail in the architectural and landscape design statements submitted with the planning application, and in Chapter 3 of the EIAR. The key aspects of the proposal with regard to its potential townscape and visual effects are (1) the layout, massing and height, (2) the façade treatments, and (3) the landscape proposals. These are discussed briefly below.

9.4.1 Layout, Massing and Height

The layout of the proposed development has been determined by several factors. These include (a) the objective to retain the woodland/tree belts inside the north and east boundaries - to use these for screening of taller buildings and to lend biodiversity, landscape and visual amenity to the future neighbourhood; (b) the retention of Tabor House and the Chapel (while removing the other existing buildings from the site), and (c) the objective to avoid excessively pronounced steps in scale between the site and neighbouring developments.

Figure 9.5 & 9.6: Proposed layout and height strategy

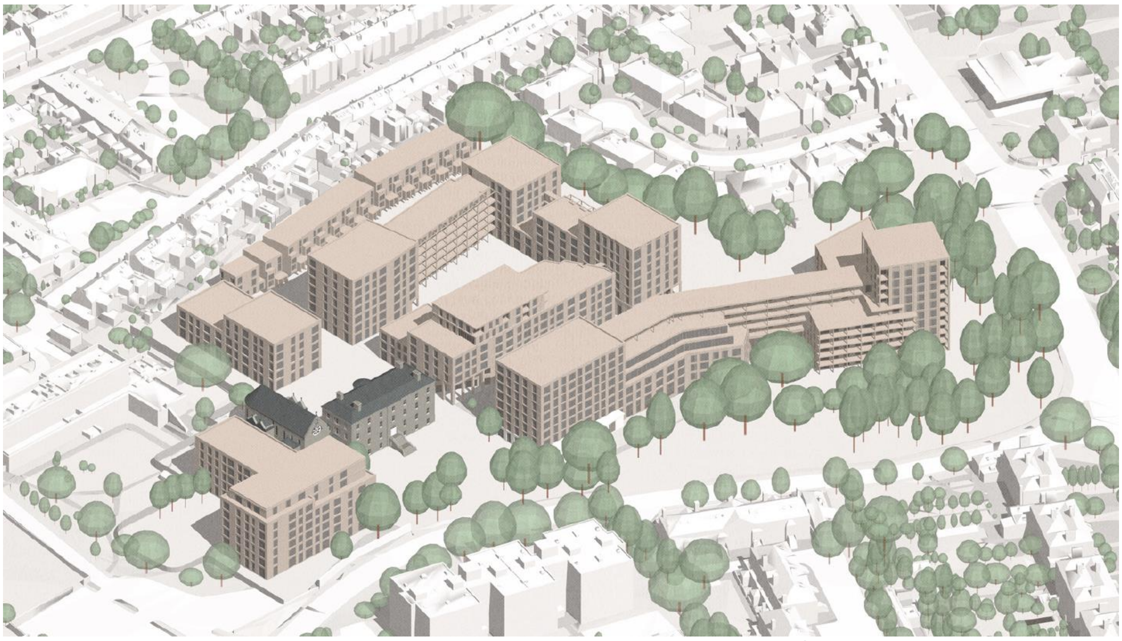


Figure 9.7: Proposed layout and arrangement of building height

Block A

Block A1 is located in the north eastern portion of the site, at the corner of Sandford Road and Milltown Road but set back from the streets (and the protected structures across the streets) behind the retained woodland belt. The building is "T" shaped in plan form, so that it presents (set back) frontage to both streets.

Block A1 rises to 10 storeys from a five storey plinth/base. The intention of this height is to (a) take advantage of its separation distance from neighbouring buildings (arising from the set back behind the woodland belt), (b) take advantage of the screening provided by the trees (for views from close-up in particular), and (c) to protrude above the tree line in more distant views - in order to have sufficient visual presence to achieve a place-making effect and improve legibility (which is lacking at this important junction in the urban structure).

Earlier in the design process Block A1 was proposed to be 13 storeys. The building has been reduced to 10 storeys for the final application in recognition of the potential for excessive visual intrusion in certain views (see Section 9.6.2 below).

Block A2 is an cranked linear block aligned roughly parallel with Milltown Road. It is also set back behind the woodland belt, with the retained trees incorporated into a new public park inside the boundary wall. The building has a complex form, incorporating an eight storey volume at its southern end, with the main linear element stepping up from five to six to seven storeys, forming a terraced frontage overlooking the park. Block A2 extends over a wide pedestrian link (forming a bridge) to connect to A1, so that in combination they form a highly articulated built frontage to the park and to Milltown Road (although the buildings would be heavily filtered by the trees in views from the road).

Figure 9.8: CGI showing the east facades of Blocks A1 and A2 fronting the park inside the Milltown Road boundary

Block F, Tabor House and the Chapel

It is proposed to retain and reuse Tabor House and the Chapel (the former for residential use, the latter for residents' amenities). They would be located on the west side of a new forecourt/ entrance plaza off Milltown Road – Tabor House forming the focal point / feature building at the main entrance to the scheme (see Figure 9.7 above).

Block F is located on the south side of the plaza, combining with Tabor House and the southern end of Block A2 to provide the built enclosure defining the space. Block F and A2 also serve to frame the view of Tabor House from Milltown Road, so that its visibility from the public realm would be increased. Block F is seven storeys in height, with a five storey projection to the west alongside the chapel.

Figure 9.9: CGI showing the view of Tabor House through the entrance on Milltown Road, with Block A2 to the right

Blocks B and C

Blocks B and C occupy a central position in the site. Together they form a perimeter block, which (a) encloses a large (50m x 25-37m) central courtyard, and (b) combines with the other buildings (A2 to the east, Tabor House and Block D to the south, and Block E to the west) to form the scheme's internal streets. Blocks B and C are thus an important arranging element, giving the scheme a grid arrangement and serving to define and enclose the streets, generating a distinct 'urban' character in this central area (contrasting with the parkland character of the eastern area facing Milltown Road).

The linear buildings making up Blocks B and C are divided into distinct volumes using steps in the building line, steps in height, setbacks, and variations in materials. The height of the various volumes making up the blocks ranges from two to eight storeys (see Figure 9.6 above). This is to avoid excessively linear 'slab blocks' and to add architectural and visual interest to the scheme.

The height of the north-facing range of Block C is of particular importance. This building faces the neighbouring Norwood Park estate to the north (see Photos 9.6 and 9.7 above). The building is made up of four volumes of different heights, including a central four storey element, a small two storey element, and taller elements of six and eight storeys at the western and eastern ends. It is intended that the deconstructed massing and modulated height would combine with the building's setback from the boundary behind a row of retained trees, to avoid excessive enclosure or visual intrusion in views from Norwood Park.

Figure 9.10: CGI showing the courtyard enclosed by Blocks B and C

Figure 9.11: CGI showing the courtyard north façade of Block C (in the foreground), which faces Norwood Park across an open space with a line of retained mature trees

Blocks D and E

The proposed buildings (D and E) in the western portion of the site are generally closer to the boundary and do not benefit from any proposed retention of trees inside the boundary. Therefore, the building typologies and height are selected to avoid dominance of the neighbouring houses or excessive visual intrusion in views from the houses and the street.

Block D is an apartment building which combines with Blocks B and C to form an internal street. The building steps down from five storeys at the centre of the site, to a three storey volume at the western end, behind the houses of Cherryfield Avenue. Block E is comprised of two terraces of three storey, flat roofed duplex units. The terraces face Block C across an internal street and present their rear facades to the houses of Cherryfield Avenue, forming a back-to-back arrangement typical of the suburban environment. There are no balconies to the rear of the duplexes as they face Cherryfield Avenue.

Figure 9.12: CGI showing the internal street between Block E to the left and Block C to the right

9.4.2 Façade Treatments

The proposal includes five different materials palettes, which are intended to be complementary (in material and colour) but sufficiently diverse when applied to the different buildings to result in a built environment that is architecturally and visually interesting.

The principal material throughout the development would be brick (complementing the predominant material in the residential buildings of the receiving environment), ranging in colour from light mottled buff to mottled red and grey. The palettes also include pre-cast Techrete cladding panels in a variety of colours and textures (degrees of aggregate exposure), metal cladding, and metal window frames and balconies.

9.4.3 Landscape Proposals

The landscape proposals are described under two headings below, i.e. (1) tree removal, retention and planting, and (2) landscape masterplan.

9.4.3.1 Tree Removal, Retention and Planting

A survey of the site by CMK Horticulture and Arboriculture identified 404 no. trees on the site. The trees are in varying condition, ranging from high quality (Category A) to moderate quality (Category B), low quality (Category C) and unsuitable for retention (category U):

- Category A: 23 No. trees (5.6%)
- Category B: 206 No. trees (51.1%)
- Category C: 150 No. trees (37.1%)
- Category U: 25 No. trees (6.2%)

It is proposed to remove 283 no. trees and retain 121 no. trees. The strategy behind the proposal has several objectives:

- To retain as many as possible of the Category A and B trees, which have arboricultural and ecological value. 4 no. Category A trees would be removed from the site.
- To retain the main tree groups/features on the site – for their value as structural/ spatial elements of the landscape, for their ecological value, their visual amenity value and their visual screening function. Despite substantial thinning, the tree/woodland belt inside the eastern, north eastern and northern site boundaries would be retained (Figure 9.13b). The thinning of these tree belts would allow them to function as part of the recreational open space of the development.
- As far as possible, to remove mostly Category C and U trees (trees of low arboricultural or ecological value, or otherwise unsuitable for retention).
- To remove the minimum number of trees required to accommodate the proposed basement, buildings and infrastructure on site. This includes a double line of trees inside the west boundary, a line of trees across the central field, and trees from the woodland belt inside the roadside boundary (Figure 9.13a).

Figure 9.13: (a) Trees to be removed, (b) trees to be retained, and (c) proposed trees

As part of the development 238 no. new trees and large shrubs are proposed to be planted. <u>Given that these specimens would all be in better condition than the majority of the 283 no. trees to be removed, and that the 121 no. retained trees would be in better condition than they currently are (due to the thinning of the woodland and the maintenance of each retained specimen), there would be a similar quantity and a net improvement in the quality of tree</u>

cover on the site as a result of the development.

9.4.3.2 Landscape Masterplan

The main elements of the proposed landscape masterplan, with regard to potential landscape/ townscape and visual impacts, are described below.

Figure 9.14: Proposed landscape masterplan (excerpt of Drawing No. C0111 L1000)

Retained woodland/ tree belt in main public open space

A large number of the existing trees of good quality (Categories A and B) in the woodland belt would be retained in a new public park comprised of 'green buffer' areas around the boundary (i.e. woodland including understorey), open lawn areas with scattered trees, a playground, fitness areas, seating and picnic areas. The park is traversed by a network of walkways, which can be accessed from within the site and from the three entrances (one on Sandford Road, one on Milltown Road and one at the corner). This park is intended to function as a public open space, i.e. fully accessible for public use.

Boundary treatment – wall and railing

It is proposed that sections of the wall along Milltown Road and Sandford Road would be replaced with a low wall and railing along the frontage of the new public park (see above). This would make the boundary visually permeable, exposing the park to view from the street and inviting public access through the three entrances. This would result in positive effects in terms of visual amenity and legibility.

Figure 9.15: Proposed change to boundary wall

Retained trees in linear public open space inside northern/ Norwood Park boundary

A number of existing trees in good condition inside the boundary shared with Norwood Park would be retained (see Figure 9.13 above) in a linear open space also featuring natural play areas and exercise equipment, beds of ornamental shrub planting, etc. This area is intended to function (a) as agreen buffer between Block C and the houses of Norwood Park, and (b) as an area of public open space (being accessible from the entrance on Sandford Road).

Formal entrance forecourt and gardens around Tabor House and the Chapel

A large forecourt is proposed inside the main entrance off Milltown Road, in front of Tabor House and the Chapel. This area incorporates the main vehicular access (and ramp to the basement parking, which will filter 92-96% of the site's vehicular traffic immediately inside the Milltown Road vehicular entrance), pedestrian and cycle paths, a small number of parking spaces, a lawn area with a retained mature birch tree, and formal planting in front of the historic buildings. The wide, open space of the forecourt would provide a respectful setting for Tabor House and the Chapel (uncrowded by new buildings) and preserve the view of the historic buildings from Milltown Road.

To the rear (west) of Tabor House, in a courtyard enclosed to the south by the Chapel and to the west by Block D, a food garden is proposed. The design of this space is formal/ geometric (contrasting with the more organic parkland areas elsewhere in the scheme), responding to the architectural character and symmetry of Tabor House.

Other spaces

The other spaces - including a garden area to the south of Block F, the large internal courtyard between Blocks B and C, a 'residential green street' between Blocks B and A2 which provides a pedestrian connection through the site from Milltown Road to Sandford Road, and the internal streets - would have no direct impact on the wider townscape or views from the public realm. However, all of these proposed spaces are characterised by a high proportion of soft surfaces and intensive planting including numerous new trees. They would result in a particularly verdant new neighbourhood.

In addition to the ground level landscape, it is proposed to provide extensive green roofs on all of the apartment buildings, as well as several communal amenity space areas on the roofs.

9.5 Potential Impacts of the Proposed Development

9.5.1 Townscape Effects

9.5.1.1 Construction Phase

The construction process would entail the following:

- Set up site perimeter hoarding;
- Set up site construction compound, tree and biodiversity protection measures, internal transport routes;
- Demolition and site clearance;
- Excavation;
- Site services installations;
- Construction of new buildings, frames and envelopes;
- Interior fit-out of buildings;
- Exterior streetscape, landscaping and site boundary works.

During construction the site would be disturbed by the above activities and the incremental growth of the buildings, with indirect effects on the surrounding character areas (changes to their setting). The magnitude of change to the townscape in the immediate vicinity of the site would be medium-high, and the effects would reduce with increased distance from site. Overall, the sensitivity of the townscape can be considered medium (refer to 9.5.1.2). Therefore, the effects on the townscape would be 'moderate' and negative in the immediate vicinity of the site, reducing in significance with distance from the site. The effects would be temporary.

9.5.1.2 Operational Phase

Townscape Sensitivity

There are several sensitive receptors (both areas and elements/features of the townscape) in the receiving environment. These include:

- **Belmont Avenue ACA**;
- **Sandford Road, Clonskeagh Road, Eglinton Road and Cherryfield Avenue** Residential Conservation Areas;
- **Norwood Park**, a more recently developed estate enclosed by the site to the east and south, also zoned Residential Conservation area;
- **The protected structures in close proximity to the site**, including 132, 134, 136, 138 Sandford Road, and the western end of St James's Terrace on Clonskeagh Road;
- **The historic buildings on the site**;
- **The mature trees/woodland on the site**.

Together these elements form an area of strong townscape character, with a high degree of consistency in land use, plot and building typologies and architecture (with local variations). The site in its existing condition is a gap/inconsistency in this area – a notable gap owing to its large size, enclosure (due to the high boundary wall and trees), historically private use and position at a key junction. This local dilution of townscape character is noticeable on the approaches to the junction of Clonskeagh Road, Eglinton Road, Milltown Road and Sandford Road.

Balancing the area's sensitivities, there are also indications of capacity for change in the townscape, which are given heightened importance by compact growth policy. These characteristics include:

- **Milltown Road** character area. This corridor is characterised by (a) a wide variety of plot and building typologies, scale and architecture, with a high proportion of modern development including mid-high density residential developments, and (b) infill development on previously institutional lands. The site has a greater presence in the Milltown Road character area than it does in the Sandford Road area.

- **Location at a key junction**. The junction funnels traffic from three urban cores, i.e. Clonskeagh/UCD, Milltown and Donnybrook towards the city centre via Ranelagh. The site occupies the most prominent of the four quadrants around the junction. Due to a number of factors, including the non-orthogonal configuration of the junction, the absence of buildings at the corner of the site, and the wall and trees along the site boundary, the junction does not manifest as a distinct 'place' in the townscape. Despite the large houses and trees around the junction it does not figure clearly in people's mental map of the area and does not contribute positively to legibility.

  The junction as a place, and the streets to which the site has frontage, warrant greater emphasis in the townscape – to give better definition to the junction locally, and to improve the legibility of the urban structure. This can be achieved only by built form on the site (the other quadrants around the junction all being already developed). However, the site's main landscape asset, the belt of trees inside the boundary, is a constraint to development that would seek to address the roads and junction. Any building in the corner must be set back behind the trees. It is only through substantial height that a building on the site will achieve the dual objective of place-making and legibility.

- **The historic buildings on the site**. As well as being a sensitivity, the historic buildings present an opportunity for creating positive tension and visual interest in the evolving townscape, through juxtaposition with contemporary buildings and spaces, and for giving identity to new development.

- **The mature trees/woodland on the site**. As well as being a sensitivity, the woodland belt (up to 40m wide in places) constitutes an opportunity due to its screening effect. This feature also adds character and amenity to the site itself and the wider townscape.

Informed by this analysis, the sensitivity of the receiving environment can be classified 'medium' (definition: *Areas where the landscape has certain valued elements, features or characteristics but where the character is mixed or not particularly strong, or has evidence of alteration, degradation or erosion of elements and characteristics. The landscape character is such that there is some capacity for change. These areas may be recognised in landscape policy at local or county level and the principal management objective may be to consolidate landscape character or facilitate appropriate, necessary change*).

Magnitude of Townscape Change

The magnitude of townscape change which would result from the proposed development can be classified 'medium' (definition: *Change that is moderate in extent, resulting in partial loss or alteration to key elements, features or characteristics of the landscape, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context. Such development results in change to the character of the landscape*).

The townscape change – the introduction of a complex of high density buildings to former institutional lands of parkland character – would be in keeping with the trend of change in the Milltown Road corridor, and would cause no significant change to the character of *that* area. The change to the Sandford Road corridor would be more substantial, and would affect the character of this area. The classification of magnitude of change also takes account of the proposed retention of much of the woodland belt along Sandford Road and Milltown Road, and the retention (with modifications) of the boundary wall.

Significance of Townscape Effects

Measuring the magnitude of change against the townscape sensitivity (refer to Table 9.3 above) the significance of the effects is predicted to be 'moderate' (definition: *An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends*).

Townscape change of some significance is unavoidable with the development of a large opportunity site, in a prominent position (at a key junction in the urban structure, with long frontage to two main thoroughfares), at the interface between two different characterareas (one being characterised by low density development). Contemporary, high density development that fits comfortably into the Milltown Road area will inevitably contrast with the Sandford Road area. Additionally, if the development is intended to mark the junction to improve legibility, it must protrude above the tree line and therefore intrude in views from the lower density area of Sandford Road.

Such tensions in the townscape are increasingly common and are not undesirable in the evolving urban environment. There is an established, policy-driven trend of redevelopment of the previously institutional lands in inner suburban areas. The access of these areas to public transport, neighbourhood centres and other urban amenities is too valuable not to exploit. The resulting change should therefore be viewed as neutral in principle, and if it can also deliver benefits additional to density, e.g. improved legibility, place identification or the introduction of buildings of high design and material quality, thereby adding to the character and visual interest of the townscape, its effects can be positive - even if it contrasts with some of the context development. It will not be possible to achieve high density in historically low density areas without such change in townscape character and the composition of views.

Since the proposal is in part policy-driven - being encouraged by the DCDP policy on Making a more Compact Sustainable City (Section 4.5.3: *"This plan will continue to physically consolidate the city and to <u>optimise the efficient use of urban land</u>. This will minimize wastage of scarce urban land, reduce urban sprawl and provide for a compact city with attractive mixed-use neighbourhoods, a variety of housing types and tenure, and adaptable housing, where people of all ages will choose to live as a matter of choice…"*), the degree of the proposal's compliance with relevant policy can be used to guide the assessment of its townscape effects as positive, neutral or negative. The proposal is assessed below with reference to the key DCDP policy.

DCDP Policy	Assessment
DCDP Section 14.8.14 (Z15 zoning): *With any development proposal on these lands, consideration should be given to their potential to <u>contribute to the development of a strategic green network</u>… and to the <u>delivery ofhousing in the city</u>…*	The proposed development would deliver 671 No. residential units, comprising 604 No. Build-to-Rent apartment and duplex units (89 No. studios, 262 No. 1 bed units, 242 No. 2 bed units and 12 No. 3 bed units) and 67 No. Build-to-Sell apartments and duplex units (11 No. studios, 9 No. one bed units, 32 No. two bed units and 15 No. three bed units). The development would contribute to the strategic green network by providing a new public park inside the site boundary along Sandford Road and Milltown Road. The modification of the boundary wall would make the park visible from the public realm, and it would be accessed by three entrances from the adjacent roads. The park would be characterised by a large number of retained mature trees of high arboricultural and ecological value.
Policy SC13 (urban density): *"To <u>promote sustainable densities</u>, particularly in public transport corridors, which will <u>enhance the urban form and spatial structure of the city</u>, which are <u>appropriate to their context</u>… having regard to the safeguarding criteria set out in Chapter 16 (development standards), including the criteria and standards for good neighbourhoods, <u>quality urban design and excellence in architecture</u>. These sustainable densities will include <u>due consideration for the protection of surrounding residents, households and communities</u>".*	The proposal represents a balance between (1) the requirement to protect the amenities of the surrounding neighbourhoods/ residents, and (2) the compact growth imperative and the opportunity afforded by large urban site for residential development of sustainable density, and enhancement of the urban form and spatial structure. - Where the adjacent roads and/or the mature trees on site provide a buffer from the neighbouring houses, the buildings step up in height (e.g. Blocks A, B, C and F). - Where the site adjoins neighbouring properties with no public road or vegetation buffer, the buildings step down in height (e.g. Blocks D and E). - Where the townscape would benefit from a marker in the built form to improve legibility (i.e. at the junction of Sandford Rd and Milltown Rd), a building of landmark scale and quality is proposed (Block A1).
Architecture *SC25: "To promote development which incorporates exemplary standards of <u>high-quality, sustainable and inclusive urban</u>*	The proposed layout and arrangement of massing/ height responds appreciably to (a) the site's existing buildings of architectural/ heritage value, (b) the site's trees of highest arboricultural and ecological value, (c) the existing roads/ urban grain, and (d) the existing buildings and residential amenities around the site. Refer to Figures 9.5, 9.6 and 9.7 for illustrations

design, urban form and architecture befitting the city's environment and heritage and its diverse range of locally distinctive neighbourhoods, such that they positively contribute to the city's built and natural environments. This relates to the design quality of general development across the city, with the aim of achieving excellence in the ordinary, and which includes the creation of new landmarks and public spaces where appropriate." Section 16.2.1: *"In the appropriate context, imaginative contemporary architecture is encouraged, provided that it respects Dublin's heritage and local distinctiveness and enriches its city environment. Through its design, use of materials and finishes, development will make a positive contribution to the townscape and urban realm."*	of this fact. The proposal also responds to the opportunity to enhance the urban structure/ legibility by the introduction of buildings of landmark scale and architectural quality (particularly Block A). The proposal can thus be considered an exemplar of good, responsive urban design. Nonetheless, due to (a) its scale in terms of spatial extent and height, (b) its retention of key buildings and vegetation features, and (c) its divergence from the predominant development typology in the area (particularly to the north and west of the site), the development would create a new neighbourhood of distinctive character – contributing to the city's built and natural environments. While clearly different in typology and scale to many of the existing buildings in the area, the CGIs and photomontages show that the design, materials and finishes of the proposed buildings are befitting of the area (refer to Figures 9.8-11) and would make a positive contribution to the townscape.
Protected Structures and Conservation Areas *"Any development which has an adverse impact on the setting of a protected structure will be refused planning permission."* Section 11.1.5.6: *"Development outside Conservation Areas can also have an impact on their setting. Where development affects the setting of a Conservation Area, an assessment of its impact on the character and appearance of the area will be required… Any development which adversely affects the setting of a Conservation Area will be refused planning permission and the City Council will encourage change which enhances the setting of Conservation Areas."*	There are several protected structures in the receiving environment, including houses directly across Sandford Road (nos. 132, 134, 136, 138) and Milltown Road (St James' Terrace) from the site. There is also an ACA (Belmont Avenue) which extends to some 40m from the site boundary. The proposed development would take place in the townscape setting of these heritage assets. In all three cases (the Sandford Road houses, St James' Terrace and Belmont Avenue ACA), the proposed buildings would be separated from the heritage assets by (a) a busy urban thoroughfare, and (b) a belt of retained mature trees/ woodland. The development would be visible from these buildings/ areas, and as part of view compositions *with* these buildings/ areas, but due to the separation distance and the buffering effect of the roads and vegetation the development would not dominate or otherwise negatively affect them. It would simply form a part of the ever-evolving urban environment around them. Since the development itself would also be of high design and material quality, it would have no adverse effect on the setting of the protected structures or the ACA.

Table 9.7: Assessment of Compliance with Key Townscape-related DCDP Policy

The above assessment of the proposed development against the key DCDP policy indicates that while the development would result in a moderately significant townscape impact, its potential effects on townscape character can be considered positive.

9.5.2 Visual Effects

9.5.2.1 Construction Phase

During construction the site and immediate environs would be disturbed by construction activities and haulage, and the incremental growth of the buildings on site. In the earlier stages, until the buildings reach substantial height above ground, the effects would be largely limited to the immediate environs (adjoining streets and properties). As the buildings begin to grow above ground level the visual effects would be more widespread.

The magnitude of change would range from negligible to medium-high and would vary over time; therefore the significance of the effects would also vary – although they would typically be negative during construction. Such temporary negative visual effects are unavoidable and not unusual in the urban context where change is continuous.

9.5.2.2 Operational Phase

22 No. viewpoints have been selected for assessment of the proposal's visual effects informed by Verified View Montages (VVMs or photomontages). The viewpoints were selected to represent visual receptors in all of the potentially affected character areas around the site, as identified in Section 9.3.4 above, and to show the proposal from a range of angles and distances (see viewpoint map, Figure 9.16 below). The viewpoint selection is considered representative of the receiving environment and adequate for the purpose of assessing the proposal's potential visibility and visual effects. The viewpoints are as follows:

VVM No.	Location
Sandford Road	
1	Sandford Road mid-distant view
2	Sandford Road local view
3	Sandford Road opposite site – Representing view from houses (protected structures) across street
Belmont Avenue	
4	Belmont Avenue approaching junction with Sandford Road, opposite site entrance (outside ACA)
5	Belmont Avenue distant view (inside ACA)
Eglinton Road	
6	Eglinton Road – Distant view
7	Eglinton Road – Middle distant view
8	Junction of Eglinton Road and Clonskeagh Road
Clonskeagh Road	
9	Clonskeagh Road approaching site
Norwood Park	
10	Norwood Park – View south along street
11	Norwood Park – View east along street
Cherryfield Avenue	
12	Cherryfield Avenue Lower
13	Cherryfield Avenue Upper
Milltown Road	
14	Milltown Road opposite site
15	Mount Sandford entrance opposite site
16	Mount Sandford view from front terrace
17	Milltown Road footpath alongside site
18	Milltown Road – Distant view
19	View representing Garrynure
Milltown Park	

20	Milltown Park access road
21	Milltown Park – View from rear of accommodation block
Albany Road	
22	Albany Road – distant view from west

Table 9.8: Viewpoints for Visual Effects Assessment

The viewpoints are assessed in Table 9.9 below. The assessment should be read in conjunction with the baseline views and VVMs provided under separate cover (see EIAR Appendix 9.1). For each viewpoint, a baseline/existing view (photograph) and a proposed view (photomontage/ VVM) are provided - for both summer and winter. The summer and winter views areprovided to show the varying screening effect of vegetation between the seasons.

For the methodology and the criteria and terms used in the assessments, refer to Section 9.2.2.3 and 9.2.3 above.

Note on impact significance classifications: It should be noted that the matrix (Table 9.3) and the EPA's chart (Figure 9.1) guiding the classification of impact significance are a guide. The assessor also uses professional judgement informed by their expertise, experience and common sense to arrive at a classification of significance that is reasonable and justifiable. In the EPA guidelines the chart (Figure 9.1 above) above is accompanied by a footnote that states: *"The depiction of significance classifications is indicative and should not be relied on as being definitive. It is provided for general guidance purposes"* (EPA draft guidelines Section 3, page 53).

Once the assessor has classified the sensitivity of the receptor and the magnitude of change (using the definitions in Tables 9.1, 9.2, 9.5 and 9.6 as a guide), the matrix and chart (Table 9.3 and Figure 9.1) are used as a starting point for the impact significance classification – using the assessor's professional judgement to arrive at a classification that is reasonable and sensible. For example, according to the EPA chart a change of high magnitude affecting a receptor of medium sensitivity may be classified as either 'significant' or 'moderate'. That judgement is made by the assessor.

Figure 9.16a: Viewpoints for Visual Effects Assessment – Local Views

Figure 9.16b: Viewpoints for Visual Effects Assessment – Distant Views

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
Viewpoints 1-13 address above the Sandford Road character area, comprised of low density residential streets, to the north and west of the site. Viewpoints 14-21 address the Milltown Road area, of more diverse character, to the east and south of the site.						
1	Sandford Rd mid-distant view (approx. 200m)	View 1 shows the strong consistency of character along Sandford Road, with the houses all 2-3 storeys, mostly of red brick with pitched roofs, set back from the road behind shallow front gardens. The road itself is relatively wide, with two vehicular lanes, dedicated cycle lanes both sides, and footpaths. The trees on the site can be seen from a distance and gain in prominence on approach.	Medium	The tall element of Block A would be visible, protruding above the roofline of the streetfront buildings and the tree line on the site, and set back from the street behind the trees. The extent of the protrusion is modest. It is sufficient to achieve visibility and recognition - allowing the building to function as a landmark - while avoiding excessive contrast in scale. There would be no harm to the existing buildings or other elements in the view and no reduction in visual amenity; only the introduction of a new building in the distance. This would (a) cause a slight change in townscape character (not inappropriate in the corridor of an urban thoroughfare), and (b) mark a key junction along the road, improving legibility.	Low-Medium	Slight neutral
2	Sandford Road – local view (approx. 65m)	The petrol station is one of the few deviations from low density residential use in the Sandford Road corridor. This contributes to a shift in character approaching the site and the junction with Milltown Road.	Medium	Approaching the site, the extent of protrusion of Block A above the roofs and trees reduces. At this point it would be screened in summer, and just about discernible in winter (filtered through the bare tree canopy). When visible (e.g. a short distance ahead or back along the road), its presence would not be inappropriate, being located at a key junction and the interface between two distinct townscape character areas (Sandford Rd and Milltown Rd).	Negligible-Low	Not significant neutral
3	Sandford Road opposite site	The view represents road users and the houses (protected structures) across the road from the site. At this proximity to the junction with Milltown Road the road widens to three	Medium	The site's main landscape/visual asset, the trees, would be largely unaffected by the development. The buildings would be screened in summer, and in winter Building A would be visible but filtered by the trees. At this proximity the design and material quality	Low	Slight neutral

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
		lanes. Across the road is the high boundary wall of the site and beyond that the wide belt of woodland, which even in winter presents as a dense bank of vegetation, enclosing the vista.		of the building would be evident. The introduction of a building of urban typology and scale would cause a change in character. However, in the context, i.e. at the junction of two main thoroughfares, this is not inappropriate. Being lower than the treeline, the building would cause no increase in visual enclosure. The character of the view would change but there would be no reduction in visual amenity.		
4	Belmont Avenue approaching junction with Sandford Road, opposite site entrance (outside ACA)	Approaching the junction with Sandford Road, the view is framed by the wide gable walls of the two houses at the junction - the house to the left a protected structure. Across the road is the site entrance flanked by high boundary walls and inside the walls the site's dense woodland.	Medium	Block A would protrude marginally above the tree line in summer and in winter it would be clearly visible, along with Block C deeper within the site – both buildings partially screened or filtered by the trees. Due to the buildings' setback from the street there would be no sense of dominance of the existing/ historic buildings in view. At this proximity the architecture of Block A would be appreciable, specifically the articulation and three dimensional quality of the facade and the quality of the materials. The site would retain its park-like character despite the presence of the buildings (the open space and trees would lend the development a park-like character). The character of the townscape/ view would be altered but not inappropriately given the location, and the overall composition of built form, vegetation and open space in the view would be pleasing.	Low-Medium	Moderate positive
5	Belmont Avenue distant view (inside ACA)	The view is taken from further north along Belmont Avenue, some 150m from the site, within the ACA. The view along the narrow road is	High	As in View 1, seen from a distance the tall element of Block A would be clearly visible, protruding above the roofline of the foreground buildings and the trees on the site. A part of Block C would also be discernible.	Low-Medium	Moderate neutral

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
		framed by two storey houses, all pre-20th century but of varying style and materials. There is an apartment development under construction behind the houses to the right, on a former part of the Muckross Park College grounds. The Sandford Road junction, the site entrance and the trees inside the boundary are visible in the distance.		Due to its modern urban typology, contrasting with the existing buildings in view, the development would shift the character of the townscape towards a more urban condition. This is not inappropriate given the location, and the scale of the building is such that it would not dominate the foreground houses; such compositions can enhance the character and visual amenity of the urban area. The photomontage shows that Belmont Avenue can withstand the change in its environs without diminution of its value and visual amenity.		
6 & 7	Eglinton Road distant (230m) and mid-distant (115m) views	Eglinton Road is characterised by large, mostly 3 storey Victorian houses set back behind long front gardens. The road corridor is wide, with two vehicular lanes, cycle lanes and wide verges with rows of mature street trees. The trees add visual amenity to the street, and contribute to a high degree of visual enclosure. While the character of Eglinton Road is strong, the environs are changing, reflecting the urban location. At the opposite end of the road from the site, towards the junction with Donnybrook Road, planning permission has been granted for a high density residential scheme of up to 12 storeys, involving the demolition of nos. 1, 3, 5, 7, 9 and 11 Eglinton Road.	Medium	In summer the development would be entirely screened by the street trees and site woodland in both Views 6 and 7. In winter Block A would be largely screened in View 7 but visible in the distance from Viewpoint 6. Similar visibility would be experienced from the front gardens of some of the houses. Overall, the visual impact on Eglinton Road would be limited. The character of the road is sufficiently strong that it can withstand the change without diminution of its character, and there would be no reduction in visual amenity.	Negligible-Low	Slight neutral
8	Junction of Eglinton Road and	The view is taken from Eglinton Road approaching the double-junction of Eglinton Road and Clonskeagh Road,	Medium	The tall element of Block A, set back behind the retained woodland belt inside the site boundary, would be a prominent addition to the view, protruding above	Medium	Moderate positive

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
	Clonskeagh Road	Sandford Road and Milltown Road.  The stretched, non-orthogonal junction occupies a large space and channels a large volume of traffic between the city centre via Ranelagh to UCD/Clonskeagh and the neighbourhood centres of Donnybrook and Milltown. The mature trees and handsome houses lend visual amenity to the view. However, the status of the junction in the urban structure is not reflected in land use or built form. As a 'place' the junction lacks definition and makes limited contribution to legibility.		the tree line. Due to its height the building would be sufficiently exposed to be identifiable. Its design and material quality would also be revealed. Due to its separation distance from the street and the surrounding houses and the screening effect of the trees, the building can be comfortably accommodated beside the wide junction. A new architectural feature of high quality would be introduced in an appropriate location, adding visual interest and improving townscape legibility, with no negative effect on any valued feature or characteristic. Another element of note is the proposed new treatment of the boundary wall and the new public pedestrian entrance at the corner of the site. These would encourage public access and use of the open space internal to the site, which has heretofore been closed off to public use.		
9	Clonskeagh Road mid-distant view (approx. 110m)	The street is characterised by large houses (St James' Terrace, a protected structure) set back behind mature gardens, generating a high degree of visual amenity. However, on the approach to the junction with Eglinton Rd and Milltown Rd there is a lack of legibility considering	Medium	The development would be screened in the summer. In winter the tall element of Block A would protrude above the foreground trees. Due to its modern urban typology, contrasting with the existing buildings in view, the development would shift the townscape character towards a more urban condition. This is not inappropriate given the location, and there is sufficient separation distance and screening to avoid dominance	Low-Medium	Slight neutral

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
		the location.		of the houses by the proposed building. The Clonskeagh Road townscape corridor can withstand the change without weakening its character. As in the other views from the roads approaching the site (e.g. Views 1 and 4), the development would improve legibility without affecting visual amenity.		
10	Norwood Park – view south	Norwood park is a small estate off Sandford Road, comprised of a single, curved road lined by semi-detached houses. The houses on the south side of the road back onto the site, which extends to the east and south. In the view south along the estate road the mature trees inside the site's northern boundary can be seen between and rising above the houses.	Medium-High	In summer the development would be largely screened from view. In winter the taller volumes (6 and 8 storeys) bookending the linear Block C, aligned parallel with the Norwood Park houses, would be exposed - although filtered by the tree canopies. There would be an increase in built enclosure in addition to the change in character (in views from rear windows and gardens as well as from the street). In the evolving urban context, driven by compact growth policy, this type and magnitude of change is not unusual, and can be considered neutral (the built form is considered and not unsightly, and the design and material quality of the buildings would be evident from this distance).	Medium-High	Significant neutral
11	Norwood Park – view east	The view east along the estate road is similar to the view south, with the mature trees on the site rising above the houses' roofline, adding to visual amenity as well as enclosure.	Medium-High	Only the tall volume of Block A would be visible in summer, with the remainder of the development screened by the trees. In winter Blocks A and C would be visible above and between the houses - prominent additions despite the filtering effect of the bare tree canopies. Being enclosed on two sides by the site, Norwood Park has a high degree of exposure, and visual impact on the estate (intrusion of new, taller buildings and increased enclosure) is unavoidable if the site is to be developed at a higher density. The change to the composition and	Medium	Moderate neutral

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
				character of the views would be moderate to significant, but retention of the boundary trees and the high design and material quality of the buildings would neutralise the visual effects.		
12	Cherryfield Avenue Lower	The northern section of Cherryfield Avenue (the part zoned Residential Conservation area) is lined by a continuous terrace of houses positioned close to the street, generating a high degree of visual enclosure.	Medium	Terraces of three storey duplex units are proposed inside the west boundary back-to-back with the Cherryfield Avenue houses. The taller apartment buildings are further to the east, removed from Cherryfield. Therefore the development would not be visible from the street. The duplex terraces would be visible from the rear windows and gardens of the Cherryfield houses (until a proposed tree line inside the boundary matures) resulting in an increase in visual enclosure, but the change would not be inappropriate. The proposal clearly responds to the sensitivity of Cherryfield Avenue in the arrangement and height of the buildings.	Low	Slight neutral
13	Cherryfield Avenue Upper	Cherryfield Avenue Upper is more recently developed than the lower section. Rather than a continuous terrace, the mid-20th century houses are arranged in terraces of four or six houses. The end of terrace houses have adjoining garages, but there are views from the street towards the site through the gaps between the terraces, over the garages. At one of these gaps the corner of a roof of Tabor House can be glimpsed in the distance.	Medium	Block D is located in the south west corner of the site. This is a small apartment block 3 storeys in height at its western end (to the rear of the Cherryfield houses), stepping up to 5 storeys internal to the site (facing Tabor House across a courtyard). Block D would be glimpsed from the street between the Cherryfield terraces, the stepped profile of the red brick building screening the small part of Tabor House that is currently visible. The building would be visible from the rear windows and gardens of the Cherryfield houses, resulting in an increase in visual enclosure, but the change would not be inappropriate. The proposal clearly responds to the sensitivity of Cherryfield Avenue in the arrangement and height of the buildings.	Low	Slight neutral

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
Viewpoints 1-13 address above the Sandford Road character area, comprised of low density residential streets, to the north and west of the site. Viewpoints 14-21 address the Milltown Road area, of more diverse character, to the east and south of the site.						
14	Milltown Road opposite site	This view taken from a position across the road from the site's eastern boundary shows the extent of screening provided by the woodland belt inside the boundary.	Medium	In summer the proposed development would be entirely screened from view. In winter, Block A - set back behind the boundary wall and a wide open space incorporating the retained trees - would be visible but heavily filtered by the tree canopies. Despite the scale of the development, due to the setback of the buildings from the road and the screening effect of the trees, it would have limited effect on the character of the view and there would be no loss of visual amenity.	Low	Slight neutral
15 & 16	Mount Sandford entrance and view from front terrace opposite site	A single duplex terrace in Mount Sandford faces the site across Milltown Road (the others being arranged to the rear of this terrace, with no visual exposure to the site). Views 15 and 16 represent the view which would be experienced by all the residents of Sandford Lodge on departure from the estate, and the views from the front terrace. The front terrace is set back behind a boundary wall and a narrow garden with a row of maturing trees (see View 16). These provide a visual screen additional to the belt of woodland inside the site's eastern boundary. The woodland screens the interior of the site although in winter Tabor House can be discerned through the bare tree canopy (View 15).	Medium	In summer the development would be almost entirely screened from view. In winter, Block A - set back behind the proposed open space incorporating numerous retained mature trees - would be exposed to view, although filtered by the tree canopies, softening the building's presence. Enough of the building would be revealed for its architecture to be appreciated - notably the articulation of the facades and the variation and quality of the materials. Tabor House would remain visible to the left of the field of view. Considering (a) the location/context, (b) the retention of the trees/ sylvan character of the site, (c) the retention of visibility of Tabor House, (d) the addition of buildings of high design and material quality, and (e) the avoidance of any sense of dominance/overbearing, the visual effect can be classified positive.	Low - Medium	Slight - Moderate positive

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
17	Milltown Road footpath alongside site	This viewpoint represents the views which would be experienced by vehicular, cycle and pedestrian traffic travelling north towards the junction with Sandford Road – where traffic diverts to the city centre via Ranelagh, or to Donnybrook or Clonskeagh/UCD. The summer view shows the screening effect of the trees on both sides of the road. The 6 storey Cedar Hall building to the right is barely visible. winter the Cedar Hall apartment buildings are prominent although well set back from the road and filtered by the trees inside the boundary.	Medium	In summer the proposed development would be screened from view - apart from the new entrance in the boundary wall a short distance along the road. In winter, Blocks A and F would be discernible, set back behind the wall and filtered by the retained trees inside the boundary. Despite the scale of the development, due to the setback of the buildings from the road and the retention of the wall and trees, it would have limited effect on the view and there would be no loss of visual amenity.	Negligible-Low	Slight neutral
18	Milltown Road – Distant view	This view illustrates the difference in character between the townscape corridor of Milltown Road compared to Sandford Road. In winter the Grove House and Cedar Hall apartments are visible to the right, the buildings of urban typology and scale, and varied architectural character. A small part of the upper floor and stepped parapet of 'the Extension' (part of the existing complex of buildings on the site) is visible in the distance to the left. The wall and railing in the foreground to the left encloses the Garrynure estate.	Medium	Block F and the tops of the two taller volumes of Block A would be visible to the left of the road, protruding above the trees. The buildings are well spaced and set back from the road behind the belt of retained trees. The collective roofline steps down towards Sandford Road, reflecting the natural topography. The existing 'extension' building would be removed and a part of Block D would be visible in its place. The row of new buildings on the site would complement the buildings across the road, forming a distinctive corridor of both urban and sylvan character. Due to the buildings' spacing and setback there would be no sense of excessive enclosure. The development would have a positive effect on the urban composition - the positioning and scale of the buildings appearing logical, and legibility would be improved.	Low-Medium	Slight - Moderate positive

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
19	View representing Garrynure	To the south of the site beyond a parking area serving the Gonzaga College playing fields, is Garrynure, a small estate of two storey houses. One row of five houses faces the site, set back from the boundary behind the internal access road and a narrow green strip with trees. In views from the front windows (first floor only) a part of the site is visible over the estate wall and through the trees, beyond the parking area. The existing buildings on the site can be seen (partly screened by trees), specifically a part of Milltown Park House and parts of the Finlay Wing and the Extension. It is a complex and somewhat untidy cluster, also appearing under-scaled compared to the other elements in the composition. To the right across Milltown Road, the Cedar Hall apartment development is prominent.	Medium	The cluster of historic buildings would be replaced in the view by the new complex of apartment buildings, Block F most prominent, with a stepped profile (due to the setback of the top floor), and with parts of Block D visible to the rear. From this proximity the design and finish quality of the buildings would be appreciable, with the buildings also benefitting from the mature trees in their immediate setting, forming an attractive composition, and complementing Cedar Hall on the far side of Milltown Road.	Medium	Moderate positive
20	Milltown Park access road	The access road to the Milltown Park centre passes the cluster of buildings in the southern part of the site. In this view from the access road, the red brick accommodation block (part of the Jesuit centre, i.e. external to the subject site) is to the left, and the Extension and a part of the Chapel are to the right (both part of the site). The foreground buildings enclose a green courtyard	Medium	The Extension building would be replaced in the view by the new Block F. The connecting building from the accommodation block would be shortened, opening a view into the site over a new stone boundary wall. A cluster of buildings would be visible within the site, framed by Block F and the accommodation block. These include the refurbished Chapel building (now more fully exposed to view) and parts of Blocks B, C	Medium	Moderate positive

No	Viewpoint Location	Baseline View	Sensitivity	Proposed Change	Magnitude of Change	Significance of Effects
		which is external to the site. A low, red brick connecting building links the accommodation block to the Extension on the far side of the courtyard, closing the vista.		and D). The combination of open space and buildings from various eras creates a complex but interesting composition, of higher visual amenity value than the existing view.		
21	Milltown Park – view from rear of accommoda-tion block	The north elevation of the new Milltown Park accommodation building affords a view into the south west corner of the site (in winter; in summer the view is blocked by the tree in the foreground). The older, red brick accommodation building (external to the site) is to the right, and the houses at the end of Cherryfield Avenue Upper are to the left, framing the view into the site. A part of the Chapel roof is visible in the middle distance and in winter a part of Tabor House is visible.	Medium	In summer the majority of the development would be screened by the tree and existing buildings in the foreground. In winter, part of the development would be exposed, specifically Block D in the south west corner, stepping up from three storeys inside the boundary to five storeys further into the site where it would screen a part of Tabor House. A taller element of Block C would also be visible beyond Block D, forming a coherent, stepped composition of built form. The change to the already complex composition would cause no reduction or improvement to visual amenity. However, the winter view in particular shows the responsiveness of the proposal to the context.	Medium	Moderate neutral
22	Albany Road distant view (approx. 350m)	The alignment of Albany Road frames a view east towards the site. The view along the road is framed by two storey red brick houses and a line of street trees to the left.	Medium	A small part of Block A would protrude marginally above the distant roof and tree line. There would be no significant change to the composition or character of the view, and no loss of visual amenity.	Negligible	Not significant neutral

Table 9.9: Assessment of Potential Visual Effects

9.5.3 The 'Do Nothing' Approach

The site would remain as a large area of formerly institutional land of parkland character within an urban area of mixed character with no access to the general public. In the current situation, as a component of the local green infrastructure network it provides some visual amenity and ecosystem services. However, in the context of compact growth, the site is considered an unsustainable use of the land resource and the public have never enjoyed any right of access to these privately owned lands.

9.6 Mitigation (Remedial/Reductive Measures)

9.6.1 Construction Phase

Apart from (a) the measures incorporated in the proposed design (see 9.6.2 below), (b) the measures for tree protection (as recommended in the Tree Protection Strategy prepared by CMK Horticulture & Arboriculture Ltd) and biodiversity protection (as recommended in Chapter 8), and (c) standard best practice construction site management (e.g. erection and maintenance of site hoarding, orderly storage of materials and vehicles, etc.), no additional mitigation measures are proposed for townscape and visual effects.

9.6.2 Operational Phase

The proposal has been subject to detailed environmental impact assessment, including of potential townscape and visual effects, throughout the design and pre-planning process. Informed by this assessment, the proposal has been designed to avoid causing any significant negative townscape and visual effects.

Important mitigation measures built into the proposal from the outset include:

- The retention of the tree/ woodland belt inside the north and east boundaries aspart of the scheme's main public open space (not all of the trees, but most of the better quality trees – a sufficient volume to retain the tree belt as a key feature of the landscape), with the buildings (Block A and C) set back well behind the trees. This would (a) retain the site's 'parkland' character in views from Sandford Road and Milltown Park, (b) provide screening of the buildings, and (c) lend maturity, identity/ character, landscape and visual amenity tothe new neighbourhood.

- The retention of Tabor House and the Chapel on the site. The dual intention was to (a) preserve these assets in the interest of cultural/ architectural heritage conservation, and (b) to lend maturity, identity/ character, landscape and visual amenity to the new neighbourhood.

- Retention of trees, setting back of the buildings (Block C) and modulation of building height along the north (Norwood Park) boundary. Block C is set back from the boundary behind a linear open space incorporating the retained trees, to function as a landscape/ visual buffer between the building and the nearest houses of Norwood Park. The northern range of Block C is also broken into four distinct volumes, of two, four, six and eight storeys. The intention of this articulated form is to reduce the perception of massing/height in the views from Norwood Park.

- Positioning of lower buildings (Block E and the lower volume of Block D) inside the west (Cherryfield Avenue) boundary. The proposed Block E terraces are three storeys and are positioned against the west boundary in a back-to-back arrangement with the Cherryfield Avenue houses. This is a typical lower density suburban arrangement. The Block D apartment building steps down from five to three storeys towards the west boundary, with the same intention of minimising the intrusion of the building in views from Cherryfield Avenue.

- High quality design and materials. The proposed scheme is conceived as a higher density neighbourhood of the highest architectural and landscape quality, commensurate with the qualities of the urban context. Therefore, even when visible from the surroundings (as a higher density development in a traditionally low density area unavoidably would be), the buildings and landscape would beattractive. The townscape character and views would change, but their quality would be maintained.

In addition to these decisions taken at the start of the design process, an important mitigation measure was the reduction in scale of Block A1. This element of the proposal is deliberately tall in order to achieve place-making and townscape legibility gains. However, at 13 No. storeys (as originally proposed), the step up in height from the surrounding built form could have been considered excessive and the building excessively intrusive in views. In recognition of this Block A1 was reduced to 10 No. storeys and set back several metres further from the Sandford Road boundary (the setting back was also to improve the open space inside the north boundary). The result is that the building would be visible and recognisable from the surrounding area (i.e. it would function as a landmark) without dominating or otherwise harming its townscape context.


Photos 9.15 & 9.16: Photomontages showing the originally proposed 13 storey Block A vs. the proposed 10 storey Block A, as seen from the junction of Eglinton Road and Clonskeagh Road


Photos 9.17 & 9.18: Photomontages showing the originally proposed Block A vs. the proposed Block A seen from Norwood Park.

No further mitigation measures are recommended.

9.7 Predicted Impacts of the Proposed Development

9.7.1 Townscape Effects

No mitigation measures have been recommended for townscape effects. The residual effects are the same as the potential impacts described in Section 9.5.1 above.

9.7.1.1 Construction Phase

The magnitude of townscape change in the immediate vicinity of the site would be medium. The effects would reduce with increased distance from site. While there are variations in character and sensitivity in the area, overall, the sensitivity of the townscape can be considered medium (refer to 9.5.1.2). Therefore, the effects on the townscape would be 'moderate' and negative in the immediate vicinity of the site (most notably affecting Norwood Park and parts of Cherryfield Avenue), reducing in significance with distance from the site. These effects would be temporary.

9.7.1.2 Operational Phase

Measuring the magnitude of proposed change against the sensitivity of the receiving environment (refer to 9.5.1.2), <u>the significance of the townscape effects is predicted to be 'moderate'</u> (definition: *An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends*).

Townscape change of some significance is unavoidable with the development of a large opportunity site in a prominent position (at a junction, with frontage to two main thoroughfares), at the interface between two different character areas (one being characterised by low density development). Contemporary, high density development that fits comfortably into the Milltown Road area will inevitably contrast with the Sandford Road area. Additionally, if the development is intended to mark the junction to improve legibility, it must protrude above the tree line and therefore intrude in views from the lower density area of Sandford Road.

Such tensions are increasingly common and are not undesirable in an urban environment evolving as a result of compact growth policy. The access of suburban, previously private institutional properties to public transport, neighbourhood centres, places of employment and education, public open space and other urban amenities is too valuable not to exploit. The resulting change should therefore be viewed as neutral in principle. If a proposed development is responsive to the sensitivities in the receiving environment, and if it can also deliver townscape gains/ benefits (additional to sustainable land use/ density) then its effects can be positive - even if it contrasts with some of the context development.

The assessment has found that the proposed development would achieve significant townscape benefits, including the provision of high quality new public open space for the future residents and the wider community, and place identification and improved legibility.

Importantly, the development would retain the site's main natural and cultural/ architectural heritage assets, i.e. the woodland belt, Tabor House and The Chapel, incorporating these as features/ focal points of the new neighbourhood.

Additionally, in its arrangement of built form and height the proposal demonstrates consideration of the sensitivities in the receiving environment, specifically the neighbouring residential streets and nearby protected structures. The complete avoidance of juxtaposition of building typologies and scale is not possible when high density development is introduced to historically low density areas. However, considering the context, such juxtaposition has been minimised. Only at the site interface with Norwood Park would there be any significant step in scale. Here, the potential negative effects are minimised by the setback of the building (Block C) from the boundary, the retention of existing mature trees in a linear open space inside the boundary (forming a landscape bufferbetween the new building and the houses of Norwood Park), and the considered massing/ height and façade treatment of the building – to reduce the perception of scale.

In summary, considering the sensitivities and opportunities in the receiving environment, the degree of compliance with relevant planning policy (see Table 9.6) and the proposed development (including the mitigation measures built in to avoid or reduce negative impacts), the townscape effects are predicted to be positive.

9.7.2 Visual Effects

9.7.2.1 Construction Phase

The magnitude of change to views in the receiving environment would range from negligible to medium-high and would vary over time; therefore the significance of the effects would also vary – although they would typically be negative during construction. Such temporary negative visual effects are unavoidable and are not unusual in the urban context where change is continuous.

9.7.2.2 Operational Phase

No mitigation measures have been recommended for visual effects (refer to 9.6.2 above). The residual effects are the same as the potential effects described in Section 9.5.2, and summarised in Table 9.10 below.

No	Viewpoint Location	Sensitivity	Magnitude of Change	Significance & Quality of Visual Effects		
				Construction (Temporary)	Operation (Permanent)	Residual (Permanent)
1	Sandford Rd mid-distant view (approx. 200m)	Medium	Low-Medium	Slight negative	Slight positive	Slight neutral
2	Sandford Road – local view (approx. 65m)	Medium	Negligible-Low	Not significant neutral	Not significant neutral	Not significant neutral
3	Sandford Road opposite site	Medium	Low	Slight negative	Slight neutral	Slight neutral
4	Belmont Ave approaching Sandford Road	Medium	Low-Medium	Moderate negative	Moderate positive	Moderate positive
5	Belmont Avenue distant view (inside ACA)	High	Low-Medium	Moderate negative	Moderate neutral	Moderate neutral

No	Viewpoint Location	Sensitivity	Magnitude of Change	Significance & Quality of Visual Effects		
				Construction (Temporary)	Operation (Permanent)	Residual (Permanent)
6	Eglinton Road distant view (230m)	Medium	Low	Slight negative	Slight neutral	Slight neutral
7	Eglinton Road mid-distant view (115m)	Medium	Negligible	Not significant neutral	Not significant neutral	Not significant neutral
8	Junction of Eglinton Road and Clonskeagh Road	Medium	Medium	Moderate negative	Moderate positive	Moderate positive
9	Clonskeagh Road mid-distant view (110m)	Medium	Low-Medium	Slight negative	Slight neutral	Slight neutral
10	Norwood Park – view south	Medium-High	Medium-High	Significant negative	Significant neutral	Significant neutral
11	Norwood Park – view east	Medium-High	Medium	Moderate negative	Moderate neutral	Moderate neutral
12	Cherryfield Avenue Lower	Medium	Low	Slight negative	Slight neutral	Slight neutral
13	Cherryfield Avenue Upper	Medium	Low	Slight negative	Slight neutral	Slight neutral
14	Milltown Road opposite site	Medium	Low	Slight negative	Slight neutral	Slight neutral
15	Mount Sandford entrance – view west	Medium	Low - Medium	Moderate negative	Moderate positive	Moderate positive
16	Mount Sandford entrance – view north west	Medium	Low	Slight negative	Slight neutral	Slight neutral
17	Milltown Road footpath alongside site	Medium	Negligible-Low	Slight negative	Slight neutral	Slight neutral
18	Milltown Road – Distant view	Medium	Low-Medium	Moderate negative	Slight - Moderate positive	Slight - Moderate positive
19	View representing Garrynure	Medium	Medium	Moderate negative	Moderate positive	Moderate positive
20	Milltown Park access road	Medium	Medium	Moderate negative	Moderate positive	Moderate positive
21	Milltown Park – from rear of accommodation block	Medium	Medium	Moderate negative	Moderate neutral	Moderate neutral
22	Albany Road distant view (approx. 350m)	Medium	Negligible	Not significant neutral	Not significant neutral	Not significant neutral

Table 9.10: Predicted residual visual effects

The most notable results of the visual effects assessment are as follows:

- **Limited and neutral or positive visual effect on the Sandford Road corridor**. The only elements of the proposed development that would have a significant presence in views from Sandford Road, Belmont Avenue, Eglinton Road and Clonskeagh Road, are Block A1 and the changes to the boundary wall (replacing part of the cement render and stone wall with a low wall and railing). In views from a distance (e.g. Viewpoints 1, 5, 6 and 9), Block A1 would protrude above the retained tree line. The extent of protrusion would be sufficient for the building to be seen and to be recognisable, but not so tall as to dominate or otherwise harm any existing buildings or other valued elements in the views. The development would therefore cause no loss of visual amenity, but it would contribute to place-making and legibility. The photomontages indicate that the 10 storey height of Block A1 is the ideal height to achieve the urban design objectives and also avoid any negative effects. In two views from the Sandford Road corridor, where the development would be slightly more exposed to view (Viewpoints 4 and 8), the visual effects have been assessed as positive. In both cases the development would result in an attractive and interesting urban composition, with no negative effect on any valued feature or characteristic of the views.

- **Limited effect on the setting and views of protected structures**. The protected structures closest to the site are the houses across Sandford Road to the north and St James's Terrace across Milltown Road to the east. The proposed Block A1 is separated from these houses by some 60m or more, and there are wide, busy streets and the retained mature trees on the site between them. Therefore, despite the relative height of Block A1, it would have limited effect on the setting or views of or from these protected structures (refer to the photomontages for Viewpoints 3, 4, 8 and 14.
- **Limited visual effects on Cherryfield Avenue (Residential Conservation zoned-area)**. The reduction in height of the proposed buildings towards the western site boundary limits the extent to which the proposed development would intrude in views from Cherryfield Avenue and the houses on the east side of the street, which back onto the site. While these houses would experience change in their views, the residual views would be similar to those of the majority of the houses in the area, which are typically arranged back-to-back with other houses.
- **Significant but neutral visual effects on Norwood Park**. The greatest magnitude of change to views would occur in views from Norwood Park, particularly the houses on the south side of the road, which back onto the site. In views to the east, Block A1 would protrude above the retained trees in the middle distance. It would have limited effect on the composition or character of the views, and would cause no reduction in visual amenity (a building of high design and material quality being added (in the middle distance) to the already urban composition - see photomon- tage for Viewpoint 11). In views south (Viewpoint 10) the magnitude of change would be higher, with Block C located across the boundary at a distance of 32.5- 45m from the rear facades of the houses. Block C would unavoidably intrude inviews from the street and the rear windows and gardens of a small number of houses. Several measures have been taken to minimise the effect on these views, including (a) the retention of the mature trees inside the boundary, (b) the setting back of Block C from the boundary behind a linear open space incorporating the trees, and (c) the deconstructed massing, modulated height, the highly articulated facades and material quality of Block C. Therefore, while the composition and character of the views would be changed, the new buildings in view would be sufficiently removed and of sufficiently high design quality to avoid causing any significant negative effects on visual amenity. Without a change in building typology (and corresponding reduction in residential density) this effect cannot be further reduced. Such changes are inevitable in the process of densification of the suburban environment.

- **Limited but positive visual effect on Milltown Road and adjacent properties/ developments**. Due to the retention of numerous mature trees inside the east boundary and the setting back of Block A behind the wide open space, the development would have limited effect on views from Milltown Road or the properties across the road (e.g. Viewpoints 14-19). Where the buildings would be visible (Viewpoints 15, 18, 19) they would make a positive contribution to the visual amenity of the already urban townscape corridor of Milltown Road. Possibly the most significant change in the views from Milltown Road itself would be the replacement of the existing high wall on the site boundary with a low wall and railing. This would open views into the site along the frontage of the new public park, featuring the retained woodland and glimpses of the attractive new buildings set back behind the park.

9.8 Monitoring

The retention of existing trees on site is an important element of the proposal. Any unplanned loss of trees beyond that considered and designed for in the subject application could result in negative townscape and visual impacts.

The planning application is accompanied by a Tree Protection Strategy prepared by CMK Horticulture & Arboriculture Ltd., which includes the requirement for (a) a Site Arborist to be appointed for the project, (b) the monitoring of tree protection measures by the Site Arborist throughout construction, (c) supervision by the Site Arborist of all works in the vicinity of trees, and (d) the specification by the Site Arborist of remedial works in the event of any damage to trees. The strategy also requires a re-survey of the retained trees post construction to ensure their survival in optimum condition.

9.9 Cumulative Impacts

There are several recently permitted developments, and proposals currently in the planning process, for a range of development types, including residential schemes of higher density (than the prevailing density) in the vicinity of the site. These include:

	Planning Reference	Development and Location	Date Granted
1.	**ABP Reg. Ref. PL29S.307267**	148 No. Unit Residential Development Eglinton Road, Donnybrook, Dublin 4	**ABP Decision Date:** 31st August 2020
2.	**DCC Reg. Ref. 2189/20** **ABP Reg. Ref. PL29S.307375**	36 No. Unit Residential Development Sandford Lodge, Sandford Road, Dublin 6	**Decision Date:** 11th March 2021 **ABP Grant:** 27th March 2020
3.	**DCC Reg. Ref. 3301/20** ***Currently Under Appeal*** **ABP Reg. Ref. ABP-309378-21**	100 No. BTR Unit Shared Accommodation Nos. 22-24 Donnybrook Road, Kiely's Pub, Donnybrook, Dublin 4	**Granted:** 13th January 2021 **ABP Decision Due:** 10th June 2021 (Not yet made)

4.	**DCC Reg. Ref. 2115/19**	203 No. Bed Student Accommodation Alexandra College, Richmond Avenue South, Milltown, Dublin 6	**Granted:** 20th March 2019 **Final Grant:** 25th April 2019
5.	**DCC Reg. Ref. 3907/18**	Works at Alexandra College, Richmond Avenue South, Milltown, Dublin 6 (including construction on a new internal campus road, relocation of existing car and coach parking, provision of additional bicycle parking spaces and the provision of improvement works to the campus entrance on Milltown Road to include a set-back gateway)	**Granted:** 25th January 2019 **Final Grant:** 5th March 2019
6.	**DCC Reg. Ref. 3513/20** **ABP Reg. Ref. ABP-309720-21**	Mixed Use Development of 49 No. Build-to-Rent units and 231 sq m retail space Nos. 25-27 Donnybrook Road and Nos. 1-3 The Crescent, Donnybrook, Dublin 4	**Granted:** 24th February 2021 **Final Grant:** 26th May 2021 (Appeals Withdrawn)
7.	**DCC Reg. Ref. 2124/20**	Single storey extension (c. 120 sq m) to the south of the existing school to provide additional canteen facilities Muckross Park College, Marlborough Road, Dublin 4	**Granted:** 20th March 2020 **Final Grant:** 29th June 2020
8.	**No. 1. DCC Reg. Ref. 2582/16** **No. 2. DCC Reg. Ref. 3312/20**	Demolition of existing sheds (c. 25 sq m) and construction of 4 No. detached houses No. 91 Belmont Avenue, Donnybrook, Dublin 4 Revised ground floor rear extension to include a single storey rear return for a utility room No. 91 Belmont Avenue, Donnybrook, Dublin 4	**Granted:** 8th August 2016 **Final Grant:** 16th September 2016 **Granted:** 28th October 2020 **Final Grant:** 9th December 2020

9.	**DCC Reg. Ref. WEB1065/19** **ABP Reg. Ref. ABP-304727-19**	New 3g artificial turf pitch capable of accommodating full size rugby and football over the site on an existing natural grass pitch within the playing fields Gonzaga College, Sandford Road, Ranelagh, Dublin 6	**Granted:** 31st May 2019 **Final Grant:** 9th October 2019
10.	**DCC Reg. Ref. 3159/17** **ABP Reg. Ref. ABP-300024-17**	Revision to DCC Reg. Ref. 2308/16 to increase the total apartment units from 96 No. to 116 No. Lands at the former Paper Mills site, bounded by the River Dodder to the East, Clonskeagh Road to the West, Clonskeagh Bridge to the South-West, Dublin 6	**Granted:** 27th September 2017 **Final Grant:** 4th July 2018
11.	**DCC Reg. Ref. 3144/18**	Demolition of the existing Anglesea Stand and Anglesea Terrace structure (c. 7,716 sq m), 'lean-to' open fronted shed bounding Simmonscourt Road (approx. 145 sq m) and removal of modern terrace (approx. 44sq m) area surrounding the clock tower (a protected structure). Provision of a new grandstand (7,332.2 sq m) over 3 levels, 21.3 m [26.8 m OD] in height (with associated floodlighting and acoustic public address within roof of new stand) with a connection (via a glazed bridge link at level 01) to the pocket building of (1,204.3 sq m GFA) comprising a 2 level (storey) 9.91 m [15.41 m OD] in height building with plant (89 sq m) at roof level (within a louvered cover - overall height 10.66 m 16.12 m OD)) to the east. Site within the overall RDS Lands, Ballsbridge, Dublin 4	**Granted:** 24th July 2018 **Final Grant:** 31st August 2018
12.	**DCC Reg. Ref. 2189/20** **ABP Reg. Ref. ABP-307375-20**	Demolition (c. 392 sq m) of Block 5 (1 storey) and Block 6 (1 storey) (total 4 No. units) and the	**Granted:** 27th March 2020

		construction of 36 No. residential units in the form of 2 No. three storey terraces Lands at Sandford Lodge, Sandford Close, Sandford Road, Dublin 6	**Final Grant:** 11th March 2021
13.	**DCC Reg. Ref. 2244/21** *Currently on Appeal under:* **ABP Reg. Ref. ABP-310204-21**	Demolition of structures on site and construction of a 12 No. storey development including 84 apartments with retail and café/restaurant (570 sq m) Junction of Donnybrook Road and Brookvale Road, Donnybrook, Dublin 4, D04 K3T8	**Refused:** Refused by DCC on 14th April 2021 **ABP Decision Due Date:** 13th September 2021
14.	**DCC Reg. Ref. 3939/19** **ABP Reg. Ref. ABP-306755-20**	The demolition of the existing Rectory and the construction of 9 No. dwellings The Rectory, Purser Gardens, Rathmines, Dublin 6, D06 E0Y5	**Granted:** 19th February 2020 **ABP Grant:** 9th September 2020
15.	**DCC Reg. Ref. 4011/18** **ABP Reg. Ref. ABP-304085-19**	The demolition of all buildings on the former commercial site to the rear and the construction of a new residential development comprising 20 No. residential houses No. 1 Annesley Park, Dublin 6	**Granted:** 4th March 2019 **ABP Grant:** 4th November 2019
16.	**DCC Reg. Ref. 2812/20**	Demolition of existing single storey structures to the side and rear. - Construction of single storey rear extension to the side and rear of the existing dwelling No. 23 Bushfield Terrace, Donnybrook, Dublin 4, D04 V2RO	**Granted:** 29th July 2020 **Final Grant:** 9th September 2020
17.	**DCC Reg. Ref. 2412/19** **ABP Reg. Ref. ABP-305475-19**	The construction of a residential scheme arranged in 3 No. new three-four storey blocks with habitable attic accommodation at a site at The former Donnybrook Laundry at The Crescent,	**Granted:** 22nd August 2019 **ABP Grant:** 29th January 2020

		Donnybrook, Dublin 4, D04 R856 and No. 17 The Crescent, Donnybrook Road, Dublin 4 D04 A6Y7	
18.	**DCC Reg. Ref. 2731/21 (alterations to DCC Reg. Ref. 3890/14 extended by DCC Reg Ref. 3890/14/X1-4 No. bedroom dwelling)**	Development comprising provision of a pedestrian entrance gate off Eglinton Road; (ii) provision of a temporary construction access off Eglinton Road; and (iii) all ancillary works necessary No. 1 Eglinton Square, Donnybrook, Dublin 4, D04 E2W2	**DCC Decision:** Split decision 29th June 2021 – Grant proposed pedestrian entrance gate and refuse proposed temporary construction entrance.
19.	**(SHD) ABP Reg. Ref. ABP-310138-21 (www.msmshd.ie)**	Demolition of existing buildings on site and part of the granite wall along Dundrum Road, excluding Small Hall and the construction of 231 No. apartments and a childcare facility Mount Saint Mary's and Saint Joseph's, Dundrum Road, Dundrum, Dublin 14	**ABP Decision Date:** 25th August 2021

Pending:

	Planning Reference	Development	Date Granted
1.	**DCC Reg. Ref. 2843/21**	Construction of Donnybrook Primary Care Centre comprising 4 No. storeys over basement level accommodating HSE medical diagnostics, consulting and treatment rooms plus ancillary offices The Royal Hospital Donnybrook, Morehampton Road, Donnybrook, Dublin 4, D04 HX40	**DCC Decision:** Further Information Received 25th August 2021 Decision due 21st September 2021
2.	**DCC Reg. Ref. 2477/21**	The demolition of a single storey rear return and provision of 2 No. residential units; and the provision of a new part 2 to part 4 No. storey structure to the rear of the site accommodating 10 No. residential units	**DCC Decision:** (Further Information Requested 20th May 2021)

		No. 47 Ranelagh Road, Ranelagh, Dublin 6	
3.	**DCC Reg. Ref. 2762/21**	Construction of an additional storey consisting of an additional 2-bedroom apartment at third floor level, with private balconies. There will be an increase in units from 6 to 7 No. apartments Nos. 47-48 Chelmsford Road, Ranelagh, Dublin 6	**Refused:** 5th July 2021 **Appealed to ABP:** Decision due 2nd December 2021
4.	**DCC Reg. Ref. 2704/21**	Construction of 64 No. Build-to-Rent apartment units comprising 19 No. studio apartments, 41 No. one bedroom apartments and 4 No. two bedroom apartments St. Mary's Home, Pembroke Park and No. 28A Clyde Lane, Dublin 4	**DCC Decision:** (Further Information Requested 24th June 2021)

None of these permitted or proposed developments is (a) so close to the subject site, and/or (b) of such large scale that they could interact with the proposed development to result in townscape or visual impacts of *greater significance* than those predicted in Section 9.7 above. (There would be some cumulative townscape effect – see comment on the Eglinton Road SHD scheme below - but this would not change the significance or quality classifications in 9.7.1.2.)

The Eglinton Road SHD scheme (PL29S.307267) is the largest of the permitted or proposed developments in the site vicinity. It is located at the opposite end of Eglinton Road from the site. That permission allows for the houses at Nos. 1, 3, 5, 7, 9 and 11 Eglinton Road to be replaced by an apartment building of up to 13 storeys. This development and the subject proposal could not be seen in any one field of view (being separated by 500m and at opposite ends of a curved street). <u>However, they would jointly contribute to a shift in townscape character experienced by the residents and users of Eglinton Road</u>.

This is an example of how the proposed development *would* interact with other proposed developments, permitted developments and the already constructed higher density developments in the area (e.g. Cedar Hall, Grove House, etc.) to result in a general shift in townscape character - towards a more urban, mixed density condition. This change is the result of compact growth policy, and it is not a negative change. It should be recognised that while the introduction of higher density development will unavoidably cause a change in character and the composition of views, low density housing will remain the predominant development typology in the site vicinity.

9.10 Interactions

9.10.1 Biodiversity (see Chapter 8 of this EIAR)

The retained open space within the site will provide amenity areas for residents, including play areas, fitness areas and benches. This will involve thinning of trees within the woodland which, without mitigation to protect the wildlife, could impact on wildlife in the area for which the woodland provides cover and foraging ground. Mitigation measures involve planting of native shrubs in the understory which will enhance the woodland structure and provide habitat for wildlife to safely commute and nesting opportunity for birds.

It is proposed to remove 283 of the 404 No. existing trees on the site to facilitate the development (and/or due to their current poor condition), and to retain 121 No. trees in the application site. The strategy is to retain as many as possible of the Category A and B trees (better quality specimens) and remove Category U and C (low quality) trees where necessary to accommodate the development, and also to 'open up' the overly dense woodland areas for healthier growth of the retained specimens and enable the use of these areas as open space. Of the 283 No. trees proposed to be removed, the majority are Category U and C trees, 120 No. are Category B trees and 4 No. are Category A trees.

It is also proposed as part of the development to plant 238 No. new trees and large shrubs. Given that these specimens would all be in better condition than the majority of the 283 No. trees to be removed, and that the retained trees would be in better condition than they currently are (due to the thinning of the woodland and the maintenance of each retained specimen), there would be a similar quantity and a net improvement in the quality of shrub and tree cover on the site as a result of the development which will ensure the site's function to provide habitat for a range of species and providing a wildlife corridor at the site. Therefore, the interactions between biodiversity and landscape is considered to be long-term, slight and neutral.

9.10.2 Population and Human Health (Chapter 5 of this EIAR) / Wind (Chapter 17 of this EIAR)

The proposed development would introduce a new, high density residential neighbourhood to the townscape, making more sustainable use of the valuable urban land resource. The proposal includes a substantial area of communal and public open space, most notably a new public park (including a playground and a network of footpaths) inside the site boundaries along Sandford Road and Milltown Road. The park would be visible and accessible from the public realm around the site, representing a significant gain in public open space - with long-term, positive and significant impacts on the health of the existing population and the new resident community.

The interactions between the proposed development and its environs and human health have been evaluated within the Wind Assessment. The modelling has included the proposed design, the proposed landscaping strategy and the existing landscape which will remain, in conjunction with the existing buildings surrounding the development. The combination of all interactions has resulted in a comfortable environment for pedestrians within the proposed development, and the interaction between population/human health, landscape and wind will be long-term, neutral and imperceptible.

9.10.3 Architectural Heritage (Chapter 6 of this EIAR)

The proposed development would retain Tabor House and the Chapel - the two most valuable existing architectural features of the site - as part of the cluster of buildings. Their condition, and the character and condition of their setting would be improved by the development, with both buildings opened up to view from Milltown Road.

As a remnant of the Milltown Park demesne the woodland belt inside the Sandford Road and Milltown Road boundaries is also a cultural heritage feature. While the proposed development includes the removal of a large number of trees from the woodland belt, the majority of specimens in good condition would be retained (and supplemented by new planting) - so that the woodland belt remains as a distinct landscape feature of the site. This too would benefit from increased visual exposure to the public realm resulting from the proposed replacement/modification of the tall boundary wall with a low wall and railing - allowing greater public appreciation of the woodland as a landscape/ cultural heritage feature. The impact of the interaction between architectural heritage and landscape is considered to be long-term, moderate and positive.

9.11 Difficulties Encountered in Preparation of the Chapter

No difficulties were encountered in the preparation of the Landscape and Visual Impact Assessment chapter.

9.12 References

1. Dublin City Development Plan 2016-2022, Dublin City Council;
2. Guidelines for Landscape and Visual Impact Assessment, 3rd edition (2013), Landscape Institute and Institute of Environmental Management and Assessment.
3. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, 2018, published by the Department of Housing, Planning and Local Government.
4. Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (2017), Environmental Protection Agency.
5. Photography and Photomontage in Landscape and Visual Impact Assessment (2011), Landscape Institute.
6. Townscape Character Assessment, Technical Information Note 05/2017 (2017), Landscape Institute.
7. Urban Design Manual – A Best Practice Guide (2009), Department of Environment, Heritage and Local Government.
8. Urban Development and Building Height Guidelines for Planning Authorities (2018), Department of Housing, Planning and Local Government.

10.0 LAND, SOILS AND GEOLOGY

10.1 Introduction

The Lands, Soils and Geology Chapter of this EIAR has been prepared by Brendan Keogh (BA BAI PGradDip CEng MIEI) of DBFL Consulting Engineers. Brendan Keogh is a Chartered Professional Engineer with over 15 years' experience in the design and construction of civil engineering projects. Projects have included works associated with the commercial, industrial, energy, residential and public infrastructure sectors.

Ross Griffin (BE PGradDip CEng MIEI) of DBFL Consulting Engineers also contributed to this chapter. Ross Griffin is a Chartered Professional Engineer with over 15 years' experience in the design and construction of structural engineering projects. Projects have included structures associated with the residential, commercial and public sectors.

This chapter of the EIAR comprises of an assessment of the likely impact of the proposed development on the soils and the geological environment as well as identifying proposed mitigation measures to minimise any impacts. Impact on land (landscape character) is assessed in Chapter 9.0 (Landscape and Visual Impact Assessment).

In summary, the proposed development ("the site") comprises of 671 residential dwelling (604 No. Build to Rent and 67 No. Build to Sell) on a c. 4.26 ha site (developable area). The development also includes a creche with outdoor play area and communal internal amenities (co-working space, lounges, libraries and multi-purpose hall).

The proposed development will also include the following associated engineering infrastructure:

- Provision of a new vehicle access off Milltown Road (primary vehicle access to the proposed development facilitating access to the basement carpark as well as serving pedestrians and cyclists). This new site access shall be a priority junction. A Toucan Crossing is also proposed in the vicinity of the Milltown Road access to improve facilities for vulnerable road users.
- Retain existing entrance on Sandford Road (facilitates pedestrian and cycle access as well as limited vehicle access to the northern end of the site). Improvements to existing pedestrian crossing point in the vicinity of the Sandford Road entrance is also proposed. There is no vehicular access from Sandford Road to the basement carpark, the forecourt area adjacent to Tabor House and the duplex units along the western boundary (which are all served exclusively from Milltown Road).
- Provision of an additional access points for pedestrians and cyclists adjacent to the junction of Sandford Road / Milltown Road.
- Provision of internal site roads including associated footpaths.
- Provision of on-site surface water drainage infrastructure which will discharge from the site along its south-eastern boundary via Milltown Road and the junction of Milltown Road / Sandford Road prior to discharging to the existing public surface water drainage network in Eglinton Road (proposed 300mm diameter pipe extending approximately 300m from the proposed development site boundary to the outfall location which includes replacement of approx. 160m of the existing 225mm diameter drainage network along Eglington Road.).
- Provision of foul drainage and water supply infrastructure and connections.

10.2 Methodology

An assessment of the likely impact of the proposed development on soils and the geological environment included the following activities and has been informed by the EPA "Guidelines on the Information to be Contained in Environmental Impact Assessment Reports", Draft August 2017.

- Ground Investigation Study – Ground Investigation Report prepared by GII, Project No. 9338-12-19, Issue Date 29 October 2020.
- Environmental Assessment – Environmental Assessment Report prepared by GII, Project No. 9338-12-19, Issue Date 22 June 2020.
- Review of information available on the Geological Survey of Ireland (GSI) online mapping service.

Ground Investigations for the proposed development were carried out by Ground Investigations Ireland (GII) between January and June 2020 and included the following scope of work:

- 11 No. Trial Pits.
- 3 No. Infiltration Tests.
- 14 No. Window Samples.
- 13 No. Dynamic Probes.
- 16 No. Cable Percussion Boreholes (5 No. Rotary Cores).
- 9 No. Plate Bearing Tests.
- 1 No. TRL probes to determine CBR Value.
- 7 No. Groundwater monitoring wells.

Refer to Appendix 10.1 Ground Investigation Reports (GII, Project No. 9338-12-19, Issue Date 29 October 2020).

Refer to Appendix 10.2 Environmental Assessment Report (GII, Project No. 9338-12-19, Issue Date 22 June 2020).

10.3 Receiving Environment

10.3.1 Soils

Ground conditions at the site, as observed during Ground Investigations, are summarised as follows:

- Topsoil was encountered in the majority of test locations, typically at depths between 0.2 and 0.4m BGL (with a maximum depth of 0.7m BGL encountered in TP05).
- Made ground deposits encounter under topsoil/surfacing at some locations at depths between 0.5 and 1.0m BGL. These deposits were described generally as brown slightly sandy, slightly gravelly CLAY with occasional cobbles or grey sandy angular Gravel. In some locations the made ground contained occasional fragments of brick.
- Cohesive deposits were encountered beneath topsoil and made ground noted above and consisted of brown slightly sandy slightly gravelly CLAY with occasional cobbles overlying a stiff or very stiff dark grey/black slightly sandy slightly gravelly CLAY with occasional cobbles. The strength of the cohesive deposits typically increased with depth (noted as very stiff at 2.2m BGL at the majority of exploratory holes with some extending to 2.6m BGL before very stiff deposits were encountered.
- Granular deposits were encountered in BH16 within the cohesive deposits and were typically grey brown slightly clayey sandy sub angular sub rounded fine to coarse GRAVEL with occasional cobbles.
- The rotary core boreholes recovered weak to strong grey/dark grey fines to medium grained LIMESTONE with calcite veining. Residual weather mudstone also found in some locations. Depths to rock varies from 9.0m to 18.45m BGL.

At the time of the initial site investigations, groundwater was observed at 4 of 16 borehole locations at depths typically ranging from 2.5m to 3.0m BGL. Standpipes have been installed at 7 no. boreholes locations to determine the equilibrium groundwater level over time. Ground water measurements taken in June 2020 and October 2020 indicated ground water depths of 1.0m to 7.5m BGL.

Infiltration tests were carried out at 3 locations. Test results indicate that soils are impermeable with no infiltration recorded (typical of the cohesive material observed during site investigations).

Ground Investigations Ireland's Environmental Assessment Report (refer to Appendix 10.2) notes that material sampled across the site is free of contamination and can be classified as non-hazardous.

Review of GSI's online mapping service ("Quaternary Sediments") identify surficial geology in the vicinity of the site as "*Till derived from limestones*" which is consistent with the findings of Ground Investigations Ireland's Site Investigation Report

10.3.2 Geology

Review of GSI's online mapping service (March 2021) generally describes bedrock geology in the vicinity of the site as "*Dark limestone & shale (Lucan Formation)*". Refer to Figure 10.1 below.

GSI have classified the site's groundwater vulnerability as "Low" and have classified underlying aquifers as "Locally Important". Refer to Chapter 11 of this EIAR (Hydrology) for further comment regarding Hydrogeology.

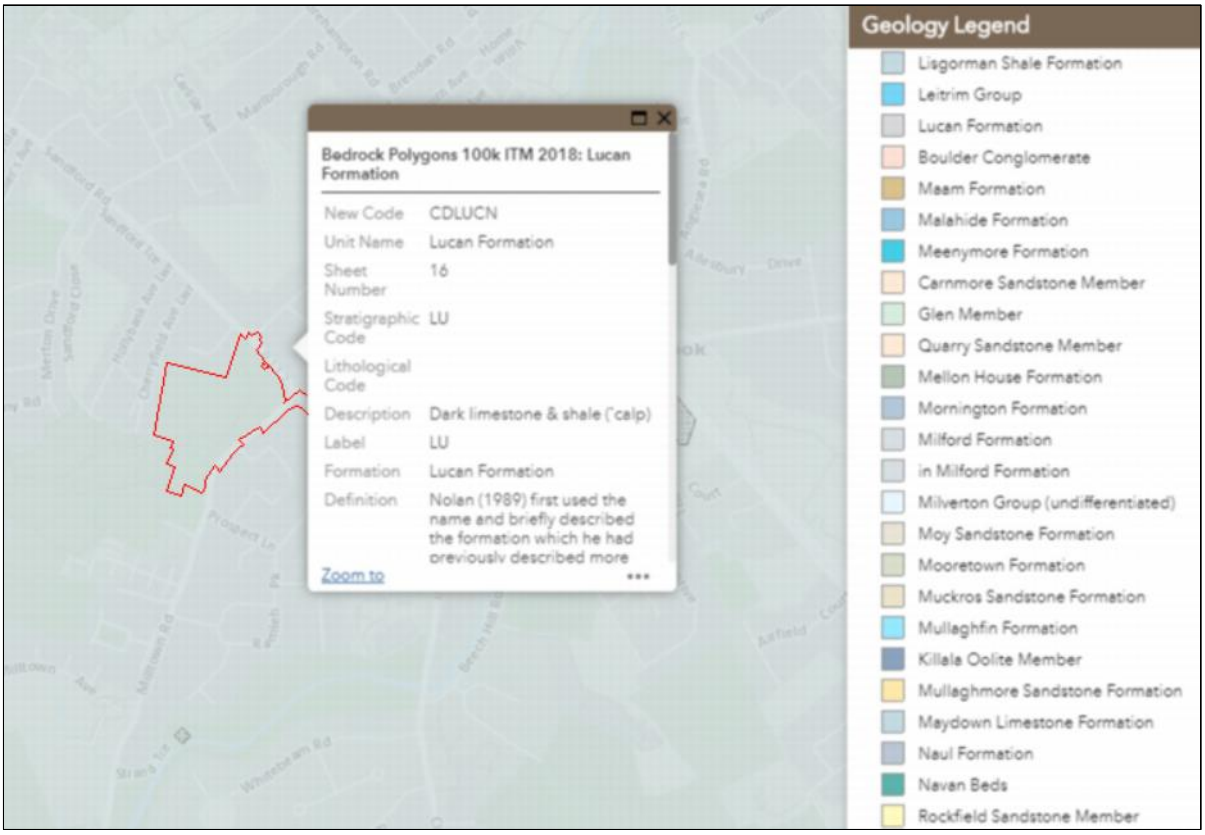


Figure 10.1: Extract from GSI Online Mapping Service – Bedrock Geology (red line boundary indicative)

10.4 Characteristics of Proposed Development

Site development works will include stripping of the 0.2m to 0.4m thick topsoil layer. It is expected that a portion (approximately 40%) of the stripped topsoil will be reused on site (incorporated into landscaping of open spaces) with remaining topsoil reused on another site as a by-product in accordance with Article 27 of the EC (Waste Directive) Regulations (2011) or disposed of at a licenced waste receiving facility (subject to the approval of the facility operator in accordance with their facility permit or licence). Refer to Section 10.5.1.1 below.

Excavation of subsoil layers will be required in order to allow road construction, foundation excavation, basement excavation for underground carpark, drainage and utility installation and provision of underground attenuation of surface water.

In general, the designed road levels and finished floor levels follow the natural topography of the site, therefore, minimising the need for cut / fill operations to enable development.

Underlying subsoil layers generally comprise of slightly sandy slightly gravelly CLAY with occasional cobbles or sandy angular gravel. Due to the proposed site layout (basement construction with ground floor levels and external pavement levels designed to follow the natural topography of the site), there is limited potential for reuse of excavated material as non-structural fill. As such, nearby sites requiring clean fill material will be contacted to investigate reuse opportunities. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the EC (Waste Directive) Regulations (2011). Should reuse opportunities be unavailable excavated material will be removed from site to a licenced waste receiving facility (subject to the approval of the facility operator in accordance with their facility permit or licence). Also refer to Section 10.5.1.2 below.

Importation of fill will be required beneath buildings and roadways (structural fill). Further information regarding importation of fill is included in Section 10.5.1.3 below. This material will be sourced from quarries that have all required licenses and planning permissions..

10.5 Identification of Potential Impacts

10.5.1 Construction Phase

10.5.1.1 Stripping of Topsoil

Removal of the existing topsoil layer will be required within proposed building footprints and within areas required to enable site access and permeability (e.g. roads and footpaths). As noted previously, approximately 40% of stripped topsoil will be reused on site (incorporated into landscaping) with remaining topsoil reused on another site as a by-product in accordance with Article 27 of the EC (Waste Directive) Regulations (2011) or disposed of at a licenced waste receiving facility (subject to the approval of the facility operator in accordance with their facility permit or licence).

Ground Investigations Ireland Environmental Report (Appendix 10.2) notes that "*the site is free of contamination*" and that waste classification testing indicate that "*material sampled across the site can be classified as non-hazardous*". This report also notes that the material sampled is suitable from an environmental impact perspective for removal from site as a byproduct in line with Article 27 of the European Communities (Waste Directive) Regulations 2011.

Stripping of topsoil will result in exposure of the underlying subsoil layers to the effects of weather and construction traffic and may result in subsoil erosion.

This impact without mitigation is considered to have a negative / significant / short-term effect.

Table 10.1 Preliminary Estimated topsoil volumes (+/- 10%)

	Volume (m^3)
Topsoil strip (100mm to 300mm)	23,000
Topsoil reuse (landscape of gardens, open space etc.)	10,000
Removal of topsoil from site	13,000

10.5.1.2 Excavation of Subsoil Layers

Excavation of existing subsoil layers will be required in order to allow road construction, foundation excavation, basement excavation for underground carpark, drainage and utility installation and provision of underground attenuation of surface water. Underlying subsoil layers generally comprise of slightly sandy slightly gravelly CLAY with occasional cobbles or sandy angular gravel.

Due to the proposed site layout (basement construction with ground floor levels and external pavement levels designed to follow the natural topography of the site), there is limited potential for reuse of excavated material as non-structural fill.

As such, nearby sites requiring clean fill material will be contacted to investigate reuse opportunities. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the EC (Waste Directive) Regulations (2011). Should reuse opportunities be unavailable excavated material will be removed from site to a licenced waste receiving facility (subject to the approval of the facility operator in accordance with their facility permit or licence).

Ground Investigations Ireland Environmental Report (Appendix 10.2) notes that "*the site is free of contamination*" and that waste classification testing indicate that "*material sampled across the site can be classified as non-hazardous*". This report also notes that the material sampled is suitable from an environmental impact perspective for removal from site as a byproduct in line with Article 27 of the European Communities (Waste Directive) Regulations 2011.

This impact without mitigation is considered to have a negative / significant / short-term effect.

Table 10.2 Excavation of Subsoil / Removal of Excavated Material (+/- 10%) Foundation Option 1 (Standard Pad & Strip Foundations to All Blocks including Basement) and 3 (Pads & Strips to All Blocks except Ground Improvement to Block E)

	Volume (m^3)
Cut (excavation of subsoil layers as described in 10.5.1.2 above)	57,000
Removal of excavated material from site	57,000

Table 10.3 Excavation of Subsoil / Removal of Excavated Material (+/- 10%) Foundation Option 2 (Pads & Strips to All Blocks except Bored Piles to Block D & F)

	Volume (m^3)
Cut (excavation of subsoil layers as described in 5.5.1.2 above)	51,000
Removal of excavated material from site	51,000

Table 10.4 Quantum of Soil Removal (+/- 10%)

	Removal of Topsoil from Site (m^3) See Table 10.1	Removal of Excavated Material from Site (m^3) See Table 10.2 & 10.3	Total Quantum of Soil Removal (m^3)
Foundation Options 1 & 3	13,000	57,000	70,000
Foundation Option 2	13,000	51,000	64,000

10.5.1.2.1 Foundation Design & Construction

The selection of the current foundation proposal of standard strip and pad footings is based on results of the site investigations, the structural modelling, loading calculations and site constraints. If during excavation of the foundations and basement unexpected ground conditions arise that vary from the site investigations results, it may be necessary to amend the indicative foundation solutions proposed at this juncture.

The standard strip and pad foundations and basement excavation/construction shall be executed as follows:

- Excavate to foundation/basement formation level forming slope batters as necessary
- Cast the reinforced concrete pad and strip footings, rising walls and ground floor slabs
- Cast the basement to ground level reinforced concrete retaining walls, columns and lift, stair, shear walls
- Cast the reinforced concrete ground slabs
- Backfill to ground level the surrounding slope batters using granular material as appropriate.

Whilst not required as a permanent foundation solution, the proximity of protected tree roots and structures such as the Chapel Building and Tabor House may necessitate some element of temporary sheet piling on site in discrete areas where the space for slope battering is not available. Steel sheet piles are driven into the ground using a piling hammer to facilitate vertical excavation on one side. The steel sheet piles are extracted and reused once the permanent works are complete and backfilled.

Other foundation solutions considered include augered bored piles which transfer large loads to the very stiff clay without need for bulk excavation. Piles are not required for the basement area which extends into the very stiff clay layer. Piling may prove a more appropriate foundation solution at construction stage than excavating and backfilling beneath the standalone Blocks D and F which must both be founded on the very stiff clay stratum. Considerations surrounding the installation of piles include noise, vibrations, disposal of pile uprisings and the use of very heavy plant on site which are mitigated by using quieter lower vibration augered piling rigs than driven pile alternatives, also limiting pile depths by design and using piling mats to support the large rigs.

Ground improvement techniques were also considered but are only appropriate for low rise lightly loaded structures such as the duplex houses. Ground improvement techniques considered include lime stabilization. Currently the site investigation indicates a suitable bearing stratum is achievable by extending standard strip footings into the firm clays for the low-rise houses.

10.5.1.3 Imported Fill

Materials imported to site for use as fill will be natural stones sourced from locally available quarries or materials that have been approved as by-products by the EPA in accordance with the EPA's criteria for determining a material is a by-product, per the provisions of article 27(1) of the European Communities (Waste Directive) Regulations, 2011.

Imported fill materials will be granular in nature and used in the construction of ground slab formations, basement backfill, road pavement foundations, drainage and utility bedding and surrounds.

Materials will be brought to site and placed in their final position in the shortest possible time. Any imported material will be kept separate from the indigenous arisings from the site. All excavation to accommodate imported material will be precisely coordinated to ensure no surplus material is brought to site beyond the engineering requirement.

This impact without mitigation is considered to have a negative / significant / short-term effect.

Table 10.5 Imported Fill (+/-) 10%

	Volume (m^3)
Imported Fill (granular material beneath road pavement, under floor slabs, for drainage and utility bedding / surrounds and construction phase haul routes)	20,000

10.5.1.4 Construction Traffic

Earthworks plant (e.g. dump trucks) and vehicles delivering construction materials to site (e.g. road aggregates, concrete deliveries etc.) have potential to cause rutting and deterioration of the topsoil layer and any exposed subsoil layers, resulting in erosion and generation of sediment laden runoff.

This issue can be particularly noticeable at site access points (resulting in deposition of mud and soil on the surrounding road network). Dust generation can also occur during extended dry weather periods as a result of construction traffic.

This impact without mitigation is considered to have a negative / significant / short-term effect.

10.5.1.5 Accidental Spills and Leaks

During the construction phase there is a risk of accidental pollution from the sources noted below. Accidental spills and leaks may result in contamination of the soils underlying the site.

- Storage of oils and fuels on site.
- Oils and fuels leaking from construction machinery.
- Spillage during refuelling and maintenance of construction machinery.
- Use of cement and concrete during construction works.

This impact without mitigation is considered to have a negative / significant / short-term effect.

10.5.1.6 Geological Environment

Due to the proposed site layout and levels (basement construction with ground floor levels and external pavement levels designed to follow the natural topography of the site), any excavations are expected to be relatively shallow (up to. 5.0m from existing ground level) and are not expected to impact on the underlying geology (i.e. rotary core boreholes carried out as part of site investigations indicate depth to rock varying from 9.0m to 18.45m BGL).

This impact without mitigation is considered to have a neutral / non- significant / short-term effect.

10.5.1.7 Risks to Human Health

Risks to Human Health associated with works during the construction phase in relation to land and soils include:

- Work which puts persons at risk of burial under earthfall e.g. during basement excavation.
- Works that could undermine existing foundations.
- Contact with existing underground services e.g. gas leaks or electrocution.
- Access and egress from the site and interface with site staff and / or the public e.g. Risk of slips, trips and falls.
- Dust generation.
- Use of machinery and plant e.g. risk of injury to personnel and damage to plant and machinery due to improper use.

This impact without mitigation is considered to have a negative / significant / short-term effect.

10.5.2 Operational Phase

On completion of the construction phase, there will be no further impact on soils and the geological environment.

10.5.3 'Do Nothing' Scenario

There will be no impact on soils and the geological environment if the development does not proceed.

10.6 Ameliorative, Remedial or Reductive Measures

10.6.1 Construction Phase

10.6.1.1 Stripping of Topsoil

Stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development. As noted previously, approximately 40% of stripped topsoil will be reused on site (incorporated into landscaping) with remaining topsoil reused on another site as a by-product in accordance with Article 27 of the EC (Waste Directive) Regulations (2011) or disposed of at a licenced waste receiving facility (subject to the approval of the facility operator in accordance with their facility permit or licence).

At any given time, the extent of topsoil strip (and consequent exposure of subsoil) will be limited to the immediate vicinity of active work areas.

Topsoil stockpiles will be protected for the duration of the works and not located in areas where sediment laden runoff may enter existing surface water drains.

Topsoil stockpiles will also be located so as not to necessitate double handling.

This impact with mitigation is considered to be neutral / non-significant / short-term.

10.6.1.2 Excavation of Subsoil Layers

The need to excavate existing subsoil layers has been minimised as the proposed ground floor levels and external pavement levels have been designed to follow the natural topography of the site. The basement excavation has also been minimized in as far as the structural and functional constraints will allow.

Disturbed subsoil layers will be stabilized as soon as practicable (e.g. backfill of service trenches, construction of road capping layers, concrete blinding of the basement excavation, construction of building foundations and completion of landscaping). The duration that subsoil layers are exposed is to be minimised in order to mitigate against weather effects.

Similar to comments regarding stripped topsoil, stockpiles of excavated subsoil material will be protected for the duration of the works. Stockpiles of subsoil material will be located separately from topsoil stockpiles.

Measures will be implemented to capture and treat sediment laden surface water runoff (e.g. surface water inlet protection and earth bunding adjacent to open drainage ditches).

This impact with mitigation is considered to be neutral / non-significant / short-term.

10.6.1.3 Imported Fill

As noted in section 10.5.1.3 above, importation of fill to site will be required. Materials imported to site for use as fill will be natural stones sourced from locally available quarries or materials that have been approved as by-products by the EPA in accordance with the EPA's criteria for determining a material is a by-product, per the provisions of article 27(1) of the European Communities (Waste Directive) Regulations, 2011.

No large or long-term stockpiles of fill material will be held on the site. At any time, the extent of fill material held on site will be limited to that needed in the immediate vicinity of the active work area.

Smaller stockpiles of fill, where required, will be suitably protected to ensure no sediment laden runoff enters existing surface water drains. Such stockpiles are to be located in order to avoid double handling.

This impact with mitigation is considered to be neutral / non-significant / short-term.

10.6.1.4 Construction Traffic

Earthworks plant and vehicles delivering construction materials to site will be confined to predetermined haul routes around the site and designated delivery areas. This mitigates the risk of rutting and deterioration of the topsoil layer and any exposed subsoil layers.

Vehicle wheel wash facilities will be installed in the vicinity of any site entrances and road sweeping implemented as necessary in order to maintain the road network in the immediate vicinity of the site.

Dust suppression measures (e.g. dampening down) will be implemented as necessary during dry weather periods.

This impact with mitigation is considered to be neutral / non-significant / short-term.

10.6.1.5 Accidental Spills and Leaks

In order to mitigate against spillages contaminating underlying soils, all oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area.

Refueling and servicing of construction machinery will take place in a designated hardstand area (when not possible to carry out such activities off site).

A response procedure will be put in place to deal with any accidental pollution events and spillage kits will be available and construction staff will be familiar with the emergency procedures and use of the equipment.

Concrete batching will take place off site when possible to minimise the risk of ground contamination on site during the concrete batching process.

This impact with mitigation is considered to be neutral / non-significant / short-term.

10.6.1.6 Geological Environment

No mitigation measures are proposed in relation to the geological environment.

10.6.1.7 Risks to Human Health

- Contractor / Project Supervisor Construction Stage (PSCS) to implement safe systems of construction including but not limited to battering the sides of trench excavations and installation of excavation shoring systems.

- Full precautions to be taken when working in vicinity of boundary structures for protection of same. Method and sequence of construction to be agreed with design team prior to commencement of work. Contractor's Temporary Works Designer to prepare Method Statement and Temporary Works Cert to ensure stability of excavations and adjacent structures.

- Contractor to obtain utility company network plans and arrange observation as required.

- Contractor to locate and record all services on site prior to commencement of excavations.

- Contractor to prepare and implement a Construction Traffic Management Plan that will be agreed with the Design Team and local authority and which will ensure the safety of the public during construction (note, an outline Traffic Management Plan is included in the Preliminary Construction Management Plan).

- Contractor must supervise vehicle movements to and from the site during construction in order to ensure that this traffic management plan is fully implemented. Plan to include deliveries to the site, staff parking, works outside the defined site such as utility connections.

- Public pedestrian routes to be established at site entrance as required.

- All personnel using machinery/plant to have undergone training on the use of said machinery/plant. Ongoing site supervision to be undertaken to ensure all use of machinery/plant is in accordance with the training undertaken.

- Contractor's employees to be provided with all required PPE in accordance with Safety, Health and Welfare at Work Act, 2005.

- Contractor to prepare a Dust Management Plan with reference to the mitigation measures outlined in Chapter 12.0 (Air Quality and Climate).

This impact with mitigation is considered to be neutral / non-significant / short-term.

10.6.2 Operational Phase

On completion of the construction phase, no further mitigation measures are proposed as there will be no further impact on soils and the geological environment.

10.6.3 'Do Nothing' Scenario

No mitigation measures are proposed in relation to soils and the geological environment if the development does not proceed.

10.7 Predicted Impact of the Proposed Development

10.7.1 Construction Phase

Implementation of the measures outlined in Section 10.6.1 will ensure that the potential impacts of the proposed development on soils and the geological environment are neutral / non-significant / short-term.

10.7.2 Operational Phase

There are no predicted impacts arising from the operational phase.

10.7.3 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

10.8 Monitoring

Proposed monitoring during the construction phase in relation to the soil and geological environment are as follows:

- Adherence to Construction Management Plan (note, a Preliminary Construction Management Plan is enclosed separately which must be adhered to) and Outline Construction and Environment Management Plan.

- Construction monitoring of the works (e.g. inspection of existing ground conditions on completion of cut to road formation level in advance of placing capping material, stability of excavations etc.).

- Inspection of fuel / oil storage areas.

- Monitoring cleanliness of adjacent road network, implementation of dust suppression and provision of vehicle wheel wash facilities.

- Monitoring of contractor's stockpile management (e.g. protection of excavated material to be reused as fill, protection of soils for removal from site from contamination).

No ongoing monitoring is proposed on completion of the construction phase.

10.9 Reinstatement

Once the foundations and basement "box" are complete they are backfilled to ground level as necessary.

All temporary construction compounds and site entrances are to be removed upon completion of the construction phase. Such areas are to be reinstated in accordance with the landscape architects plan and engineer's drawings.

All construction waste and / or scrapped building materials are to be removed from site on completion of the construction phase.

Oil, fuel etc. storage areas are to be decommissioned on completion of the construction phase. Any remaining liquids are to be removed from site and disposed of at an appropriate licenced facility. Dublin City Council's Environmental Control Section is to be notified of the proposed destination for disposal of any liquid fuels.

10.10 Interactions and Potential Cumulative Impacts

10.10.1 Interactions

10.10.1.1 Chapter 15 Transportation

Delivery of materials to site (e.g. aggregates for road construction, concrete for foundations, delivery of construction plant to site) and removal of excavated topsoil / subsoil will lead to potential impact on the surrounding road network.

The impact of the interaction is considered to be short-term, imperceptible and neutral

10.10.1.2 Chapter 11 Water and Hydrology

Stripping of topsoil will result in exposure of the underlying subsoil layers to the effects of weather and construction traffic and may result subsoil erosion and generation of sediment laden surface water runoff.

Due to relatively high level of groundwater encountered in some boreholes there may be a need to dewater excavations during construction.

The impact of the interaction is considered to be short term, imperceptible and neutral.

10.10.1.3 Chapter 16 Material Assets – Site Services

Trench excavations to facilitate site service installation will result in exposure of subsoils to potential erosion.

The impact of the interaction is considered to be short-term, imperceptible and neutral.

10.10.1.4 Chapter 14 Material Assets – Waste Management

Oil, fuel etc. storage areas are to be decommissioned on completion of the construction phase. Any remaining liquids are to be removed from site and disposed of at an appropriate licensed facility.

Topsoil not being reused on site and excavated subsoil materials may be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the EC (Waste Directive) Regulations (2011). Should reuse opportunities be unavailable such material will be removed from site to a licenced waste receiving facility (subject to the approval of the facility operator in accordance with their facility permit or licence).

The impact of the interaction is considered to be permanent, imperceptible and neutral.

10.10.1.5 Chapter 13 Noise and Vibration

Development of the site will result in a level of construction related noise and vibration.

The impact of the interaction is considered to be short-term, imperceptible and neutral.

10.10.1.6 Chapter 12 Air Quality and Climate

Dust generation can also occur during extended dry weather periods as a result of construction traffic.

The impact of the interaction is considered to be short-term, imperceptible and neutral.

10.10.1.7 Chapter 8 Biodiversity

Removal of the existing topsoil layer will be required across the site as well as removal of some trees, vegetation etc.

The impact of the interaction is considered to be short-term, imperceptible and neutral.

10.10.1.8 Chapter 6 Archaeology and Cultural Heritage

Archaeological monitoring may necessitate open excavations for a period in order to facilitate consultation with DHLGH, processing of licences and/or full excavation/preservation-by-record of archaeological features. This would result in exposure of the underlying subsoil layers to the effects of weather.

The impact of the interaction is considered to be short-term, not significant and neutral.

10.10.2 Potential Cumulative Impacts

Other developments currently under construction and other committed development in the vicinity of the site have been considered and are likely to have similar impacts during the construction phase in relation to soils and geology.

Should the construction phase of any developments coincide with development of the site, potential cumulative impacts are not anticipated once similar ameliorative, remedial and reductive measures are implemented.

Table 10.6 Lands, Soils & Geology – Summary of Construction Phase Likely Significant Effects with and without out Mitigation / Monitoring

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	Extent	Quality	Significance	Duration	Type	Probability			Quality	Significance	Duration	Type	Probability
Stripping of topsoil	On-Site	Negative	Significant	Short-Term	Direct	Likely	Stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development.	Monitor adherence to PCMP	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Excavation of subsoil layers	On-Site	Negative	Significant	Short-Term	Direct	Likely	The need to excavate subsoil layers has been minimised as the proposed levels have been designed to follow the natural	Monitoring of contractor's stockpile management (e.g. protection of excavated material to be reused as fill, protection of soils for	Neutral	Not Significant	Short-Term	Direct	Un-Likely

							topography of the site	removal from site from contamination)					
Materials imported to site for use as fill	On-Site	Negative	Significant	Short-Term	Direct	Likely	Fill material will be natural stones sourced from locally available quarries or materials that have been approved as by-products by the EPA	Monitor adherence to PCMP	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Construction Traffic	On-Site	Negative	Significant	Short-Term	Direct	Likely	Earthworks plant and vehicles delivering construction materials to site will be confined to predetermined haul routes around the site and designated delivery areas. Vehicle wheel wash facilities will be installed in the	Monitor contractors' compliance with PCMP. Monitoring cleanliness of adjacent road network, implementation of dust suppression and provision of vehicle wheel wash facilities.	Neutral	Not Significant	Short-Term	Direct	Un-Likely

							vicinity of any site entrances and road sweeping implemented as necessary in order to maintain the road network in the immediate vicinity of the site.							
Accidental Spills and Leaks	On-Site	Negative	Significant	Short-Term	Direct	Likely	Response procedure will be put in place to deal with any accidental pollution events. Refueling and servicing of construction machinery will take place in a designated hardstand area (when not possible to carry out such activities off site).	Monitor contractors' compliance with PCMP	Neutral	Not Significant	Short-Term	Direct	Un-Likely	

Impact on Geological Environment	On-Site	Neutral	Non-Significant	Short-Term	Direct	Unlikely	No mitigation proposed						
Risks to Human Health	On-Site	Negative	Significant	Short-Term	Direct	Likely	Contractor / Project Supervisor Construction Stage (PSCS) to implement safe systems of construction	Monitor contractors compliance with Health and Safety requirements	Neutral	Not Significant	Short-Term	Direct	Un-Likely

11.0 WATER & HYDROLOGY

11.1 Introduction

The Water and Hydrology Chapter of this EIAR has been prepared by Brendan Keogh (BA BAI PGradDip CEng MIEI) of DBFL Consulting Engineers (Associate Director Civils). Brendan Keogh is a Chartered Professional Engineer with over 15 No. years experience in the design and construction of civil engineering projects. Projects have included works associated with the commercial, industrial, energy, residential and public infrastructure sectors.

Marcelo Allende (BEng), and Teri Hayes (BSc MSc PGeol EurGeol) also contributed to preparation of this chapter. Marcelo is a Water Resources Engineer with over 15 years of experience in environmental consultancy and water resources studies. Marcelo is an Environmental Consultant with AWN Consulting, a member of the International Association of Hydrogeologists (Irish Group) and a member of Engineers Ireland (MIEI). Teri is a hydrogeologist with over 25 years of experience in water resource management and impact assessment. She has a Masters in Hydrogeology and is a former President of the Irish Group of the Association of Hydrogeologists (IAH) and has provided advisory services on water related environmental and planning issues to both public and private sector bodies. She is qualified as a competent person as recognised by the EPA in relation to contaminated land assessment (IGI Register of competent persons www.igi.ie). Her specialist area of expertise is water resource management eco-hydrogeology, hydrological assessment and environmental impact assessment.

This chapter of the EIAR comprises of an assessment of the likely impact of the proposed development on the surrounding surface water and hydrogeological environments (including flood risk, surface water drainage, foul drainage and water supply) as well as identifying proposed mitigation measures to minimise any impacts.

In summary, the proposed development ("the site") comprises of 671 residential dwelling (604 No. Build to Rent and 67 No. Build to Sell) on a c. 4.26 ha site (developable area). The development also includes a creche with outdoor play area and communal internal amenities (co-working space, lounges, libraries and multi-purpose hall).

The proposed development will also include the following associated engineering infrastructure:

- Provision of a new vehicle access off Milltown Road (primary vehicle access to the proposed development facilitating access to the basement carpark as well as serving pedestrians and cyclists). This new site access shall be a priority junction. A Toucan Crossing is also proposed in the vicinity of the Milltown Road access to improve facilities for vulnerable road users.

- Retain existing entrance on Sandford Road (facilitates pedestrian and cycle access as well as limited vehicle access to the northern end of the site). Improvements to existing pedestrian crossing point in the vicinity of the Sandford Road entrance is also proposed. There is no vehicular access from Sandford Road to the basement carpark, the forecourt area adjacent to Tabor House and the duplex units along the western boundary (which are all served exclusively from Milltown Road).

- Provision of an additional access points for pedestrians and cyclists adjacent to the junction of Sandford Road / Milltown Road.

- Provision of internal site roads including associated footpaths.

- Provision of on-site surface water drainage infrastructure which will discharge from the site along its south-eastern boundary via Milltown Road and the junction of Milltown Road / Sandford Road prior to discharging to the existing public surface water drainage network in Eglinton Road (proposed 300mm diameter pipe extending approximately 300m from the proposed development site boundary to the outfall location which includes replacement of approx. 160m of the existing 225mm diameter drainage network along Eglington Road.).

- Provision of foul drainage and water supply infrastructure and connections.

The proposed surface water drainage network accords with SuDS (Sustainable Drainage Systems) principles, divides the site into five drainage catchments and discharges to an existing 300mm diameter public surface water drain on Eglinton Road (east of the site) at a controlled greenfield runoff rate of 2.0 l/sec/ha.

The proposed development's foul drainage network discharges to an existing 600mm diameter combined sewer located on the Sandford Road north east of the site and an existing 375mm diameter combined sewer on the Milltown Road south of the site.

An existing 9" diameter cast iron watermain runs along the Sandford Road to the north east and along the Miltown Road to the south east which will be used to service the development.

Refer to Irish Water's Network Plan included in Appendix 11.1.

11.2 Methodology

Assessment of the likely impact of the proposed development on the surrounding surface water and hydrogeological environments included the following activities and has been informed by the EPA "Guidelines on the Information to be Contained in Environmental Impact Assessment Reports", Draft August 2017.

- Site inspection / walkover.
- Review of topographic and GPR survey information.
- Review of Irish Water utility plans (surface water drainage, foul drainage and water supply). Refer to Appendix 11.1.
- Ground investigations including trial pits, infiltration testing and environmental testing.
- Review of information available on the Environmental Protection Agency (EPA) online mapping service.
- Review of information available on the Geological Survey of Ireland (GSI) online mapping service.
- Review of Office of Public Works (OPW) National Flood Hazard Mapping and CFRAM Studies (Catchment Flood Risk Assessment and Management Studies).
- Consultation with Dublin City Council's Water Services Section.
- Consultation with Irish Water.
- Submission of a Pre-Connection Enquiry Application to Irish Water.
- Obtaining a Statement of Design Acceptance from Irish Water.

As part of assessing the likely impact of the proposed development, surface water runoff, foul drainage discharge and water usage calculations were carried out in accordance with the following guidelines:

- Greater Dublin Strategic Drainage Study (GDSDS)
- Irish Water's Code of Practice for Wastewater Infrastructure
- Irish Water's Code of Practice for Water Infrastructure

11.3 Receiving Environment

11.3.1 Hydrology

The proposed development site lies within the Liffey and Dublin Bay Catchment (Hydrometric Area 09) and Dodder River sub-catchment (WFD name: Dodder_SC_010, Id 09_16) (EPA, 2021). The Dodder River is located approx. 500m southeast of the subject development site. From here the Dodder River flows for approx. 3.0km before discharging into the Liffey Estuary lower transitional waterbody which in turn discharges into Dublin Bay coastal waterbody which includes Special Area of Conservation (SAC)/ proposed Natural Heritage Area (pNHA).

The EPA (2021) on-line mapping presents the available water quality status information for water bodies in Ireland. The Dodder River has a Water Framework Directive (WFD) status (2013-2018) of 'Moderate' and a WFD risk score of 'At risk of not achieving good status'. This moderate status is related to its biological status (invertebrate and fish) and dissolved oxygen conditions (which fails in relation to its percentage saturation); all remaining chemical condition have been classified as 'good'. The most recent quality data (2019) for the Dodder River also indicate that it is 'Slightly polluted'.

The Dodder catchment discharges to the Liffey Estuary Lower which has a WFD status (2013-2018) of 'Good', and Dublin Bay has a WFD status of 'Good'. The Liffey Estuary Lower waterbody has a WFD risk score of 'At risk of not achieving good status' while the Dublin Bay waterbody has a WFD risk score of 'Not at risk'. The surface water quality data for the Liffey Estuary Lower and Dublin Bay (EPA, 2021) indicate that they are 'Unpolluted'. Under the 2015 'Trophic Status Assessment Scheme' classification of the EPA, 'Unpolluted' means there have been no breaches of the EPA's threshold values for nutrient enrichment, accelerated plant growth, or disturbance of the level of dissolved oxygen normally present.

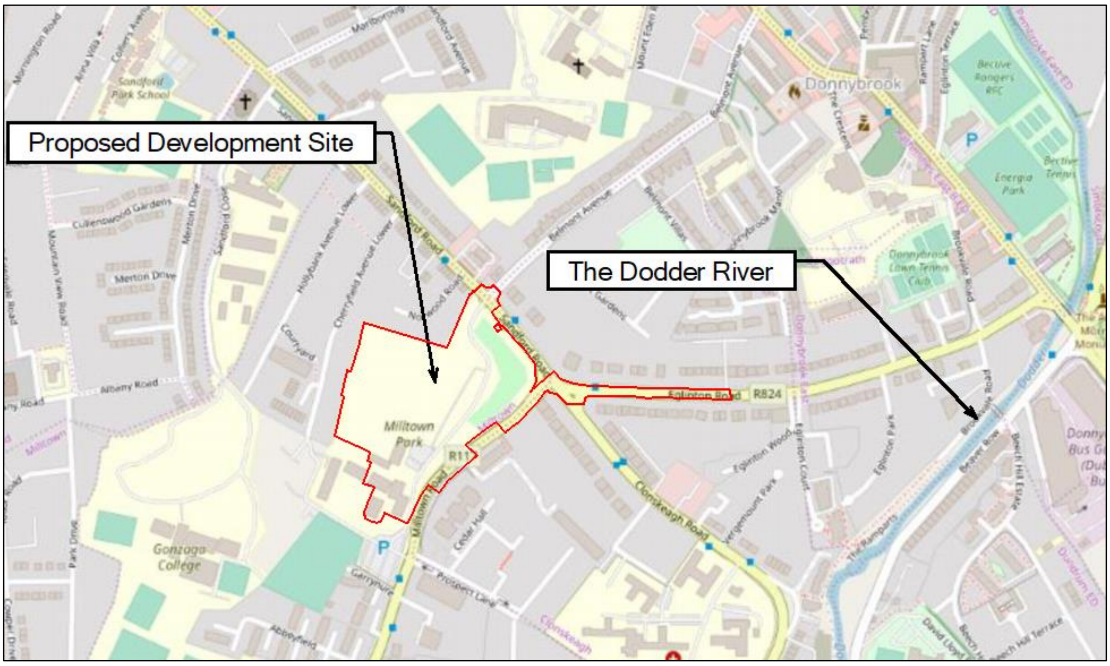


Figure 11.1: Extract from EPA Online Mapping Service (Site Boundary Indicative)

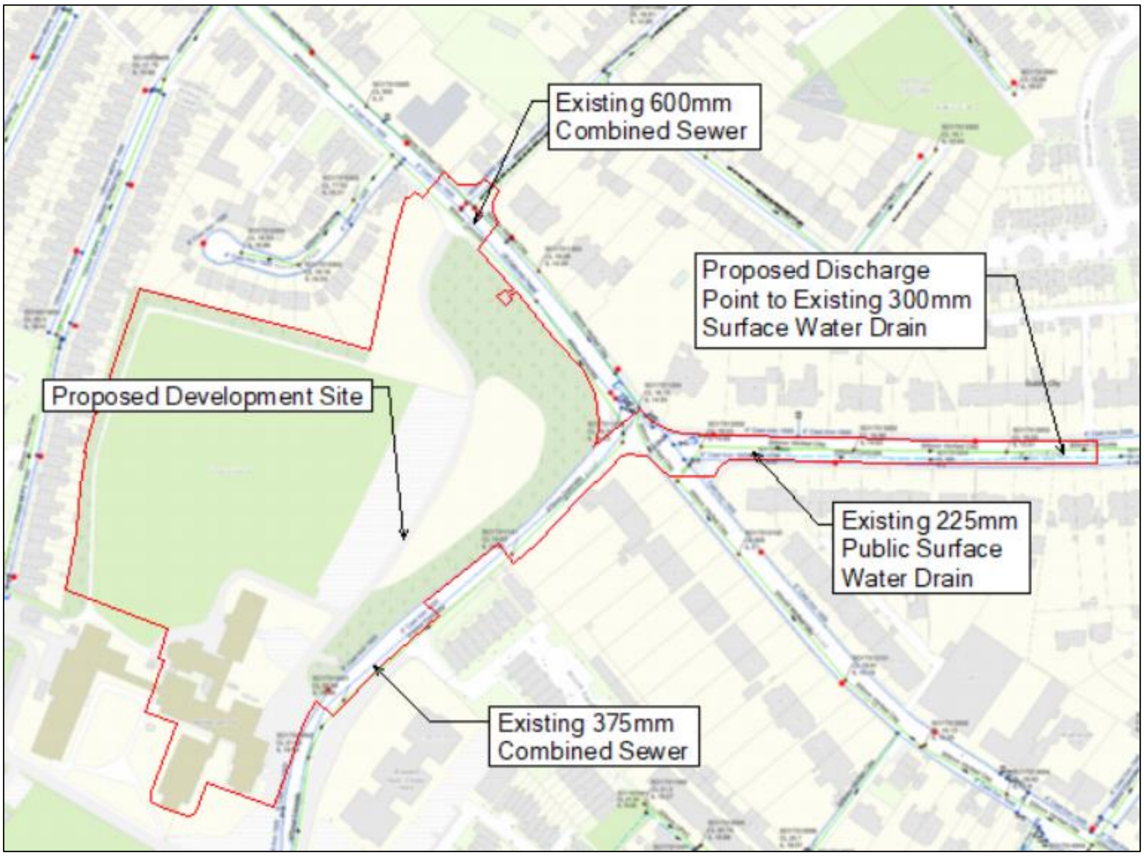


Figure 11.2: Extract from Irish Water Network Plan (Site Boundary Indicative)

11.3.2 Hydrogeology

Mapping from the Geological Society of Ireland (GSI maps, http://www.gsi.ie accessed on 21-04-2021) indicates the bedrock underlying the site is part of the Lucan Formation (code CDLUCN) and made up of dark limestone and shale (Calp). The lithological description comprises dark-grey to black, fine-grained, occasionally cherty, micritic limestones that weather paler, usually to pale grey. There are rare dark coarser grained calcarenitic limestones, sometimes graded, and interbedded dark-grey calcar. The beds are predominantly fine-grained distal turbidites in the north Dublin Basin. The formation is intermittently exposed on the coast between Rush and Drumanagh Head. The formation ranges from 300m to 800m in thickness.

The GSI also classifies the principal aquifer types in Ireland as:

- Lk - Locally Important Aquifer - Karstified
- Ll - Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm - Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Pl - Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Pu - Poor Aquifer - Bedrock which is Generally Unproductive
- Rkd - Regionally Important Aquifer (karstified diffuse)

Presently, from the GSI (2021) National Bedrock Aquifer Map, the GSI classifies the bedrock aquifer beneath the subject site as a 'Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones'. The proposed development is within the 'Dublin' groundwater body and is classified as 'Poorly productive bedrock'. The most recent WFD groundwater status for this water body (2013-2018) is 'Good' with a current WFD risk score 'Under Review'.

Aquifer vulnerability is a term used to represent the intrinsic geological and hydrological characteristics that determine the ease with which groundwater may be contaminated generally by human activities. The GSI (2021) guidance presently classifies the bedrock aquifer vulnerability in the region of the subject site as 'Low' which indicates a general overburden depth potential of >10m. This shows that the aquifer is naturally protected by low permeability glacial clays. The aquifer vulnerability class in the region of the site is presented in Figure 11.4.

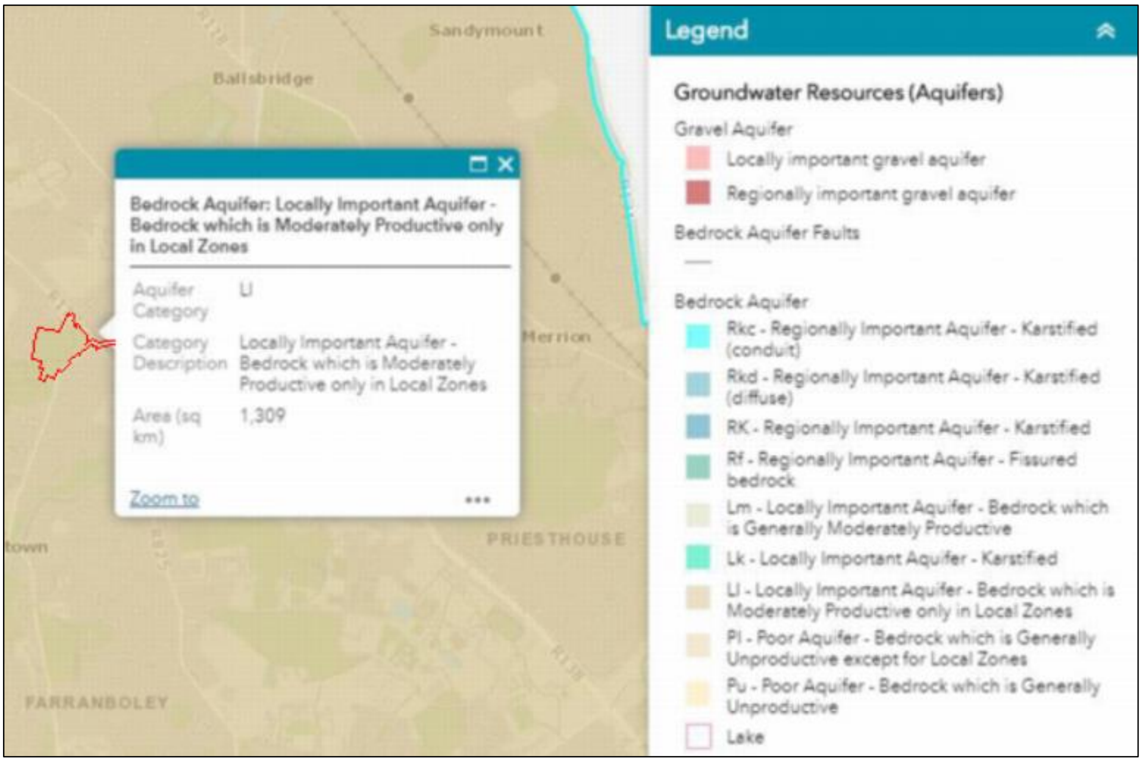


Figure 11.3: Extract from GSI Online Mapping Service – Groundwater Aquafers (Site Boundary Indicative).

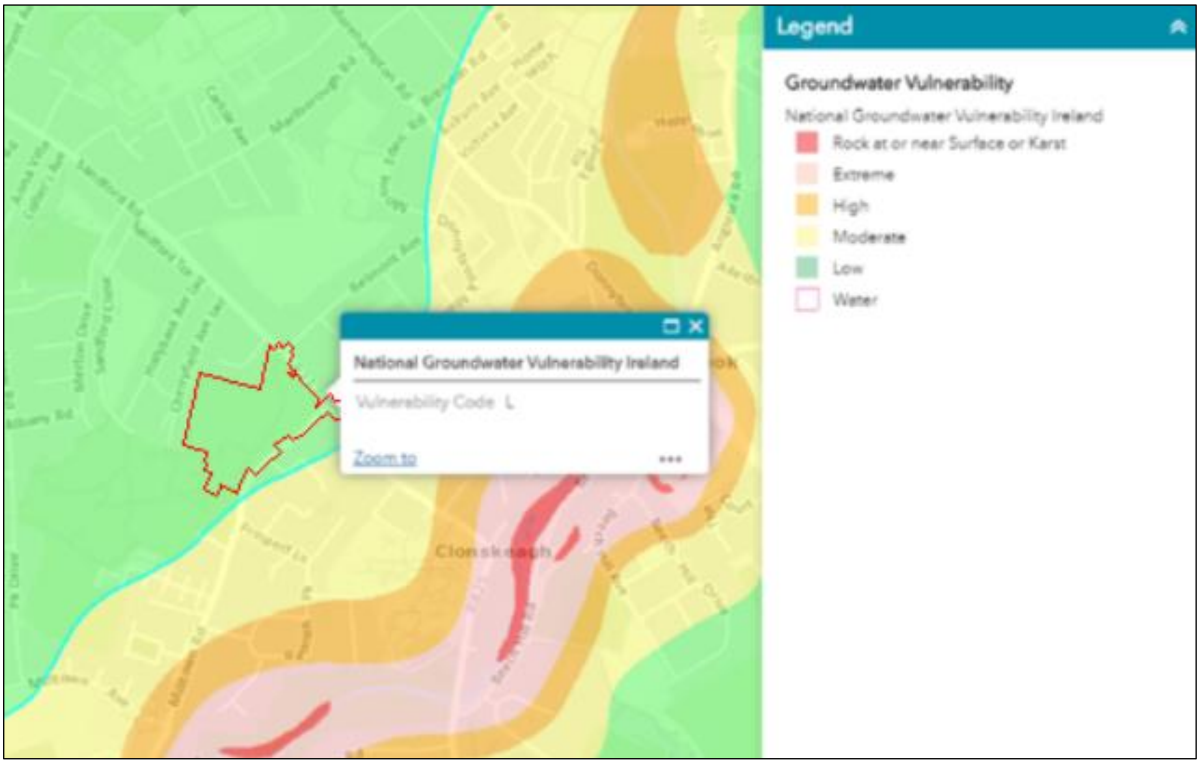


Figure 11.4: Extract from GSI Online Mapping Service – Groundwater Vulnerability (Site Boundary Indicative).

11.3.3 Flood Risk

A flood hazard assessment has been undertaken by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping (www.floods.ie) and the Eastern CFRAM Study.

This assessment has been carried out in accordance with the procedures for a "Flood Risk Assessment" as outlined in the OPW's Guidelines for Planning Authorities – The Planning System and Flood Management (November 2009).

OPW Flood Hazard Mapping

OPW's Summary Local Area Report is included in Appendix 11.2 (Flood Hazard Information).

This report is sourced from the OPW website (www.floodmaps.ie) and summarises all flood events within 2.5 km of the site. No flood events are noted in the immediate vicinity of the site.

Also, no benefitting lands are identified in the vicinity of the site. Benefiting lands are lands that might benefit from implementation of a major drainage scheme or lands subject to flooding or poor drainage.

Eastern CFRAM Study

Extracts from the Dodder Catchment Flood Risk Assessment and Management Study are included in Appendix 11.2 (Flood Hazard Information) which indicates the extent of fluvial flooding in the vicinity of the site.

The closest modelled node to the site is located on the Dodder River (approx. 500m south east of the site). No fluvial flooding in indicated in the vicinity of the site.

11.3.4 Foul Drainage

An existing 600mm diameter combined sewer is located adjacent to the site's northern-eastern boundary (Sandford Road). An existing 375mm diameter combined sewer is also located adjacent to the site's south-eastern boundary (Milltown Road) which outfalls to the 600mm diameter combined sewer in Sandford Road. Refer to Figure 11.2 and the Irish Water Network Plan included in Appendix 11.1. The existing combined sewer network described above ultimately discharges to Ringsend Waste Water Treatment Plant (also refer to AWN Consulting Hydrological Qualitative Risk Assessment).

An existing private foul drainage network is located within the site (typically 150mm diameter) which outfalls to the combined sewer on the Sandford Road via a combined connection with the private surface water drainage network. No active foul drains discharge to the existing private foul drainage network within the site which will become redundant upon commencement of site development works.

Pre-connection enquiry feedback has been received from Irish Water which confirms that, as it is proposed to discharge surface water flows from the development to existing surface water drainage infrastructure in Eglinton Road, discharge of foul drainage flows to existing combined sewers adjacent to the site is feasible.

11.3.5 Surface Water Drainage

Existing surface water drains on site discharge to the existing combined sewer network along Sandford Road and Milltown Road rather than the existing surface water drain in Eglinton Road / Dodder River.

As noted previously, an existing surface water drain runs along Eglinton Road east of the site (initially 225mm diameter increasing to 300mm diameter). Refer to Figure 11.2 and the Irish Water Network Plan included in Appendix 11.1.

The existing surface water drain in Eglinton Road ultimately discharges to the Dodder River.

It is proposed to discharge attenuated flows from the site to the existing drainage network noted above.

11.3.6 Water Supply

The locations of the existing public water mains are shown on Irish Water's Service Plan (refer to Appendix 11.1 and Figure 11.5).

An existing 9" cast iron watermain runs along the Sandford Road (north east of the development) and Milltown Road (south east of the development).

Irish Water have confirmed that new connections to the existing water supply network are feasible.

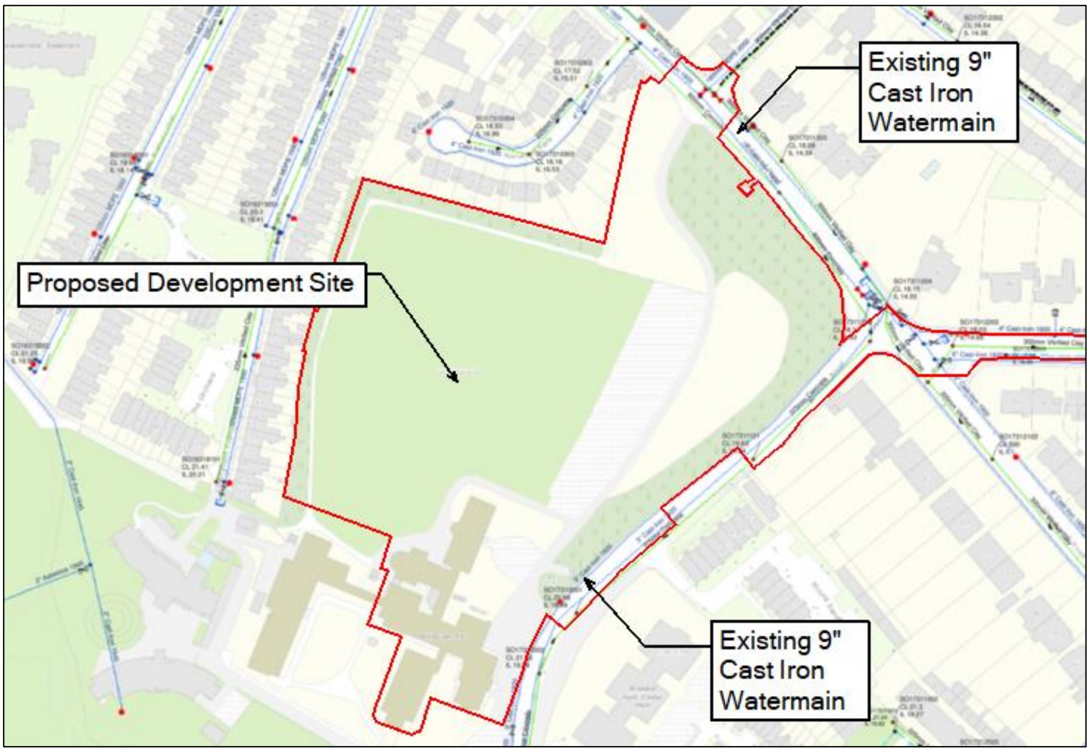


Figure 11.5: Extract from Irish Water Network Plan (Site Boundary Indicative)

11.4 Characteristics of the Proposed Development

11.4.1 Hydrology

The proposed development is located approximately 500m from the primary hydrological feature in the vicinity of the site (i.e. the Dodder River).

No adverse effect on surrounding hydrology is anticipated as surface water flows are attenuated to greenfield runoff rates in conjunction with the implementation of SUDS strategies such as permeable paving, green roofs, tree pits, drainage board over podium and installation of a Class 1 full retention fuel / oil separator. Refer to DBFL's Infrastructure Design Report (190226-rep-002) for full details of the proposed SUDS methodologies.

11.4.2 Hydrogeology

Standpipes have been installed at 7 no. boreholes locations to determine the equilibrium groundwater level over time. Ground water measurements taken in June 2020 and October 2020 indicated ground water depths of 1.0m to 7.5m BGL. Also refer to chapter 10, Appendix 10.1, Ground Investigation Reports (GII, Project No. 9338-12-19, Issue Date 29 October 2020).

Due to relatively high level of groundwater encountered in some boreholes there may be a need to dewater excavations during construction.

The need to excavate existing subsoil layers has been minimised as the proposed, ground floor levels and external pavement levels have been designed to follow the natural topography of the site (by extension the basement dig level has been minimised). As such, the deepest excavations are expected to be required for basement construction (up to approximately 5.0m below existing ground level).

It is not envisaged that the proposed development works will have any direct impact on the underlying hydrogeology (as noted in the DBFL Basement Impact Assessment "*The new basement shall not have an adverse effect on existing ground water regime as the basement extends into the low porosity boulder clays*").

11.4.3 Flood Risk

A Site-Specific Flood Risk Assessment for proposed development was undertaken in accordance with the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices (refer to DBFL Site specific flood Risk Assessment, 190226-rep-003)

Following the Flood Risk Assessment, it was determined that the site is located in Flood Zone C as defined by the Guidelines. It concluded that:

- The proposed development is appropriate for the site's flood zone category.
- The sequential approach outlined in the Guidelines has been adhered to and that the 'Avoid' principal has been achieved.

The proposed development is considered to have the required level of flood protection up to and including the 1% AEP flood event. Overland flow paths have been identified for pluvial flooding exceeding the capacity of the surface water drainage network.

11.4.4 Foul Drainage

The site generally falls from south to north at a gradient of approx. 1:45. Surface gradients become flatter (approx. 1:100) on approach to the existing site access off Sandford Road.

An existing 600mm diameter combined sewer is located adjacent to the site's northern-eastern boundary (Sandford Road). An existing 375mm diameter combined sewer is also located adjacent to the site's south-eastern boundary (Milltown Road) which outfalls to the 600mm diameter combined sewer in Sandford Road. The existing combined sewer network described above ultimately discharges to Ringsend Waste Water Treatment Plant (also refer to AWN Consulting Hydrological Qualitative Risk Assessment).

Two foul drainage discharge points are proposed for the site (in the vicinity of the proposed access off Milltown Road and the existing access of Sandford Road). See Figure 11.6 below.

The topography and existing combined sewers described above facilitate a gravity drainage solution for the site at the proposed connection points (Milltown Road / Sandford Road).

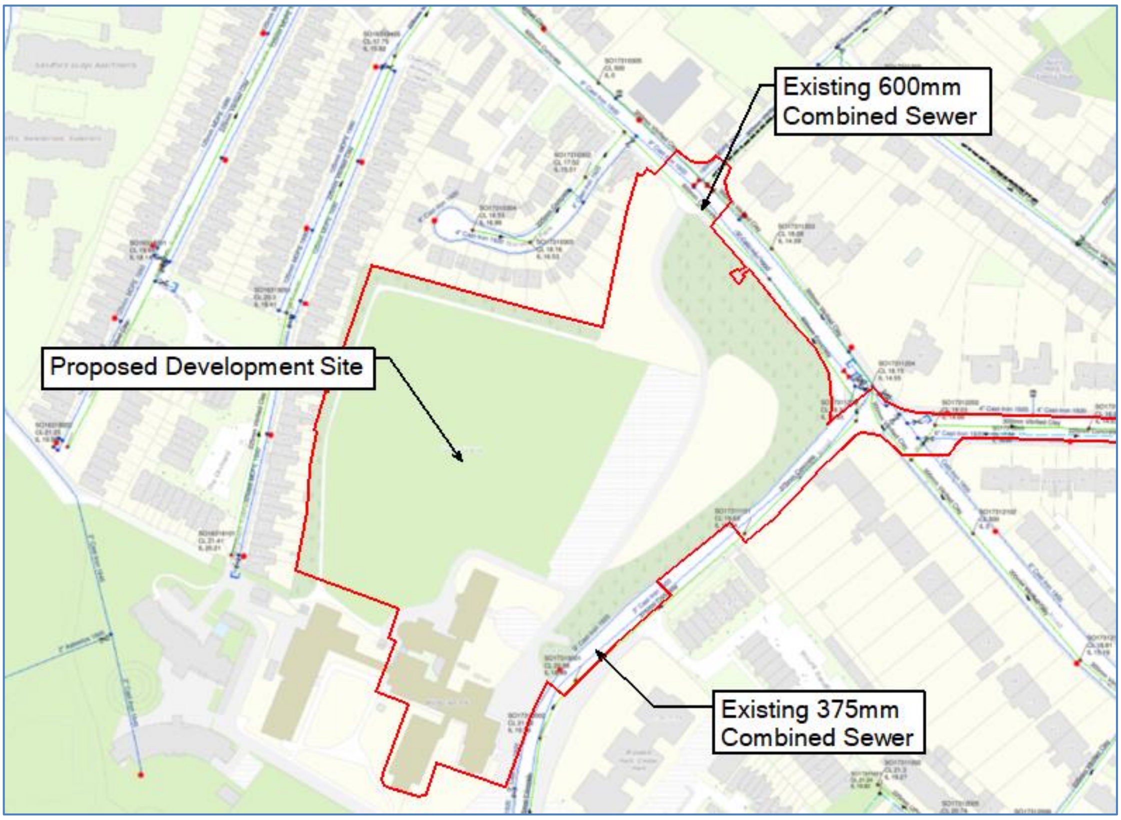


Figure 11.6: Extract from Irish Water Network Plans – Site Boundary Indicative Only

The proposed foul drainage network comprises of a network of 225mm diameter pipes. Individual dwellings located along the site's western boundary are being serviced by individual 100mm diameter connections.

The foul drainage network for the proposed development has been designed in accordance with Irish Water's Code of Practice for Wastewater Infrastructure and associated standard details.

A daily foul discharge volume of approx. 302m³ has been calculated as outlined in Irish Water's Code of Practice for Wastewater Infrastructure (refer to DBFL Infrastructure Design Report, 190226-rep-002).

11.4.5 Surface Water Drainage

The public surface water network on Eglinton Road (as described above in Section 11.3.5 and Figure 11.7 below) is expected to provide a suitable surface water discharge point for the proposed development. However, in order to achieve the required drainage invert levels on site, approximately 160m of the existing 225mm diameter drainage network along Eglinton Road will need to be replaced with a 300mm pipe running at a flatter gradient.

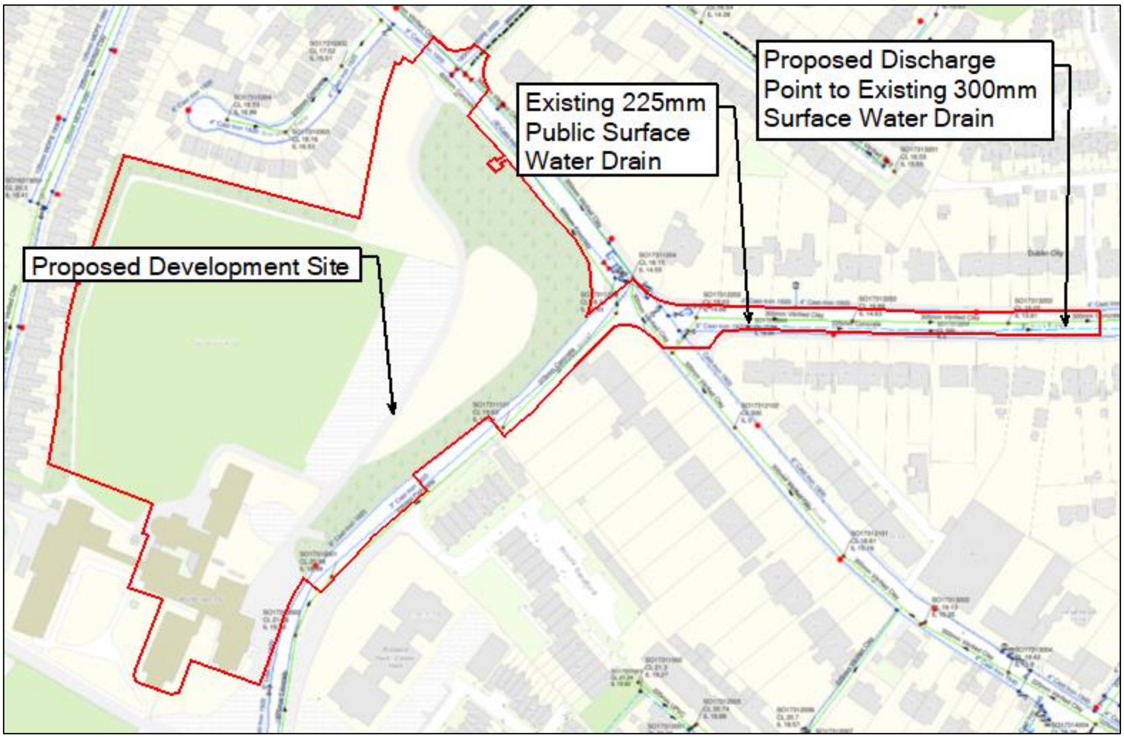


Figure 11.7: Extract from Irish Water Network Plans – Site Boundary Indicative Only

The proposed surface water drainage network will collect surface water runoff from the site via a piped network.

Surface water runoff from apartment roofs will be captured by green roof (sedum blanket or equivalent) prior to being routed to the piped surface water drainage network.

Surface water runoff from the roofs of duplex units located along the western boundary will be routed to the proposed surface water pipe network via porous aggregates beneath permeable paved driveways (providing an additional element of attenuation).

A drainage reservoir (drainage board) is to be provided on the podium slab over basement (for green areas and paved areas).

Surface water runoff from the majority of the proposed development site's internal street network will be directed to the proposed pipe network via tree pits or other SUDS features (with overflows to conventional road gullies). Part of the site's internal street network (adjacent to Block E) drains via 3 no. bio-retention areas. In limited instances, surface water runoff from paved areas will be directed to the proposed pipe network via conventional road gullies.

Surface water runoff from in curtilage parking spaces associated with duplex units located along the western boundary will be captured by permeable paving.

Any incidental surface water runoff generated from the basement carpark would drain through a separate system beneath the basement slab (out falling to the proposed foul drainage network via a petrol interceptor).

While the site does represent a single surface water catchment, for internal management of the surface water, it has been split into five sub catchments. Each sub catchment has been assessed separately in relation to surface water attenuation.

Surface water discharge rates from the proposed surface water drainage network will be controlled by a Hydrobrake type flow control device and associated underground attenuation tanks (Stormtech Chambers). Surface water discharge will also pass via a full retention fuel / oil separator (sized in accordance with permitted discharge from the site) before leaving the site. Refer to DBFL's Infrastructure Design Report (170232-rep-001) for full details of the proposed SUDS methodologies.

Surface water calculations are based on an allowable outflow / greenfield runoff rate of 2.0 l/sec/ha resulting in a total required attenuation volume of 1,282.3 m^3 (refer to DBFL Infrastructure Design Report, 190226-rep-002).

Proposed surface water drains have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS) and the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage.

11.4.6 Water Supply

It is proposed to take 2 No. 200mm diameter connections off the existing 9" water mains located along Sandford Road and Milltown Road. These connections will link within the site.

All connections, valves, hydrants, meters etc. have been designed and are to be installed in accordance with Irish Water's Code of Practice for Water Infrastructure (and associated standard details) and the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety".

An average daily domestic demand of approx. 274m^3 has been calculated as outlined in Irish Water's Code of Practice for Water Supply (refer to DBFL Infrastructure Design Report, 190226-rep-002).

11.5 Identification of Potential Impacts

11.5.1 Construction Phase

Potential negative / significant / short-term impacts that may arise during the construction phase resulting in impact on the surrounding surface water and hydrogeological environments are noted below:

- Discharge of rainwater pumped from excavations may also contain increased silt levels (potential impact on existing hydrology e.g. discharge to existing surface water drainage network).
- Accidental spills and leaks associated with storage of oils and fuels, leaks from construction machinery and spillage during refuelling and maintenance.
- Concrete runoff, particularly discharge of wash water from concrete trucks (potential impact on existing hydrology e.g. infiltration to ground).
- Due to relatively high level of groundwater encountered in some boreholes there may be a need to dewater excavations during basement construction. Although it should be noted that the new basement shall not have an adverse effect on the existing ground water regime as the basement extends into the low porosity boulder clays (refer to DBFL's Basement Impact Assessment for the proposed development).
- Improper discharge of foul drainage from contractor's compound (impact on existing hydrology e.g. cross-contamination of existing surface water drainage.).
- Cross contamination of potable water supply to construction compound.

11.5.2 Operational Phase

Potential operational phase impacts are noted below:

- Increased impermeable surface area will reduce local ground water recharge and potentially increase surface water runoff (if not attenuated to greenfield runoff rate).
- Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network (e.g. along roads and in driveway areas).
- Increased discharge to foul drainage network (Daily Foul Discharge Vol. – Approx.302 m^3).
- Increased potable water consumption (Average Daily Domestic Demand – Approx. 274m^3).

11.5.3 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

11.6 Ameliorative, Remedial or Reductive Measures

11.6.1 Construction Phase

The following measures are proposed during the construction phase to mitigate against risks to the surrounding hydrological environment. When mitigated, construction phase impacts are considered to be to be neutral / non-significant / short-term.

- A Preliminary Construction Management Plan has been prepared as part of this application and is to be implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the Preliminary Construction Management Plan. An Outline Construction and Environmental Management Plan (CEMP) has been prepared as part of the planning application and will be implemented during the construction phase.

- Weather conditions and typical seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations with an objective of minimizing soil erosion.

- In order to mitigate against spillages contaminating the surrounding surface water and hydrogeological environments, all oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area. Refuelling and servicing of construction machinery will take place in a designated hardstand area (where not possible to carry out such activities off site).

- Concrete batching (for use in in situ concrete pours) will take place off site and wash down and wash out of concrete trucks will take place off site (at authorized concrete batching plant in full compliance with relevant planning and environmental consents).

- The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply. Foul drainage discharge from the construction compound will be tankered off site to a licensed facility until a connection to the public foul drainage network has been established.

- The construction compound's potable water supply shall be protected from contamination by any construction activities or materials. The contractor shall obtain a temporary connection from the existing water supply network along Milltown Road / Sandford Road in accordance with Irish water requirements for same.

11.6.2 Operational Phase

The design of proposed site levels (roads, FFL etc.) has been carried out to ensure the proposed development is elevated and set in such a way as to avoid concentrating additional surface water flow in any particular location.

Following the Site Specific Flood Risk Assessment, it has been determined that the proposed development is located in Flood Zone C as defined by the Guidelines i.e. proposed development is considered to have the required level of flood protection up to and including the 1% AEP flood event.

Proposed mitigation measures to address residual flood risks are summarised below;

- Proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.

- Overland flow routes, directed towards open space areas, are identified / established in the event of storms exceeding the 1% AEP design capacity of the attenuation system (also refer to DBFL Report 190226-rep-002, Site Specific Flood Risk Assessment).

The development's basement shall not have an adverse effect on the existing ground water regime as the basement extends into the low porosity boulder clays (refer to DBFL's Basement Impact Assessment for the proposed development).

Surface water runoff from the site will be attenuated to the greenfield runoff rate as outlined in the Greater Dublin Strategic Drainage Study (GDSDS). Surface water discharge rates will be controlled by a Hydrobrake type vortex control device in conjunction with below ground attenuation storage.

The following methodologies are being implemented as part of a SuDS surface water treatment train approach:

- Permeable paving in driveway areas.

- Surface water runoff from duplex roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved driveways.

- Surface water runoff from apartment roofs will be captured by green roofs (sedum blanket) prior to being routed to the piped surface water drainage network.

- Surface water runoff from the majority of site's internal street network will be directed to the proposed pipe network via tree pits or other SUDS features (with overflows to conventional road gullies). Part of the site's internal street network (adjacent to Block E) drains via 3 No. bio-retention areas. In limited instances, surface water runoff from paved areas will be directed to the proposed pipe network via conventional road gullies.

- A drainage reservoir (drainage board) is to be provided on the podium slab over basement. The podium will have a mix of soft landscaping and permeable hard landscaping (over a drainage board which would serve as a reservoir).

- Attenuation of the 30 and 100-year return period storms (refer to DBFL Report 190226-rep-002, Infrastructure Design Report).

- Installation of a Hydrobrake (limiting surface water discharge from the site to 2.0 l/sec/ha).

- Surface water discharge will also pass via a fuel / oil separator (sized in accordance with permitted discharge from the site).

A contract will be entered into with a suitably qualified contractor for maintenance of the attenuation system, green roof installations, Hydrobrake and full retention fuel / oil separator noted above.

Irish Water have confirmed that based on the capacity currently available in the foul drainage and water supply networks and subject to a valid connection agreement being put in place the proposed connections can be facilitated (refer to Irish water correspondence in Appendix 11.3).

No specific mitigation measures are proposed in relation to foul drainage however, all new foul drainage lines will be pressure tested and be subject to a CCTV survey in order to identify any possible defects prior to being made operational (in accordance with Irish water's QA Field Inspection Requirement Manual).

No specific mitigation measures are proposed in relation to water supply, however, water conservation measures such as dual flush water cisterns and low flow taps will be included in the design.

The potential impact of climate change has been allowed for as follows;

- Pluvial flood risk - attenuation storage design allows for a 20% increase in rainfall intensities.

- Pluvial flood risk - drainage system design allows for a 20% increase in flows.

- Provision of min. freeboard (500mm) from 1% AEP as required by GDSDS (mitigation against impact of climate change).

It is also noted that AWN's Hydrological Risk Assessment concludes that '*During operation the potential for an impact to ground or storm water is negligible and there are measures incorporated within the proposed development to manage stormwater run-off quality. These specific measures will provide further protection to the receiving soil and water environments*'.

11.6.3 Do Nothing Scenario

No mitigation measures are proposed in relation to water and the hydrological environment if the development does not proceed.

11.7 Predicted Impact of the Proposed Development

11.7.1 Assessment of Source Partway Receptor Linkages

The potential for impact on the aquifer is low based on the low chemical storage on site during construction phase and post development. The overburden thickness and low permeability nature of till and a lack of fracture connectivity within the limestone will minimise the rate of off-site migration for any indirect discharges to ground at the site. As such there is no potential for a change in the groundwater body status or significant source pathway linkage through the aquifer to any Natura 2000 site.

Should any silt-laden stormwater from construction or hydrocarbon-contaminated water from a construction vehicle leak manage to enter the public stormwater sewer, the suspended solids will naturally settle within the drainage pipes and hydrocarbons will dilute to background levels (water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019); by the time the stormwater reaches any open water based on the distance to waterways. Similarly, during operation, should any leak of hydrocarbon occur from a vehicle, the volume of contaminant release is low and combined with the significant attenuation within in the public stormwater sewers, hydrocarbons will dilute to background levels with no likely impact above water quality objectives as outlined in S.I. No. 272 of 2009, S.I. No. 386 of 2015 and S.I. No. 77 of 2019.

The peak wastewater discharge is calculated at an average wastewater discharge of 21.4 litres/sec. The sewage discharge will be licensed by Irish Water, collected in the public sewer and treated at Irish Water's WWTP at Ringsend prior to discharge to Dublin Bay. This WWTP is required to operate under an EPA licence (D0034-01) and to meet environmental legislative requirements. The plant has received planning permission (2019) and will be upgraded with increased treatment capacity over the next five years. The peak foul discharge calculated for the proposed development is well within the current capacity of the WWTP.

11.7.2 Construction Phase

Implementation of the measures outlined in Section 11.6.1 will ensure that the potential impacts of the proposed development on water and the hydrogeological environment are imperceptible during the construction phase.

11.7.3 Operation Phase

As surface water drainage design has been carried out in accordance with the GDSDS and SuDS methodologies (refer to section 11.6.2) are being implemented as part of a treatment train approach, impacts on the water and hydrogeological environment arising from the operational phase are considered imperceptible

Irish Water have issued pre-connection feedback which confirms that provision of foul drainage and water supply connections are feasible.

11.7.4 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

11.8 Monitoring

Proposed monitoring during the construction phase in relation to the water and hydrogeological environment are as follows:

- Implementation of measures included in the Preliminary Construction Management Plan and Outline Construction and Environment Management Plan (included in application documents).
- Inspection of fuel / oil storage areas.
- Monitoring cleanliness of adjacent road network, implementation of dust suppression and vehicle wheel wash facilities.

During the operational phase an inspection and maintenance contract are to be implemented in relation to the proposed drainage network, Class 1 full retention fuel / oil separator, hydrobrakes and attenuation devices).

11.9 Reinstatement

Oil, fuel etc. storage areas are to be decommissioned on completion of the construction phase. Any remaining liquids are to be removed from site and disposed of at an appropriate licenced facility. Dublin City Council's Environmental Control Section will be notified of the proposed destination for disposal of any liquid fuels.

11.10 Interactions and Potential Cumulative Impacts

11.10.1 Interactions

Chapter 10 Land, Soils and Geology

In the absence of mitigation, surface water runoff during the construction phase may lead to erosion and contain increased silt levels (e.g., runoff across areas stripped of topsoil) or become polluted by construction activities.

Increased impermeable surface area will reduce local ground water recharge and potentially increase surface water runoff (if not attenuated to greenfield runoff rate).

This interaction is considered to be short-term, imperceptible and neutral.

Refer to the Lands and Soils Chapter (Section 10.6) for proposed mitigation measures "… and conclusions in relation to residual impacts.

Chapter 15 Transportation

Construction and operation stage traffic have the potential to impact water quality via hydrocarbon spills and leaks.

This interaction is considered to be short-term, imperceptible and neutral.

Chapter 5 Population and Human Health

Potential impacts on human health have also been considered, particularly with regard to provision of water supply and foul drainage infrastructure.

This interaction is considered to be long-term, imperceptible and neutral.

11.10.2 Potential Cumulative Impacts

The proposed surface water drainage infrastructure has been designed in accordance with the relevant guidelines i.e., Greater Dublin Strategic Drainage Study (GDSDS) and OPW Flood Risk Assessment Guidelines. Any other future development in the vicinity of the site would have to be similarly designed in relation to permitted surface water discharge, surface water attenuation and SuDS, therefore, no potential cumulative impacts are anticipated in relation to surface water drainage and flooding.

No potential cumulative impacts are anticipated in relation to foul drainage and water supply. Irish Water have confirmed that the proposed foul drainage connection to the existing combined sewer and proposed connection to the existing water supply network are feasible (refer to Section 11.3.4 and Section 11.3.6).

11.11 Conclusion

A conceptual site model (CSM) has been prepared following a desk top review of the site and surrounding environs. Based on this CSM, plausible Source-Pathway-Receptor linkages have been assessed assuming an absence of any measures intended to avoid or reduce harmful effects of the proposed project (i.e. mitigation measures) in place at the proposed development site. Refer to AWN Hydrological & Hydrogeological Qualitative Risk Assessment.

There is no direct source pathway linkage between the proposed development site and open water (i.e. Dodder Catchment or Dublin Bay). It is concluded that there is also no resultant indirect source pathway linkage from the proposed development through public sewers which could result in any change to the current water regime (water quality or quantity) and open water as defined. There is an indirect connection through the foul sewer which will eventually discharge to the Ringsend WWTP and ultimately discharges to Dublin Bay. The future development has a peak foul discharge that would equate to 0.19% of the licensed discharge at Ringsend WWTP (peak hydraulic capacity).

It is concluded that there are no pollutant linkages as a result of the construction or operation (without the use of mitigation) of the proposed development which could result in a water quality impact which could alter the habitat requirements of the Natura sites within Dublin Bay.

Mitigation measures have been included during construction. During operation the potential for an impact to ground or storm water is negligible and there are measures incorporated within the proposed development to manage stormwater run-off quality. These specific measures will provide further protection to the receiving soil and water environments. However, the protection of downstream European sites is in no way reliant on any of these measures and has not been taken into account in assessing the impact on water quality for the European sites in and around Dublin Bay.

Table 11.1 Water & Hydrology – Summary of Construction Phase Likely Significant Effects with and without Mitigation / Monitoring

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
Increased silt levels in surface water runoff and rainwater pumped from excavations	On-Site & Adjacent Drainage Network	Negative	Significant	Short-Term	Direct	Likely	Extent of topsoil strip (and consequent exposure of subsoil) will be limited to the immediate vicinity of active work areas. Weather conditions will also be taken account of when planning stripping of topsoil and excavations with an objective of minimizing soil erosion.	Monitor contractors' compliance with PCMP	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Accidental spills and leaks	On-Site & Adjacent Drainage Network	Negative	Significant	Short-Term	Direct	Likely	Response procedure will be put in place to deal with any accidental pollution events	Monitor contractors' compliance with PCMP	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Discharge of wash water from concrete trucks	On-Site & Adjacent Drainage Network	Negative	Significant	Short-Term	Direct	Likely	Concrete batching and wash down / wash out of concrete trucks will take place off site.	Monitor contractors' compliance with PCMP	Neutral	Not Significant	Short-Term	Direct	Un-Likely

Dewater excavations during basement construction	On-Site	Negative	Significant	Short-Term	Direct	Likely	Basement excavation will be coordinated with the proposed staging for the development to minimise requirement for dewatering	Monitor contractors' compliance with PCMP and recommendations from the Basement Impact Assessment	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Improper discharge of foul drainage from contractor's compound	Adjacent Drainage Network	Negative	Significant	Short-Term	Direct	Likely	Foul drainage discharge from the construction compound will be tankered off site to a licensed facility until a connection to the public foul drainage network has been established	Monitor contractors' compliance with PCMP	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Cross contamination of potable water supply to construction compound	Adjacent Water Supply Network	Negative	Significant	Short-Term	Direct	Likely	The contractor shall obtain a temporary connection from the existing water supply network along Milltown Road / Sandford Road in accordance with Irish water requirements for same	Monitor contractors' compliance with PCMP	Neutral	Not Significant	Short-Term	Direct	Un-Likely

12.0 AIR QUALITY AND CLIMATE

12.1 Introduction

This chapter assesses the likely air quality and climate impacts associated with the proposed residential development at Milltown Park, Sandford Road, Dublin 6. A full description of the development is available in Chapter 3 - Description of Development.

This chapter was completed by Dr Avril Challoner and Niamh Nolan from AWN Consulting. Dr. Avril Challoner is a Senior Environmental Consultant in the Air Quality section of AWN Consulting. She has 8 years experience in the environmental consulting sector. She holds a BEng (Hons) in Environmental Engineering from the National University of Ireland Galway, HDip in Statistics from Trinity College Dublin and has completed a PhD in Environmental Engineering (Air Quality) in Trinity College Dublin graduating in 2013. She is a Chartered Scientist (CSci), Member of the Institute of Air Quality Management and specialises in the fields of air quality, EIA and air dispersion modelling. Avril has extensive experience preparing EIAs for a wide range of both residential and commercial developments over the last 8 years.

Niamh Nolan is an Environmental Consultant in the Air Quality section of AWN. She has one year experience in the environmental consulting sector and has experience preparing EIAs for a number of residential developments. She holds a BSocSci (Hons) in Social Policy and Geography from University College Dublin. She is an Associate Member of both the Institute of Air Quality Management and the Institution of Environmental Science. She has experience in mapping software primarily in QGIS and she specialises in the area of air quality, climate and sustainability.

12.2 Study Methodology

12.2.1 Criteria for Rating of Impacts

Ambient Air Quality Standards

In order to reduce the risk to health from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 12.1 and Appendix 12.1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate EU Directive 2008/50/EC, which has set limit values for NO_2, PM_{10} and $PM_{2.5}$, which are applicable in relation to this project (see Table 12.1). Although the EU Air Quality Limit Values are the basis of legislation, other thresholds outlined by other EU Directives are used which are triggers for particular actions (see Appendix12.1).

Pollutant	Directive Note 1	Limit Type	Value
NO_x	2008/50/EC	Critical level for protection of vegetation	30 µg/m3 NO + NO_2
Nitrogen Dioxide(NO_2)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m3
		Annual limit for protection of human health	40 µg/m3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m3
		Annual limit for protection of human health	40 µg/m^3
Particulate Matter (as $PM_{2.5}$)	2008/50/EC	Annual limit for protection of human health	25 µg/m^3

Note 1 EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Table 12.1: Ambient Air Quality Standards

Dust Deposition Guidelines

The concern from a health perspective is focussed on particles of dust which are less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$) and the EU ambient air quality standards outlined in Table 12.1 have set ambient air quality limit values for PM_{10} and $PM_{2.5}$.

With regards to larger dust particles that can give rise to nuisance dust, there are no statutory guidelines regarding the maximum dust deposition levels that may be generated during the construction phase of a development in Ireland. Furthermore, no specific criteria have been stipulated for nuisance dust in respect of this development.

With regard to dust deposition, the German TA-Luft standard for dust deposition (non-hazardous dust) (German VDI, 2002) sets a maximum permissible emission level for dust deposition of 350 mg/(m^2*day) averaged over a one-year period at any receptors outside the site boundary. Recommendations from the Department of the Environment, Heritage & Local Government (DEHLG, 2004) apply the Bergerhoff limit of 350 mg/(m^2*day) to the site boundary of quarries. This limit value can also be implemented with regard to dust impacts from construction of the proposed development.

Climate Agreements

Ireland is party to both the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The Paris Agreement, which entered into force in 2016, is an important milestone in terms of international climate change agreements and includes an aim of limiting global temperature increases to no more than 2°C above pre-industrial levels with efforts to limit this rise to 1.5°C. The aim is to limit global GHG emissions to 40 gigatonnes as soon as possible whilst acknowledging that peaking of GHG emissions will take longer for developing countries. Contributions to GHG emissions will be based on Intended Nationally Determined Contributions (INDCs) which will form the foundation for climate action post 2020. Significant progress was also made in the Paris Agreement on elevating adaption onto the same level as action to cut and curb emissions.

In order to meet the commitments under the Paris Agreement, the EU enacted *Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No. 525/2013* (the Regulation). The Regulation aims to deliver, collectively by the EU in the most cost-effective manner possible, reductions in GHG emissions from the Emission Trading Scheme (ETS) and non-ETS sectors amounting to 43% and 30%, respectively, by 2030 compared to 2005. Ireland's obligation under the Regulation is a 30% reduction in non-ETS greenhouse gas emissions by 2030 relative to its 2005 levels.

In 2015, the Climate Action and Low Carbon Development Act 2015 (No. 46 of 2015) was enacted (the Act). The purpose of the Act was to provide for the approval of plans by Government in relation to climate change for the purpose '*to pursue, and achieve, the transition to a low carbon, climate resilient and environmentally sustainable economy by the end of the year 2050*' (3.(1) of No. 46 of 2015). The Act makes provision for a national mitigation plan, and a national adaptation framework. In addition, the Act provided for the establishment of the Climate Change Advisory Council with the function to advise and make recommendations on the preparation of the national mitigation and adaptation plans and compliance with existing climate obligations.

The *Climate Action Plan* (CAP) (Government of Ireland, 2019), published in June 2019, outlines the current status across key sectors including Electricity, Transport, Built Environment, Industry and Agriculture and outlines the various broadscale measures required for each sector to achieve ambitious decarbonisation targets. The CAP also details the required governance arrangements for implementation including carbon-proofing of policies, establishment of carbon budgets, a strengthened Climate Change Advisory Council and greater accountability to the Oireachtas. The CAP has set a built environment sector reduction target of 40 - 45% relative to 2030 pre-NDP (National Development Plan) projections.

Following on from Ireland declaring a climate and biodiversity emergency in May 2019 and the European Parliament approving a resolution declaring a climate and environment emergency in Europe in November 2019, the Government approved the publication of the General Scheme for the Climate Action (Amendment) Bill 2019 in December 2019. The General Scheme was prepared for the purposes of giving statutory effect to the core objectives stated within the CAP.

In October 2020, the Climate Action and Low Carbon Development (Amendment) Bill 2020 was published in draft format (draft 2020 Climate Act) which amends and enhances the 2015 Climate Act. The purpose of the 2020 Draft Climate Act is to provide for the approval of plans '*for the purpose of pursuing the transition to a climate resilient and climate neutral economy by the end of the year 2050*'. The 2020 Draft Climate Act also '*provide for carbon budgets and a decarbonisation target range for certainsectors of the economy*'. The 2020 Draft Climate Act removes any reference to a national mitigation plan and instead refers to both the Climate Action Plan, as published in 2019, and a series of National Long Term Climate Action Strategies. In addition, the Environment Minister shall request each local authority to make a 'local authority climate action plan' lasting five yearsand to specify the mitigation measures and the adaptation measures to be adopted by the local authority.

The Dublin City Council Climate Action Plan 2019 – 2024 published in 2019 (Dublin City Council and Codema, 2019) outlines a number of goals and plans to prepare for and adapt to climate change. There are five key action areas within the plan: Energy and Buildings, Transport, Flood Resilience, Nature-based Solutions and Resource Management (waste and water). Some of the measures promoted within the Action Plan under the 5 key areas involve a 40% reduction in the Council's greenhouse gas emissions by 2030, improving and developing flood resilient designs, promotion of the use of green infrastructure and waste prevention initiatives. The implementation of these measures will enable the Dublin City Council area to adapt to climate change and will assist in bringing Ireland closer to achieving its climate related targets in future years. New developments need to be cognisant of the Action Plan and incorporate climate friendly designs and measures where possible.

12.2.2 Construction Phase

The current assessment focuses on identifying the existing baseline levels of PM_{10} and $PM_{2.5}$ in the region of the proposed development by an assessment of EPA monitoring data. Thereafter, the impact of the construction phase of the development on air quality was determined by a qualitative assessment of the nature and scale of dust generating construction activities associated with the proposed development.

The Institute of Air Quality Management in the UK (IAQM) guidelines (2014) outline an assessment method for predicting the impact of dust emissions from demolition, earthworks, construction and haulage activities based on the scale and nature of the works and the sensitivity of the area to dust impacts. The IAQM methodology has been applied to the construction phase of this development in order to predict the likely magnitude of the dust impacts in the absence of mitigation measures. The UK guidance is used in the absence of specific Irish guidance as is considered best practice.

Construction phase traffic also has the potential to impact air quality and climate. The UK Design Manual for Roads and Bridges (DMRB) guidance (UK Highways Agency, 2019a), states that road links meeting one or more of the following criteria can be defined as being 'affected' by a proposed development and should be included in the local air quality assessment. The TII guidance (2011) recommends the use of the UK guidance and was based on the previous version of the UK DMRB guidance (UK Highways Agency, 2007) and notes that the TII guidance should be adapted for any updates to the DMRB (see Section 1.1 of *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, 2011)* .

- Annual average daily traffic (AADT) changes by 1,000 or more;
- Heavy duty vehicle (HDV) AADT changes by 200 or more;
- A change in speed band;
- A change in carriageway alignment by 5m or greater.

The construction stage traffic does not meet the above scoping criteria and therefore, has been scoped out from any further assessment as there is no potential for significant impacts.

12.2.3 Operational Phase

Air Quality Assessment

Operational phase traffic has the potential to impact air quality. The air quality assessment has been carried out following procedures described in the publications by the EPA (2015; 2017) and using the methodology outlined in the guidance documents published by the UK Highways Agency (2019a) and UK Department of Environment Food and Rural Affairs

(DEFRA) (2016; 2018). Transport Infrastructure Ireland (TII) reference the use of the UK Highways Agency and DEFRA guidance and methodology in their document *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* (2011). This approach is considered best practice in the absence of Irish guidance and can be applied to any development that causes a change in traffic.

The UK Highways Agency guidance *LA 150* (2019a) scoping criteria outlined in Section 12.2.2 was used to determine the road links required for inclusion in the modelling assessment. As none of the road links impacted by the proposed development met the scoping criteria a detailed assessment was scoped out as there is no potential for significant impacts to air quality.

Air Quality Impact on Ecological Sites

For routes that pass within 2 km of a designated area of conservation (either Irish or European designation) the TII requires consultation with an ecologist (TII, 2011). However, in practice the potential for impact to an ecological site is highest within 200 m of the proposed scheme and when significant changes in AADT (>5%) occur. Only sites that are sensitive to nitrogen deposition should be included in the assessment. In addition, the UK Highways Agency (2019) states that a detailed assessment does not need to be conducted for areas that have been designated for geological features or watercourses.
Transport Infrastructure Ireland's *Guidelines for Assessment of Ecological Impacts of National Road Scheme*s (2009) and *Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities* (DEHLG, 2010) provide details regarding the legal protection of designated conservation areas.

If both of the following assessment criteria are met, an assessment of the potential for impact due to nitrogen deposition should be conducted:

- A designated area of conservation is located within 200 m of the proposed development; and
- A significant change in AADT flows (>5%) will occur.

There are no ecological sites within 200 m of any impacted road links and there is no significant change in AADT flows. As a result, a detailed assessment has been scoped out as there is no potential for significant impacts to the designated site.

Climate Assessment

The UK Highways Agency has published an updated DMRB guidance document in relation to climate impact assessments *LA 114 Climate* (UK Highways Agency 2019b). The following scoping criteria are used to determine whether a detailed climate assessment is required for a proposed project during the operational stage.

- A change of more than 10% in AADT;
- A change of more than 10% to the number of heavy duty vehicles; and
- A change in daily average speed of more than 20 km/hr.

If any of the road links impacted by the proposed development meet or exceed the above criteria, then further assessment is required. None of the road links impacted by the proposed development meet the scoping criteria above and therefore a detailed assessment has been scoped out as there is no potential for significant impacts to climate.

12.3 Existing Receiving Environment

12.3.1 Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Dublin Airport, which is located approximately 11 km north of the site. Dublin Airport met data has been examined to identify the prevailing wind direction and average wind speeds over a five-year period (see Figure 12.1). For data collated during five representative years (2016 – 2020), the predominant wind direction is westerly to south-westerly, with generally moderate wind speeds (Met Éireann, 2021).

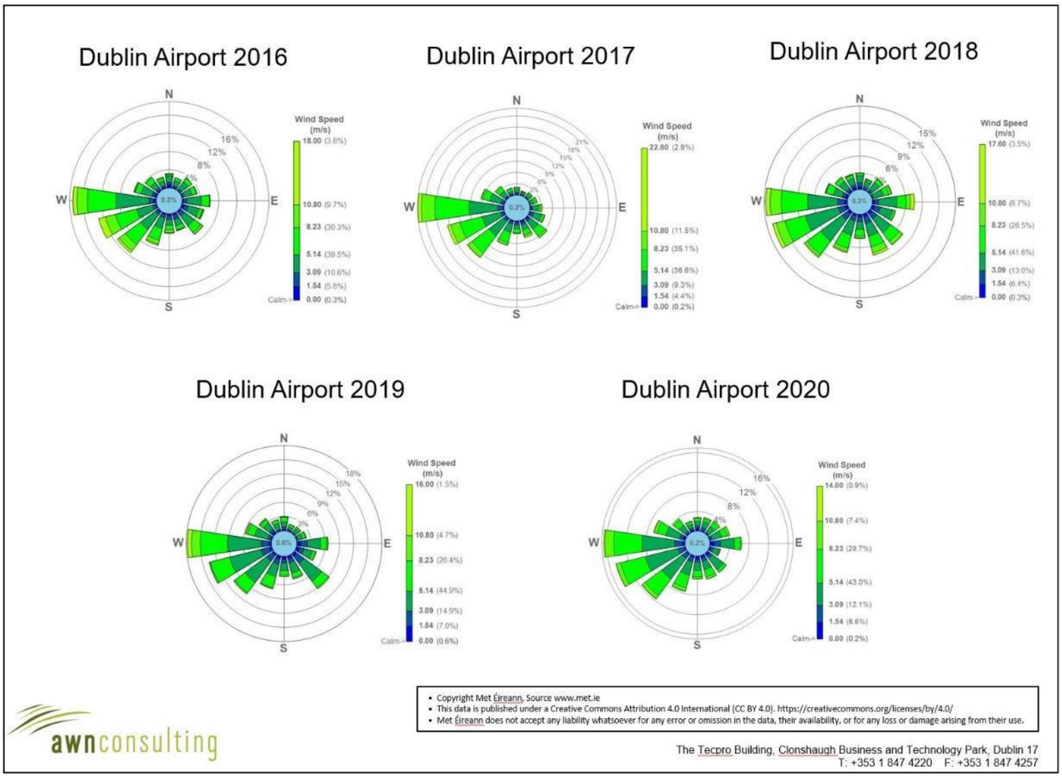


Figure 12.1: Dublin Airport Windroses 2016 – 2020

12.3.2 Baseline Air Quality

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is "*Air Quality In Ireland 2019*" (EPA, 2020a). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2021).

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes (EPA, 2021). Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 23 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D.

In terms of air monitoring and assessment, the proposed development is within Zone A (EPA, 2021). The long-term EPA monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

With regard to NO_2, continuous monitoring data from the EPA (EPA, 2020a) at suburban Zone A locations in Ballyfermot, Dun Laoghaire, Swords and Rathmines show that current levels of NO_2 are below both the annual and 1-hour limit values, with annual average levels ranging from 15 – 22 µg/m^3 in 2019 (see Table 12.2). Sufficient data is available for all stations to observe the long-term trend since 2015 (EPA, 2020a) (see Table 12.2), with results ranging from 13 – 22 µg/m^3 and few exceedances of the one-hour limit value. The station in Rathmines is approximately 1 km west of the proposed development site and monitored background concentrations would be representative of the site location. Concentrations of NO_2 at the Rathmines site over the period 2015 – 2019 ranged from 17 - 22 µg/m^3. Based on the above information, an estimate of the background NO_2 concentration in the region of the proposed development is 22 µg/m^3.

Station	Averaging Period Notes 1, 2	Year				
		2015	2016	2017	2018	2019
Rathmines	Annual Mean NO_2 (µg/m^3)	18	20	17	20	22
	Max 1-hr NO_2 (µg/m^3)	106	102	116	138	183
Dún Laoghaire	Annual Mean NO_2 (µg/m^3)	16	19	17	19	15
	Max 1-hr NO_2 (µg/m^3)	103	142	153	135	104
Swords	Annual Mean NO_2 (µg/m^3)	13	16	14	16	15
	Max 1-hr NO_2 (µg/m^3)	170	206	107	112	108
Ballyfermot	Annual Mean NO_2 (µg/m^3)	16	17	17	17	20
	Max 1-hr NO_2 (µg/m^3)	142	127	148	217	124

Note 1 Annual average limit value - 40 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 1-hour limit value - 200 µg/m^3 as a 99.8th%ile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Table 12.2: Trends in Zone A Air Quality – Nitrogen Dioxide (NO_2)

Continuous PM_{10} monitoring carried out at the Zone A locations of Tallaght, Rathmines, Phoenix Park and Dún Laoghaire showed 2015 – 2019 annual mean concentrations ranging from 9 – 15 μg/m^3 (Table 12.3), with at most 9 exceedances (in Rathmines) of the 24-hour limit value of 50 μg/m^3 (35 exceedances are permitted per year). The most representative location is Rathmines which had an average annual mean concentration of 14.6 μg/m^3 over the five year period. Based on the EPA data (Table 12.3) a conservative estimate of the current background PM_{10} concentration in the region of the proposed development is 15 μg/m^3.

Station	Averaging Period Notes 1, 2	Year				
		2015	2016	2017	2018	2019
Tallaght	Annual Mean PM_{10} (μg/m^3)	14	14	11.8	15	12
	24-hr Mean > 50 μg/m^3 (days)	4	0	2	1	3
Rathmines	Annual Mean PM_{10} (μg/m^3)	15	15	13	15	15
	24-hr Mean > 50 μg/m^3 (days)	5	3	5	2	9
Phoenix Park	Annual Mean PM_{10} (μg/m^3)	12	11	9	11	11
	24-hr Mean > 50 μg/m^3 (days)	2	0	1	0	2
Dún Laoghaire	Annual Mean PM_{10} (μg/m^3)	13	13	12	13	12
	24-hr Mean > 50 μg/m^3 (days)	3	0	2	0	2

Note 1 Annual average limit value - 40 μg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 24-hour limit value - 50 μg/m^3 as a 90.4th%ile, i.e. not to be exceeded >35 times per year (EU Council Directive 1999/30/EC & S.I. No. 180 of 2011).

Table 12.3: Trends in Zone A Air Quality – PM_{10}

Continuous $PM_{2.5}$ monitoring carried out at the Zone A location of Rathmines showed $PM_{2.5}/PM_{10}$ ratios ranging from 0.60 – 0.68 over the period 2015 – 2019. Based on this information, a conservative ratio of 0.7 was used to generate a background $PM_{2.5}$ concentration in the region of the proposed development of 9.1 μg/m^3.

Figure 12.2: Location of EPA Monitoring Sites

12.3.3 Climate Baseline

Anthropogenic emissions of greenhouse gases in Ireland included in the EU 2020 strategy are outlined in the most recent review by the EPA which details provisional emissions up to 2019 (EPA, 2020b). The data published in 2020 states that Ireland will exceed its 2019 annual limit set under the EU's Effort Sharing Decision (ESD), 406/2009/EC1 by an estimated 6.98 Mt. For 2019, total national greenhouse gas emissions are estimated to be 59.90 million tonnes carbon dioxide equivalent (Mt CO_2eq) with 45.71 MtCO_2eq of emissions associated with the ESD sectors for which compliance with the EU targets must be met. Agriculture is the largest contributor in 2019 at 35.3% of the total, with the transport sector accounting for 20.3% of emissions of CO_2.

GHG emissions for 2019 are estimated to be 4.5% lower than those recorded in 2018. Emission reductions have been recorded in 6 of the last 10 years. However, compliance with the annual EU targets has not been met for four years in a row. Emissions from 2016 – 2019 exceeded the annual EU targets by 0.29 MtCO_2eq, 2.94 MtCO_2eq, 5.57 MtCO_2eq and 6.98 MtCO_2eq respectively. Agriculture is consistently the largest contributor to emissions with emissions from the transport and energy sectors being the second and third largest contributors respectively in recent years.

The EPA 2019 GHG Emissions Projections Report for 2018 – 2040 (EPA, 2019) notes that there is a long-term projected decrease in greenhouse gas emissions as a result of inclusion of new climate mitigation policies and measures that formed part of the National

Development Plan (NDP) which was published in 2018. Implementation of these are classed as a "With Additional Measures scenario" for future scenarios. A change from generating electricity using coal and peat to wind power and a change from diesel vehicle engines to electric vehicle engines are envisaged under this scenario. While emissions are projected to decrease in these areas, emissions from agriculture are projected to grow steadily due to an increase in animal numbers. However, over the period 2013 – 2020 Ireland is projected to cumulatively exceed its compliance obligations with the EU's Effort Sharing Decision (Decision No. 406/2009/EC) 2020 targets by approximately 10 Mt CO_2eq under the "With Existing Measures" scenario and 9 Mt CO_2eq under the "With Additional Measures" scenario (EPA, 2019).

12.3.4 Sensitivity of the Receiving Environment

In line with the UK Institute of Air Quality Management (IAQM) guidance document '*Guidance on the Assessment of Dust from Demolition and Construction'* (2014) prior to assessing the impact of dust from a proposed development the sensitivity of the area must first be assessed as outlined below. Both receptor sensitivity and proximity to proposed works areas are taken into consideration. For the purposes of this assessment, high sensitivity receptors are regarded as residential properties where people are likely to spend the majority of their time. Commercial properties and places of work are regarded as medium sensitivity while low sensitivity receptors are places where people are present for short periods or do not expect a high level of amenity.

In terms of receptor sensitivity to dust soiling, there are approximately 28 high sensitivity residential properties (Figure 12.3) within 20m of the main works area of the proposed development site. The Royal Hospital in Donnybrook is approximately 550m from the proposed site, while it is a high sensitivity receptor it is outside the scoping distance, worst case receptors have been for this assessment.Based on the IAQM criteria outlined in Table 12.4, the worst case sensitivity of the area to dust soiling is considered to be **high**.

Receptor Sensitivity	**Number Of Receptors**	**Distance from source (m)**			
		<20	**<50**	**<100**	**<350**
High	>100	High	High	Medium	Low
	10-100	**High**	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 12.4: Sensitivity of the Area to Dust Soiling Effects on People and Property

In addition to sensitivity to dust soiling, the IAQM guidelines also outline the assessment criteria for determining the sensitivity of the area to human health impacts. The criteria take into consideration the current annual mean PM_{10} concentration, receptor sensitivity based on type (residential receptors are classified as high sensitivity) and the number of receptors affected within various distance bands from the construction works. A conservative estimate of the current annual mean PM_{10} concentration in the vicinity of the proposed development is 15 µg/m^3 and there are approximately 28 high sensitivity receptors located within 20m of the proposed development site. Based on the IAQM criteria outlined in Table 12.5, the worst case sensitivity of the area to human health is considered to be **low**.

Receptor Sensitivity	Annual Mean PM_{10} Concentration	Number Of Receptors	Distance from source (m)				
			<20	<50	<100	<200	<350
High	< 24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	**Low**	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	< 24 µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	< 24 µg/m^3	>1	Low	Low	Low	Low	Low

Table 12.5 Sensitivity of the Area to Human Health Impacts

Figure 12.3: Location of Sensitive Receptors

12.4 Physical Characteristics of the Proposed Development

The proposed development is at Milltown Park, Sandford Road, Dublin 6 (Figure 12.4). A full descriptionof the development is available in Chapter 3 - Description of Development.

Figure 12.4: Location of Proposed Development

When considering a development of this nature, the potential air quality and climate impact on the surroundings must be considered for each of two distinct stages:

- Construction phase, and;
- Operational phase.

12.4.1 Construction Phase

The key elements of construction of the proposed development with potential for air quality and climate impacts are:

- Potential fugitive dust emissions from general site preparation (demolition works, foundation and basement excavation) and construction activities;
- Potential fugitive dust emissions from trucks associated with construction;
- Engine emissions from construction vehicles and machinery.

12.4.2 Operational Phase

The key elements of operation of the proposed development with potential for air quality and climate impacts are:

- A change in traffic flows on road links nearby the proposed development.

12.5 Potential Impact of the Proposed Development

12.5.1 Construction Phase

Air Quality

In order to determine the level of dust mitigation required during the proposed works, the potential dust emission magnitude for each dust generating activity needs to be taken into account, in conjunction with the previously established sensitivity of the area (see Section 12.3.4). The major dust generating activities are divided into four types within the IAQM (2014) guidance to reflect their different potential impacts.

These are:

- Demolition;
- Earthworks;
- Construction; and
- Trackout (movement of heavy vehicles).

<u>Demolition</u>
Demolition will primarily involve the removal of buildings or structures currently on the site in a potentially dusty manner. This may also involve dust generation at heights. Dust emission magnitude from demolition can be classified as small, medium and large and are described below.

- **Large**: Total building volume >50,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;
- **Medium**: Total building volume 20,000 m^3 – 50,000 m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- **Small**: Total building volume less than 20,000 m^3.

As per the outline above the dust emission magnitude for the proposed demolition activities can be classified as small as approximately 2,954 m^3 of material is to be demolished. As the overall sensitivity of the area to dust soiling impacts is high there is a medium risk of dust soiling impacts from the proposed demolition activities according to the IAQM guidance (see Table 12.6). There is an overall negligible risk of human health impacts as a result of the demolition activities as the overall sensitivity of the area to human health impacts is low (Section 12.3.4).

Sensitivity of Area	**Dust Emission Magnitude**		
	Large	**Medium**	**Small**
High	High Risk	Medium Risk	**Medium Risk**
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 12.6 Risk of Dust Impacts - Demolition

<u>Earthworks</u>
Earthworks primarily involve excavating material, loading and unloading of materials, tipping and stockpiling activities. Activities such as levelling the site and landscaping works are also considered under this category. The dust emission magnitude from earthworks can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total site area > 10,000 m², potentially dusty soil type (e.g. clay which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds > 8 m in height, total material moved >100,000 tonnes;

- **Medium:** Total site area 2,500 m² – 10,000 m², moderately dusty soil type (e.g. silt), 5 - 10 heavy earth moving vehicles active at any one time, formation of bunds 4 – 8 m in height, total material moved 20,000 – 100,000 tonnes;

- **Small:** Total site area < 2,500 m², soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 4 m in height, total material moved < 20,000 tonnes, earthworks during wetter months.

The total developable site area is approximately 42,547 m² which is greater than 10,000 m². However, it is estimated that between 74,000 m² and 80,000 m² of material will be moved during excavation and infill operations, with 10,000 m² to be reused on site, this is less than 100,000 tonnes. Therefore, the dust emission magnitude for the proposed earthwork activities can be classified as medium. Taking account of the worst case of the foundation options (see Table 12.7), the proposed earthworks can remain classified as medium.

Foundation Option No.	Foundation Option Description	Decibel Level of heaviest plant required	Quantum of Soil Removal (includes roads & civils)	Quantum of Trip Generation to Remove Soil
1	Standard Pad & Strip Foundations to All Blocks incl. Basement	Excavators & Dump Trucks	70,000m³	4,375 loads ⇒ 8,750 trips (inbound and outbound)
2	Pads & Strips to All Blocks except Bored Piles to Block D & F	CFA or Kellybar auger piling rigs	64,000m³	4,000 loads ⇒ 8,000 trips
3	Pads & Strips to All Blocks except Ground Improvement to Block E	CFA or Kellybar auger piling rigs	70,000m³	4,375 loads ⇒ 8,800 trips

Table 12.7: Foundation Options

The sensitivity of the area, as determined in Section 12.3.4, is combined with the dust emission magnitude for each dust generating activity to define the risk of dust impacts in the absence of mitigation. As outlined in Table 12.8, combining the medium dust emission magnitude with a high sensitivity to dust soiling results in an overall medium risk of dust impacts as a result of the proposed earthworks activities in the absence of mitigation. There is an overall low risk of human health impacts as a result of the earthworks activities as the overall sensitivity of the area to human health impacts is low (Section 12.3.4).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	**Medium Risk**	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 12.8: Risk of Dust Impacts - Earthworks Construction

Dust emission magnitude from construction can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** Total building volume > 100,000 m^3, on-site concrete batching, sandblasting;
- **Medium:** Total building volume 25,000 m^3 – 100,000 m^3, potentially dustyconstruction material (e.g. concrete), on-site concrete batching;
- **Small:** Total building volume < 25,000 m^3, construction material with low potentialfor dust release (e.g. metal cladding or timber).

The dust emission magnitude for the proposed construction activities can be classified as large as at a worst-case as the total building volume will be greater than 100,000 m^3.As outlined in Table 12.9, combining this with a high sensitivity to dust results in an overall high risk of dust soiling impacts as a result of the proposed construction activities in the absence of mitigation. There is an overall low risk of human health impacts as a result of the construction activities as the overall sensitivity of the area to human health impacts is low (Section 12.3.4).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	**High Risk**	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 12.9: Risk of Dust Impacts – Construction

<u>Trackout</u>

Factors which determine the dust emission magnitude are vehicle size, vehicle speed, number of vehicles, road surface material and duration of movement. Dust emission magnitude from trackout can be classified as small, medium or large based on the definitions from the IAQM guidance as transcribed below:

- **Large:** > 50 HGV (> 3.5 t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length > 100 m;
- **Medium:** 10 - 50 HGV (> 3.5 t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 - 100 m;
- **Small:** < 10 HGV (> 3.5 t) outward movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.

The dust emission magnitude for the proposed trackout can be classified as large as at a worst- case as there will be greater than 50 outward HGV movements per day at peak times. As outlined in Table 12.10, combining this with a high sensitivity to dust soiling results in an overall high risk of impacts as a result of the proposed trackout activities in the absence of mitigation. There is an overall low risk of human health impacts as a result of trackout activities as the overall sensitivity of the area to human health impacts is low (Section 12.3.4).

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small

High	**High Risk**	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 12.10: Risk of Dust Impacts – Trackout

Summary of Dust Emission Risk

The risk of dust impacts as a result of the proposed development are summarised in Table 12.11 for each activity. The magnitude of risk determined is used to prescribe the level of site specific mitigation required for each activity in order to prevent significant impacts occurring.

Overall, in order to ensure that no dust nuisance occurs during the earthworks, construction and trackout activities, a range of dust mitigation measures associated with a high risk of dust impacts must be implemented. When the dust mitigation measures detailed in the mitigation section of this chapter (Section 12.7) and Appendix 12.2 are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors. With regard to the variable foundation options proposed (Table 12.7), there will be no difference in impact related to air quality once mitigation measures have been implemented, dust related impacts remain at a medium risk for all 3 No. options with human health impacts being low risk.

Potential Impact	Dust Emission Magnitude			
	Demolition	**Earthworks**	**Construction**	**Trackout**
Dust Soiling	Medium Risk	Medium Risk	High Risk	High Risk
Human Health	Negligible Risk	Low Risk	Low Risk	Low Risk

Table 12.11: Summary of Dust Impact Risk used to Define Site-Specific Mitigation

There is also the potential for traffic emissions to impact air quality in the short-term over the construction phase. Particularly due to the increase in HGVs accessing the site. The construction stage traffic has been reviewed and a detailed air quality assessment has been scoped out as none of the road links impacted by the proposed development satisfy the DMRB assessment criteria in Section 12.2.2. DBFL Consulting have outlined that the varying foundation options proposed will not significantly impact the traffic data they have provided and as such no changes need to be accommodated.

It can therefore be determined that the construction stage traffic will have an imperceptible, negative and short-term impact on air quality.

Climate

There is the potential for a number of greenhouse gas emissions to enter the atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. The Institute of Air Quality Management document "*Guidance on the Assessment of Dust from Demolition and Construction*" (IAQM, 2014) states that site traffic and plant is unlikely to make a significant impact on climate. Therefore, the impact on climate is considered to be imperceptible, neutral and short term.

Human Health

Dust emissions from the construction phase of the proposed development have the potential to impact human health through the release of PM_{10} and $PM_{2.5}$ emissions. As per section 12.3.4 the surrounding area is of low sensitivity to dust related human health impacts. It was determined that there is an overall low risk of dust related human health impacts as a result of the construction phase of the proposed development. Therefore, in the absence of mitigation there is the potential for imperceptible, negative, short-term impacts to human health as a result of the proposed development.

12.5.2 *Operational Phase*

Air Quality

There is the potential for a number of emissions to the atmosphere during the operational phase of the development. In particular, the traffic-related air emissions may generate quantities of air pollutants such as NO_2, PM_{10} and $PM_{2.5}$.

Traffic flow information obtained from DBFL Consulting, the consulting engineers on this project, was reviewed prior to assessing the impact of the proposed development. It was concluded that further assessment of impacts from the aforementioned pollutant emissions can be screened out using the UK DMRB guidance (UK Highways Agency, 2019a), on which the TII guidance was based.

The proposed development will not increase traffic levels by more than the scoping criteria (see Section 12.2.2), therefore, an assessment of the impact of traffic emissions during the operational phase on ambient air quality is not necessary as no significant impacts are likely. It can be concluded that the impact of the proposed development in terms of air quality is long-term, localised, neutral and imperceptible.

Climate

The impact of the proposed development on emissions of CO_2 impacting climate were assessed using the DMRB screening criteria as outlined in Section 6.2.3 (UK Highways Agency, 2019b). As with the air quality assessment impacts on climate can be screened out due to no road links being classed as impacted.

Therefore, the likely overall magnitude of the changes on climate in the operational stage is imperceptible, neutral and long-term.

Climate change has the potential to alter weather patterns and increase the frequency of rainfall in future years. As a result of this there is the potential for flooding related impacts on site in future years. A detailed flood risk assessment has been undertaken as part of this planning application and adequate attenuation and drainage have been provided for to account for increased rainfall in future years. Therefore, the impact will be imperceptible.

In addition, the proposed development has been designed to reduce the impact to climate where possible, the following measures have been incorporated into the design of the development: UV free-LED fittings and timer controls are considerations being undertaken to improve the impact lighting may have on climate. A central building management system (BMS) will be used to check metering to monitor and optimise substantive energy use. A number of private and visitor bicycle spaces will be provided along with lower car parking ratios of 0.50 per unit to encourage sustainable modes of transport to residents.

Further details of the measures to be incorporated into the design of the development are outlined within the Energy & Sustainability Report and Lighting Report prepared in support of this planning application.

Human Health

Traffic related air emissions have the potential to impact air quality which can affect human health. However, the change in traffic associated with the proposed development was not of the magnitude to require detailed air dispersion modelling as there is no potential for significant impacts. Therefore, traffic emissions are predicted to be below the ambient air quality standards set for the protection of human health. It can be determined that the impact to human health during the operational stage is long-term, neutral and imperceptible.

12.6 Cumulative Impacts

12.6.1 Construction Phase

According to the IAQM guidance (2014) should the construction phase of the proposed development coincide with the construction phase of any other developments within 350m then there is the potential for cumulative construction dust related impacts to nearby sensitive receptors. However, provided the mitigation measures outlined in Section 12.7 and Appendix 12.2 are implemented throughout the construction phase of the proposed development significant cumulative dust impacts are not predicted.

Due to the short-term duration of the construction phase and the low potential for significant CO_2 and N_2O emissions cumulative impacts to climate are considered imperceptible.

There are no significant cumulative impacts to air quality or climate predicted for the construction phase.

12.6.2 Operational Phase

The traffic data used to assess the operational stage impacts to air quality and climate included the cumulative traffic associated with the proposed development as well as other existing and permitted developments in the local area (see Chapter 15 Traffic and Transport). Therefore, the cumulative impact is included within the operational stage impact for the proposed development. The impact is predicted to be long-term and imperceptible with regards to air quality and climate.

12.6.3 Do-Nothing Impact

In the Do Nothing scenario, ambient air quality at the site will remain as per the baseline and will change in accordance with trends within the wider area (including influences from potential new developments in the surrounding area, changes in road traffic, etc). The Do Nothing scenario is considered neutral in terms of air quality and climate.

12.7 Avoidance, Remedial and Mitigation Measures

12.7.1 Construction Phase

Air Quality

The pro-active control of fugitive dust will ensure the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of the Dust Management Plan. The key aspects of controlling dust are listed below. Full details of the Dust Management Plan can be found in Appendix 12.2. These measures will be incorporated into the Construction Environmental Management Plan (CEMP) prepared for the site. An Outline CEMP has been prepared by Thornton O'Connor Town Planning and is enclosed separately.

The Dust Management Plan notes the following measures in summary:

- Prior to demolition blocks will be soft stripped inside buildings (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- During the demolition process, water suppression will be used, preferably with a hand-held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction will be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading equipment will be minimised, if necessary fine water sprays should be employed.

In addition, a Preliminary Construction Management plan has been prepared by DBFL Consulting Engineers and is enclosed. In summary, the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly (on any un-surfaced site road, this will be 20 kph and on hard surfaced roads as site management dictates).
- Vehicles delivering material with dust potential (soil, aggregates etc.) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.
- Public roads outside the site will be inspected on a daily basis for cleanliness and cleaned as necessary.
- Debris, sediment, grit etc. captured by road sweeping vehicles is to be disposed off-site at a licensed facility.

- Vehicles exiting the site shall make use of a wheel wash facility where appropriate prior to entering onto public roads.

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.

- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate

Construction stage traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the development. Construction vehicles, generators etc., may give rise to some CO_2 and N_2O emissions. However, due to short-term nature of these works, the impact on climate will not be significant.

Nevertheless, some site-specific mitigation measures will be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular, the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods, and minimising the waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

12.7.7 Operational Phase

The impact of the proposed development on air quality and climate is predicted to be imperceptible with respect to the operational phase in the long term. Therefore, no site specific mitigation measures are required.

The proposed development has been designed to minimise the impact to climate where possible during operation. Details of the measures to be incorporated into the design of the development are outlined below and in Section 12.5.2 and further within the Energy & Sustainability Report prepared in support of this planning application.

- UV free-LED fittings and timer controls are considerations being undertaken to improve the impact lighting may have on climate.

- A central building management system (BMS) will be used to check metering to monitor and optimise substantive energy use.

- A number of private and visitor bicycle spaces will be provided along with lower car parking ratios of 0.50 per unit to encourage sustainable modes of transport to residents.

12.8 Monitoring Required

12.8.1 Construction Phase

Monitoring of construction dust deposition at nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m^2*day) during the monitoring period between 28 - 32 days.

12.8.2 Operational Phase

There is no monitoring recommended for the operational phase of the development as impacts to air quality and climate are predicted to be imperceptible.

Summary of Potential Impact of the Proposed Development during the Construction Phase

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
Dust Emissions	Local	Negative	Significant	Short-Term	Direct	Likely	Detailed in Section 12.7	Detailed in Section 12.8	Neutral	Imperceptible	Short-Term	Direct	Likely
Traffic Emissions	Local & Regional	Neutral	Imperceptible	Short-Term	Direct	Likely	Detailed in Section 12.7	Detailed in Section 12.8	Neutral	Imperceptible	Short-Term	Direct	Likely

Summary of Potential Impact of the Proposed Development during the Operational Phase

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
Traffic Emissions	Local & Regional	Neutral	Imperceptible	Long-Term	Direct	Likely	Not Required during Operational Phase	Not Required during Operational Phase	Neutral	Imperceptible	Long-Term	Direct	Likely

12.9 Interactions

Air quality does not have a significant number of interactions with other topics. The most significant interactions are between population and human health and air quality. An adverse impact due to air quality in either the demolition, construction or operational phase has the potential to cause health and dust nuisance issues. The mitigation measures that will be put in place at the proposed development will ensure that the impact of the proposed development complies with all ambient air quality legislative limits and therefore the predicted impact is short-term, imperceptible and neutral with respect to population and human health during construction and long-term, imperceptible and neutral during the operation phase.

Interactions between air quality and traffic (Chapter 15) can be significant. With increased traffic movements and reduced engine efficiency, i.e. due to congestion, the emissions of vehiclesincrease. The impacts of the proposed development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. In this assessment, the impact of the interactions between traffic and air quality are considered to be long-term, imperceptible and neutral.

Construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between air quality and land and soils in the form of dust emissions. With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that there will be no significant interactions between air quality and land and soils.

As set out in Chapter 10 (Land, Soils and Geology), dust generation can occur during extended dry weather periods as a result of construction traffic. Dust suppression measures (e.g. dampening down) will be implemented as necessary during dry periods and vehicle wheel washes will be installed for example. The works involve stripping of topsoil and excavations, which will remove some vegetation such as trees and scrub. It will also generate dust and potentially impact on the air quality in the locality. However, the generation of dust will be temporary during construction phase and is not anticipated to have a significant impact on biodiversity.

The impact of the interactions between land, soils and geology, biodiversity and air quality are considered to be short-term, imperceptible and neutral.

No other significant interactions with air quality and climate have been identified.

12.10 Difficulties Encountered

There were no difficulties encountered when compiling this assessment.

12.10 References

BRE (2003) Controlling Particles, Vapours & Noise Pollution From Construction Sites

DEHLG (2004) Quarries and Ancillary Activities, Guidelines for Planning Authorities

Department of the Environment, Heritage and Local Government (2010) Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities

Dublin City Council & Codema (2019) Dublin City Council Climate Action Plan 2019 -2024

Environmental Protection Agency (2019) GHG Emissions Projections Report - Ireland's Greenhouse Gas Emissions Projections 2018 – 2040

Environmental Protection Agency (2015) Advice Notes for Preparing Environmental Impact Statements – Draft

Environmental Protection Agency (2017) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports - Draft

Environmental Protection Agency (2020a) Air Quality Monitoring Report 2019 (& previous annual reports)

Environmental Protection Agency (2020b) Ireland's Provisional Greenhouse Gas Emissions 1990 – 2019

Environmental Protection Agency (2021) EPA website Available at: http://www.epa.ie/whatwedo/monitoring/air/

German VDI (2002) Technical Guidelines on Air Quality Control – TA Luft

Government of Ireland (2015) Climate Action and Low Carbon Development Act

Government of Ireland (2019) Climate Action Plan 2019

Government of Ireland (2020a) Draft General Scheme of the Climate Action (Amendment) Bill 2019

Government of Ireland (2020b) Climate Action and Low Carbon Development (Amendment) Bill 2020

Institute of Air Quality Management (IAQM) (2014) Guidance on the Assessment of Dust from Demolition and Construction Version 1.1

Met Éireann (2021) Met Eireann website: https://www.met.ie/

The Scottish Office (1996) Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings

Transport Infrastructure Ireland (2009) Guidelines for Assessment of Ecological Impacts of National Roads Schemes (Rev. 2, Transport Infrastructure Ireland, 2009)

Transport Infrastructure Ireland (2011) Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes

UK DEFRA (2016) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. PG(16)

UK DEFRA (2018) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM.TG(16)

UK Highways Agency (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 - HA207/07 (Document & Calculation Spreadsheet)

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

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

UK Office of Deputy Prime Minister (2002) Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance

World Health Organisation (2006) Air Quality Guidelines - Global Update 2005 (and previous Air Quality Guideline Reports 1999 & 2000)

13.0 NOISE AND VIBRATION

13.1 Introduction

This section of the EIAR has been prepared by AWN Consulting to assess the noise and vibration impact of the proposed development in the context of current relevant standards and guidance.

This assessment has been prepared by Leo Williams BAI MAI PgDip AMIOA, Acoustic Consultant at AWN Consulting who has over 5 years' experience as an environmental consultant specialising in Acoustics and Environmental Impact Assessment. He has authored numerous EIAR chapters for various developments including residential schemes, mixed-use developments, greenways and wind farms.

This chapter includes a description of the receiving ambient noise climate in the vicinity of the subject site and an assessment of the potential noise and vibration impact associated with the proposed development during both the short-term construction phase and the long-term operational phase on its surrounding environment. The assessment of cumulative noise and vibration impacts on the surrounding environment have been considered as part of the assessment.

Mitigation measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment.

13.2 Proposed Development

The development will principally consist of: the demolition of c. 4,883.9 sq m of existing structures on site including Milltown Park House (880 sq m); Milltown Park House Rear Extension (2,031 sq m); the Finlay Wing (622 sq m); the Archive (1,240 sq m); the link building between Tabor House and Milltown Park House rear extension to the front of the Chapel (74.5 sq m); and 36.4 sq m of the 'red brick link building' (single storey over basement) towards the south-western boundary; the refurbishment and reuse of Tabor House (1,575 sq m) and the Chapel (768 sq m), and the provision of a single storey glass entrance lobby to the front and side of the Chapel; and the provision of a 671 No. unit residential development comprising 604 No. Build-to-Rent apartment and duplex units (88 No. studios, 262 No. one bed units, 242 No. two bed units and 12 No. three bed units) and 67 No. Build-to Sell apartment and duplex units (11 No. studios, 9 No. one bed units, 32 No. two bed units and 15 No. three bed units). A full description of the development is available in Chapter 3 - Description of Development. Figure 13.1 illustrates the site layout in context of its location.

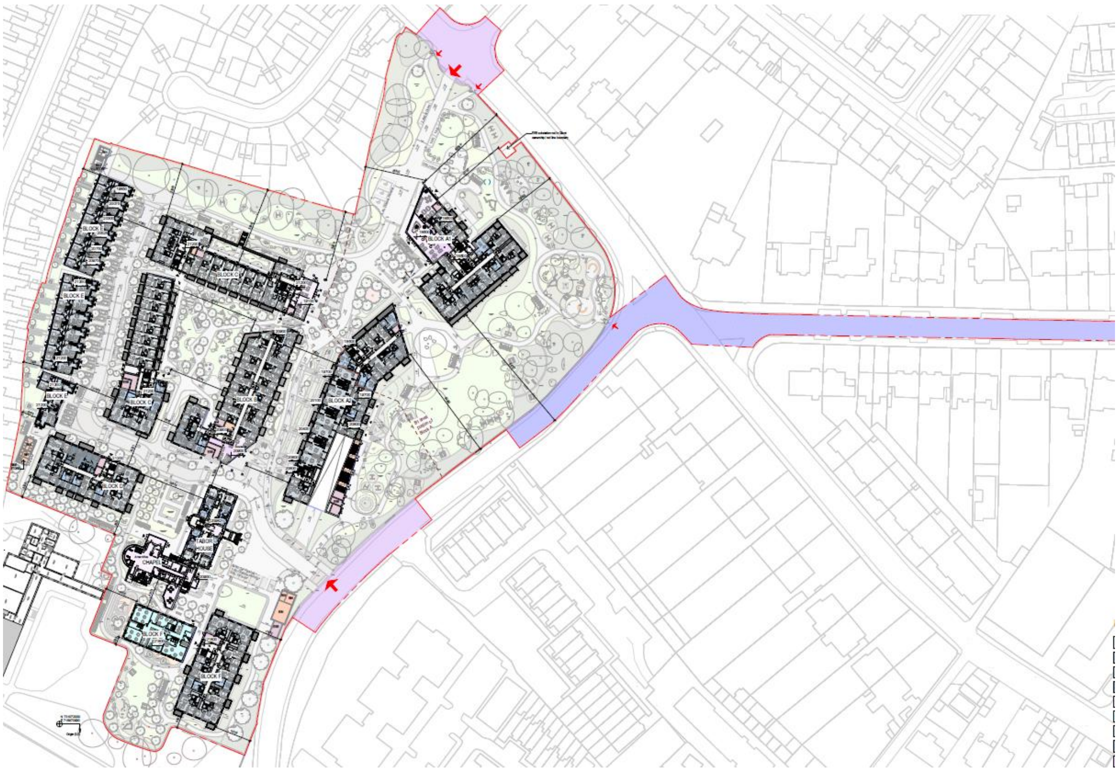


Figure 13.1: Proposed Site Layout

The construction phase will involve demolition of existing structures, site clearance, excavation over the development site, the formation of the basement levels, construction of the new buildings and landscaping.

The primary sources of outward noise that are deemed long term are mechanical plant items that will serve the development and traffic travelling to and from the development. Inward noise from road sources will also be incident on the development buildings.

13.3 Study Methodology

The assessment has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out in the following sections. In addition to specific noise and vibration guidance documents, the following Environmental Protection Agency (EPA) guidelines were considered and consulted in the preparation of this Chapter:

- Draft Advice Notes for Preparing Environmental Impact Statements (EPA 2015);
- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2017);
- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment;
- Directive 2014/52/EU of the European Parliament and of the Council of 16th April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment; and
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018)

This Chapter contains separate assessments for various aspects of the proposed development. The relevant criteria to each aspect are presented in Section 13.2.1 and referenced in each assessment section. In summary these include:

- British Standard Institute (BSI) British Standard (BS) 4142: 2014+A1:2019: Methods for Rating and Assessing Industrial and Commercial Sound (hereafter referred to as BS4142) (BSI 2019);
- BS 5228-1:2009 +A1 2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (hereafter referred to as BS 5228–1) (BSI 2014a);
- BS 5228-2:2009+A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration (hereafter referred to as BS 5228 – 2) (BSI 2014b);
- BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (hereafter referred to as BS 8233–2) (BSI 2014c);
- BS 6472-1: 2008 Guide to evaluation of human exposure to vibration in buildings, Part 1 Vibration sources other than blasting (hereafter referred to as BS 6472–1) (BSI 2008);
- BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration (hereafter referred to as BS 7385–2). (BSI 1993);
- Institute of Acoustics (IoA) ProPG: Planning and Noise. Professional Practice Guidance on Planning and Noise. New Residential Development. 2017. (hereafter referred to as ProPG) (IoA 2017).
- IoA Good Practice Guide on the Control of Noise from Pubs and Clubs (IoA 2003);
- IoA Code of Practice Guide on the Control of Noise from Pubs and Clubs (Draft) (IoA 1999);
- ISO 1996-2:2017 - Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels (hereafter referred to as ISO 1996 – 2) (ISO 2017);
- The UK Department of Transport Calculation of Road Traffic Noise (hereafter referred to as the CRTN) (UK Department of Transport 1998);
- ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures (hereafter referred to as ISO 1996 – 1) (ISO 2016);
- UK Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) LA 111 Sustainability & Environmental Appraisal LA 111 Noise and Vibration Revision 2 (hereafter referred to as DMRB Noise and Vibration) (UKHA 2020).

The study has been undertaken using the following methodology:

- Baseline noise monitoring has been undertaken across the development site to determine the range of noise levels at varying locations across the site;
- A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development,
- Predictive calculations have been performed to estimate the likely noise emissions during the construction phase of the project at the nearest sensitive locations (NSLs) to the site;

- Predictive calculations have been performed to assess the potential impacts associated with the operation of the development at the most sensitive locations surrounding the development site;
- An inward noise impact assessment has been undertaken considering the existing road noise sources impact on the proposed development; and,
- A schedule of mitigation measures has been proposed, where relevant, to control the noise and vibration emissions associated with both the construction and operational phases of the proposed development.

13.3.1 Criteria - Construction Phase

13.3.1.1 Noise

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local Authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the British Standard BS 5228-1:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Noise.*

BS5228-1 gives several examples of acceptable limits for construction or demolition noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states:

> *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."*

Paragraph E.2 goes on to state:

> *"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*
> *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
> *75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

Note that a typical planning condition in relation to construction noise issued by Local Authorities in Dublin refer also to compliance with BS 5228 Part 1 as a means of controlling impacts to the surrounding environment.

BS 5228-1, has therefore been used to inform the assessment approach for construction noise in line with normal practice.

For residential properties close to the proposed development, it is deemed appropriate to adopt a construction noise threshold of **70 dB(A)** during the daytime period. Construction noise levels above this will generate a potentially significant impact at adjacent residential properties. It is understood that no construction work will take place at night-time.

13.3.1.2 Vibration

Vibration standards address two aspects: those dealing with cosmetic or structural damage to buildings and those dealing with human comfort. For the purpose of this assessment, the range of relevant criteria used for surface construction works for both building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

Reference to the following documents has been made for the purposes of this assessment in order to discuss appropriate PPV limit values.

- British Standard BS7385: 1993: *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration*; and,
- British Standard BS5228-2: 2009 + A1: 2014: *Code of practice for noise and vibration control on construction and open sites – Vibration*.
- British Standard BS6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.*

BS5228-2 and BS7385 advise that, for soundly constructed residential property and similar structures that are generally in good repair, a threshold for minor or cosmetic (i.e. non-structural) damage should be taken as a peak component particle velocity (in frequency range of predominant pulse) of 15mm/s at 4Hz increasing to 20mm/s at 15Hz and 50mm/s at 40Hz and above. The standard also notes that below 12.5 mm/s PPV the risk of damage tends to zero.

The recommended vibration limits in order to avoid cosmetic damage to buildings, as set out in BS7385 and BS5228-2, are reproduced in Table 13.1. The documents note that minor structural damage can occur at vibration magnitudes which are greater than twice those presented in Table 13.1. Major damage to a building structure is possible at vibration magnitudes greater than four times the values set out in the table. It should be noted that these values refer to the base of the building.

Table 13.1: Transient Vibration Guide Values for Cosmetic Damage

Building Category	Vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
	4 to 15 Hz	15 to 40Hz	40Hz and above
Structurally sound and non-protected buildings	15 mm/s	20 mm/s	50 mm/s
Protected and /or potentially vulnerable buildings	6 mm/s	10 mm/s	25 mm/s

Human response to vibration stimuli occurs at orders of magnitudes below those associated with any form of building damage, hence vibration levels lower than those indicated in Table 13.2 can lead to concern. BS5228-2 also provides a useful guide relating to the assessment of human response to vibration in terms of PPV. Whilst the guide values are commonly used to compare typical human response to construction works, they tend to relate closely to general levels of vibration perception from other general sources. Table 13.2 summarises the range of vibration values and the associated potential effects on humans.

Table 13.2: Guidance on effects of human response to PPV magnitudes

Vibration Level, PPV	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies. At lower frequencies people are less sensitive to vibration.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1 mm/s	It is likely that a vibration level of this magnitude in residential environments will cause complaint.

The standards notes that single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. Where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 is more appropriate to determine whether time varying exposure is likely to give rise to any degree of adverse comment.

13.3.2 Criteria – Operational Phase

13.3.2.1 Noise

Mechanical Plant Noise

Planning conditions set by Local Authorities relating to noise emissions from mechanical plant items typically makes reference to the British Standard BS 4142: 2014+A1:2019 *Methods for Rating and Assessing Industrial and Commercial Sound*. This document is the industry standard method for analysing building services plant noise emissions to residential receptors and is the document typically used by Local Authorities in their standard planning conditions and also in complaint investigations.

BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

For an appropriate BS 4142 assessment it is necessary to compare the measured external background noise level (i.e. the $L_{A90,T}$ level measured in the absence of plant items) to the rating level ($L_{Ar,T)}$ of the various plant items, when operational. Where noise emissions are found to be tonal, impulsive in nature or irregular enough to attract attention, BS 4142 also advises that a penalty be applied to the specific level to arrive at the rating level.

The subjective method for applying a penalty for tonal noise characteristics outlined in BS 4142 recommends the application of a 2 dB penalty for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible. The following definitions as discussed in BS 4142 as summarised below:

"ambient noise level, $L_{Aeq,T}$" is the noise level produced by all sources including the sources of concern, i.e. the residual noise level plus the specific noise of mechanical plant, in terms

	of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"residual noise level, $L_{Aeq,T}$"	is the noise level produced by all sources excluding the sources of concern, i.e. the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"specific noise level, $L_{Aeq,T}$"	is the sound level associated with the sources of concern, i.e. noise emissions solely from the mechanical plant, in terms of the equivalent continuous A-weighted sound pressure level over the reference time interval [T].
"rating level, $L_{Ar,T}$"	is the specific sound level plus any adjustments for the characteristic features of the sound (e.g. tonal, impulsive or irregular components);
"background noise level, $L_{A90,T}$"	is the sound pressure level of the residual noise that is exceeded for 90% of the time period T.

If the rated plant noise level is +10 dB or more above the pre-existing background noise level then this indicates that complaints are likely to occur and that there will be a significant adverse impact at nearby noise sensitive locations, such as annoyance or sleep disturbance. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse noise impact to nearby noise sensitive locations. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low noise impact.

Some items of mechanical plant serving the development will operate 24/7 and therefore the mechanical plant noise emissions must be designed to achieve the BS4142 requirements during the more sensitive night-time period when background noise levels are lower.

Therefore, in order to limit the noise impact of mechanical plant serving the proposed development, during the detailed design of the development the specific plant noise levels will be designed to be equal or lower to the prevailing background noise level at the nearest off-site NSLs.

Appropriate assessment periods are 1hr for daytime (07:00 to 23:00 hours) and 15 minutes for night-time (23:00 to 07:00 hours) as set out in BS4142.

Additional Vehicular Traffic

Given that traffic to and from the proposed development will make use of existing surrounding roads already carrying traffic volumes, i.e. Sandford Road and Milltown Road, it is appropriate to consider the increase in traffic noise level that arises as a result of vehicular movements associated with the operation of development.

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 13.3 offers guidance as to the likely impact associated with any particular change in traffic noise level based on the Design Manual for Roads and Bridges (Source UKHA, 2020). It shows that small changes in noise levels are not normally noticeable, whereas an increase of 10 dB would be described as a doubling of loudness. In summary the assessment looks at the impact with and without development at the nearest NSLs.

Table 13.3: Significance in Change in Noise Level

Change in Sound Level (dB L_{A10})	Subjective Reaction	DMRB magnitude of Impact	EPA Classification Magnitude of Impact
0	Inaudible	No Change	Neutral
0.1 – 2.9	Barely Perceptible	Negligible	Imperceptible
3 – 4.9	Perceptible	Minor	Slight
5 – 9.9	Up to a doubling of loudness	Moderate	Moderate

Entertainment Noise

There is no Irish Standard or legislative guidance regarding the assessment of noise nuisance from entertainment source, e.g. music. However, it is good practice to specify a noise criterion relative to the existing noise levels and ensure that the proposed development has no significant impact on the nearest sensitive locations.

In the case of the proposed development there are several potential sources of entertainment noise located internally within the development across the proposed buildings. Section 13.5.3 discusses this in more detail.

The UK Institute of Acoustics (IOA) document *Good Practice Guide on the Control of Noise from Pubs and Clubs* (March 2003) contains recommendations for acoustic design criteria. This document however does not contain any objective assessment methods for music noise but defines what is considered to be inaudible music breakout as follows:

> *'Noise is considered to be inaudible when it is at low enough level such that it is not recognisable as emanating from the source in question and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question.'*

Whilst a subjective assessment of audibility will identify the likelihood of a noise nuisance, it is considered prudent to assess any noise complaint on an objective basis with respect to noise.

In order to apply an objective criterion to permit a structured analysis, we propose that the following criterion is adopted for the assessment of the entertainment noise from the proposed development:

> *The $L_{Aeq,5min}$ level measured at the nearest noise sensitive location, with entertainment taking place, shall show no increase when compared with the representative $L_{Aeq,5min}$ level measured from the same position, under the same conditions and during a comparable period with no entertainment taking place; and*
> *The $L_{eq,5min}$ level in the 63 Hz and 125 Hz octave bands at the nearest noise sensitive location, with entertainment taking place, should show no increase when compared with the representative $L_{eq,5min}$ level in the 63 Hz and 125 Hz octave bands measured from the same position, under the same conditions and during a comparable period with no entertainment taking place.*

This criterion is based on the guidance contained within the Draft IOA *Code of Practice Guide on the Control of Noise from Pubs and Clubs* (November 1999) which is guidance for the control of music noise breakout.

Creche Play Area

For other non-traffic related sources, e.g. the creche, appropriate guidance on internal noise levels for dwellings is contained within BS 8233: 2014: Guidance on Sound Insulation and Noise Reduction for Buildings. This British Standard sets out recommended noise limits for indoor ambient noise levels in dwellings as summarised in Table 13.4.

Table 13.4 Recommended Indoor Ambient Noise Levels

Typical situations	Design Range, $L_{Aeq,T}$ dB	
	Daytime $L_{Aeq,16hr}$ (07:00 to 23:00hrs)	Night-time $L_{Aeq,\ 8hr}$ (23:00 to 07:00hrs)
Living / Dining Rooms	35 / 40	n/a
Bedrooms	35	30

In relation to assessment of noise levels associated with the creche, it is appropriate to derive external limits based on the internal criteria. These are set out in Table 13.4. This is done by factoring in the degree of noise reduction afforded by a partially open window and typical 15dB attenuation is noted in this British Standard. Using this correction value across an open window, the following external noise levels would achieve the internal noise levels noted in Table 13.4 above. The creche will not operate during the night-time, i.e. 23:00 to 07:00 hours.

- Daytime / Evening (07:00 to 23:00 hours) 50 - 55dB $L_{Aeq,1hr}$

Noise emissions from Creche activity will be controlled to ensure that the resultant noise level outside the façade of any nearby dwelling, both on and offsite, will not exceed the noise level above.

Inward Noise Impact

This section considers the potential for noise impacts inwards on the proposed development due to existing and future noise sources such as noise from roads in proximity to the site.

The Professional Practice Guidance on Planning & Noise (ProPG) document was published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since its adoption, it is considered a best practice guidance and has been widely adopted in the absence of equivalent Irish guidance.

The ProPG outlines a systematic risk based 2 stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

- Stage 1 - Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels; and,
- Stage 2 – Involves a full detailed appraisal of the proposed development covering four "key elements" that include:
    - Element 1 - Good Acoustic Design Process;
    - Element 2 - Noise Level Guidelines;
    - Element 3 - External Amenity Area Noise Assessment; and,
    - Element 4 - Other Relevant Issues.

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Figure 13.2 presents the basis of the initial noise risk assessment, it provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site.

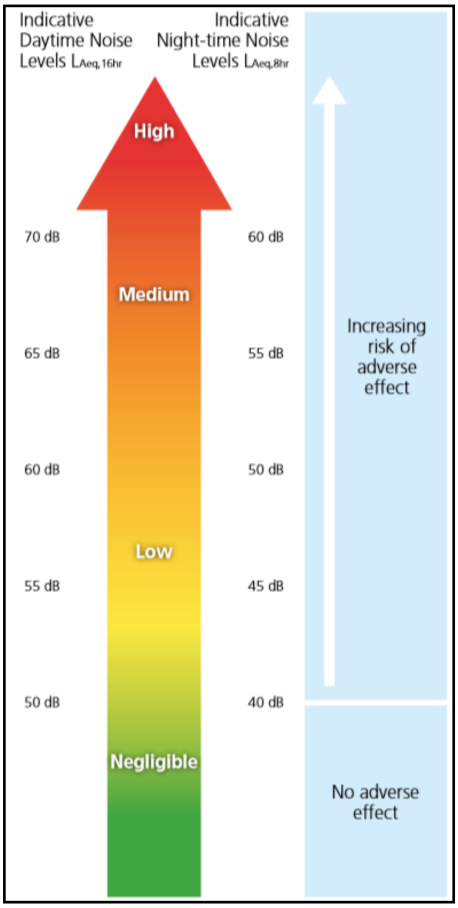


Figure 13.2: ProPG Stage 1 - Initial Noise Risk Assessment

Further, if more than 20 no. L_{AFmax} events exceed 80 dB during the night period, the site should be considered a high noise risk.

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in Table 13.5 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur.

Table 13.5: ProPG Internal Noise Levels

Activity	Location	Day (07:00 to 23:00hrs) dB $L_{Aeq,16hr}$	Night (23:00 to 07:00hrs) dB $L_{Aeq,8hr}$
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,T}$*

***Note The document comments that the internal $L_{AFmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.**

In addition to these absolute internal noise levels ProPG provides guidance on flexibility of these internal noise level targets. For instance, in cases where the development is considered necessary or desirable, and noise levels exceed the external noise guidelines, then a relaxation of the internal L_{Aeq} values by up to 5 dB can still provide reasonable internal conditions.

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$."

13.3.2.2 Vibration

Taking into account the expected activities associated with the operational phase of the proposed development, it is not anticipated that there will be any outward vibration impact associated. No further assessment of operational vibration is presented.

13.4 Receiving Environment

This section will describe the baseline situation of the site at present. Survey locations are selected in order to obtain baseline noise levels at nearby noise sensitive receivers in order to set appropriate noise criteria for the construction and operational phases of the development.

Noise surveys undertaken on site are described below and the monitoring locations illustrated on the site plan in Figure 13.3. The indicative redline boundary is illustrated in a dashed line.

13.4.1 Survey Periods

Noise surveys were carried out at the five locations by AWN over the following periods:

Table 13.6: Survey Periods

Survey	Date	Start Time	End Time
Attended Measurements	27 February 2020	11:20	15:20
Unattended Measurements	27 February to 3 March 2020	11:00	12:30

The attended survey was carried out during a weekday to obtain typical prevailing noise levels.

13.4.2 Survey Locations

To account for the varying noise environment across the proposed site and at the nearest noise sensitive receivers, 5 no. survey locations were chosen in order to capture representative prevailing noise levels.

Descriptions of the measurement locations are as follows:

NM1 Located in the south west of the site close to houses at Upper Cherryfield Avenue.

NM2 Located in the north of the site, inside the gate onto Sandford Road.

NM3 Located in front of apartments at Mound Sanford, off the Milltown Road.

NM4 Located close to houses at Garrynure, to the south of the site.

UN1 Unattended monitoring location positioned at a location representative of the proposed building façade.

13.4.3 Survey Procedure

Attended measurement periods were 15 minutes long. The results were saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up. The unattended monitor was configured to log noise levels continuously in 15 min samples.

13.4.4 Instrumentation

The surveys were performed using the equipment listed below.

Attended survey: Bruel & Kjaer 2250 (serial number: 3008402).
Unattended survey: Rion NL-52 (serial number: 1076328).

Figure 13.3: Site Layout and Survey Locations

13.4.5 Measurement Parameters

The noise survey results are presented in terms of the following parameters.

Table 13.7: Acoustic Parameters

Parameter	Description
L_{Aeq}	is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.
L_{Amax}	is the maximum sound pressure level recorded during the sample period.
L_{Amin}	is the minimum sound pressure level recorded during the sample period.
L_{A10}	is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for background noise.

Parameter	Description
L_{A90}	is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to 2x10-5 Pa.

13.4.6 Survey Results

Location NM1

Table 13.8: Summary of Attended Measured Noise Levels – NM1

Time	L_{Aeq} dB	L_{AFmax} dB	L_{AFmin} dB	L_{A10} dB	L_{A90} dB
11:40	48	57	44	49	45
12:20	47	58	43	50	45
13:00	54	67	45	58	48

It was noted during the noise survey that the primary source of noise was distant road traffic on the Milltown Road and Sandford Road. Birdsong, intermittent construction noise and plant noise from existing site buildings also provided a contribution to the overall noise environment. Ambient noise levels were in the range 48 – 54 dB L_{Aeq}. Background noise levels were in the range 45 – 48 dB L_{A90}.

Location NM2

Table 13.9: Summary of Attended Measured Noise Levels – NM2

Time	L_{Aeq} dB	L_{AFmax} dB	L_{AFmin} dB	L_{A10} dB	L_{A90} dB
11:20	64	75	51	68	55
12:00	65	76	49	68	55
12:40	65	75	49	68	55

It was noted during the noise survey that the primary source of noise was road traffic on the Sandford Road. Birdsong, passing sirens and helicopter movements also provided a contribution to the overall noise environment. Ambient noise levels were in the range 64 – 65 dB L_{Aeq}. Background noise levels were of the order of 55 dB L_{A90}.

Location NM3

Table 13.10: Summary of Attended Measured Noise Levels – NM3

Time	L_{Aeq} dB	L_{AFmax} dB	L_{AFmin} dB	L_{A10} dB	L_{A90} dB
13:25	73	83	52	76	63
14:05	73	82	52	76	61
14:43	73	82	50	77	63

It was noted during the noise survey that the primary source of noise was road traffic on the Milltown Road. Birdsong and passing pedestrian activity also provided a contribution to the overall noise environment. Ambient noise levels were of the order of 73 dB L_{Aeq}. Background noise levels were in the range 61 – 63 dB L_{A90}.

Location NM4

Table 13.11: Summary of Attended Measured Noise Levels – NM4

Time	L_{Aeq} dB	L_{AFmax} dB	L_{AFmin} dB	L_{A10} dB	L_{A90} dB
13:46	55	70	45	57	50
14:25	54	62	45	56	50
15:01	54	67	44	57	49

It was noted during the noise survey that the primary source of noise was road traffic on the Milltown Road. Birdsong and passing pedestrian activity also provided a contribution to the overall noise environment. Ambient noise levels were in the range 54 – 55 dB L_{Aeq}. Background noise levels were in the range 49 – 50 dB L_{A90}.

Location UN1

The unattended measurements collected over the survey period are summarised below.

Table 13.12: Summary of Measured Noise Levels at UN1 (dB re. 2x10-5 Pa)

Date	Period	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)		
		L_{Aeq}	L_{Amax}	L_{A90}
27 Feb	Day	56	64	52
	Night	53	61	45
28 Feb	Day	57	66	54
	Night	54	62	50
29 Feb	Day	62	71	57
	Night	60	69	54
1 Mar	Day	56	64	52
	Night	51	62	40
2 Mar	Day	56	65	53
	Night	52	61	46
3 Mar	Day	57	66	55
Average	Day	58	66	54
	Night	55	63	47

Daytime ambient noise levels were in the range of 56 to 62 dB L_{Aeq}. Daytime average maximum levels ranged from 64 to 71 dB L_{Amax}. Background noise levels were in the range of 52 to 57 dB L_{A90}.

Night-time ambient noise levels were in the range of 52 to 60 dB L_{Aeq}. Night-time average maximum levels ranged from 61 to 69 dB L_{Amax}. Background noise levels were in the range of 40 to 54 dB L_{A90}.

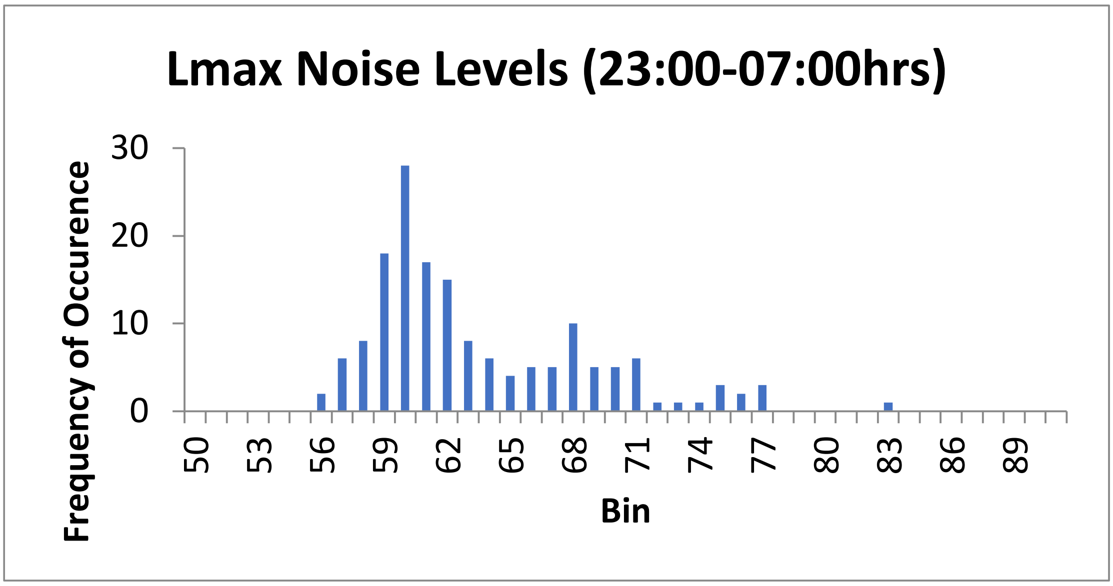


Figure 13.4: Distribution of L_{Amax} events – Night-time

In addition, the L_{AFmax} values were measured over 15-minute intervals over the duration of the unattended monitoring survey. Figure 13.4 presents the number of measured L_{AFmax} events for each decibel level during the night period measured at Location UN1. On review of the maximum noise levels the value of 68 dB L_{AFmax} is not regularly exceeded on a given night (less than 10 events).

13.5 Predicted Likely Impacts

Taking into account the characteristics of the proposed development, there is the potential for noise and vibration impacts during the short-term construction phase associated with construction activities and mobile plant, etc. During the long-term operational phase of the development there is a potential impact associated with noise emissions from mechanical plant items and from an increase in traffic coming to and from the proposed site. Noise from amenity spaces such as gym areas and the creche has also been assessed under the operational phase.

13.5.1 Construction Phase – Noise

The proposed general construction hours are 07:00 to 19:00hrs, Monday to Friday and 09:00 to 13:00 on Saturdays. Due to the type of daytime activities undertaken on a construction site of this nature, there is potential for generation of significant levels of noise.

Reference has been made to reference noise levels set out in BS5228-1 in order predict typical noise levels associated with the construction activities anticipated. Table 13.13 outlines typical plant items and associated noise levels that are anticipated for various phases of the construction programme at a standard reference distance of 10 metres from the various plant items.

Various construction methods of basement levels are currently under consideration. Each option is described below based on information provided by DBFL Consulting Engineers and have been presented in the table below for comparison and impact assessment.

Basement/Foundation Construction

The construction methods being considered for construction of foundation level are as follows:

- **Option A** – Standard pad and strip foundations to all blocks.
- **Option B** – Bored piles for Blocks D and F. Standard pad and strip to all other blocks.
- **Option C** – Ground improvement technique at Block E. Standard pad and strip to all other blocks.

Options B and C will utilise either bored piles or continuous flight auguring. The reference sound pressure levels set out in BS5228 are 80 dB L_{Aeq} and 83 dB L_{Aeq} for continuous flight auguring and bored piles respectively.

In addition to the above, sheet piles may be required for the erection of temporary retaining walls around tree roots and protected structures. This activity has been assumed as a part of each option listed above.

Table 13.13: Assumed Plant Items Reference Noise Levels

Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref.)	Construction Noise Level at 10m Distance (dB L_{Aeq})
Site Preparation	Wheeled Loader Lorry (D3 1)	75
	Tracked Excavator (C2 22)	72
	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
Demolition	Pulveriser on Tracked Excavator (C1.5)	72
	Tracked Crusher (C1.14)	82
	Breaker Mounted on Backhoe (C1.2)	92
	Dump Truck (C4.2)	78
Foundation Works	Option A	
	Tracked Excavator (C2 22)	72
	Dozer (C2.13)	78
	Concrete Pump (C3.25)	78
	Compressor (D7 6)	77
	Poker Vibrator (C4 33)	78
	Dump Truck (C4.2)	78
	Sheet Steel Piles – Hydraulic Hammer (D3.13)	78
	Option B	
	Tracked Excavator (C2.22)	72
	Dozer (C2.13)	78
	Concrete Pump (C3.25)	78
	Compressor (D7 6)	77
	Poker Vibrator (C4 33)	78
	Dump Truck (C4.2)	78
	Sheet Steel Piles – Hydraulic Hammer (D3.13)	78
	Piling Rig	80-83

Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref.)	Construction Noise Level at 10m Distance (dB L_{Aeq})
	Option C	
	Tracked Excavator (C2 22)	72
	Dozer (C2.13)	78
	Concrete Pump (C3.25)	78
	Compressor (D7 6)	77
	Poker Vibrator (C4 33)	78
	Dump Truck (C4.2)	78
	Sheet Steel Piles – Hydraulic Hammer (D3.13)	78
	Piling Rig	80-83
	Batching Plant (Lime preparation) (D6.10)	78
	Road Roller (D3.114)	80
General Construction	Hand tools	81
	Tower Crane (C4.48)	76
	Pneumatic Circular Saw (D7.79)	75
	Internal fit – out	70
Landscaping	Dozer (C2.13)	78
	Dump Truck (C4.2)	78
	Surfacing (D8.25)	68

The predicted daytime noise levels from an indicative construction period on site at the nearest off-site receptor have been calculated. Note construction noise sources for site are assumed to be running 66% of the time over soft ground. Piling operations are assumed to be running 50% of the time. The predictions have been prepared at various representative noise sensitive at various locations across the site. The nearest NSLs to the development have been identified and are illustrated in Figure 13.5.

NSL 1 Houses to the west and north of site at Norwood Park and Cherryfield Avenue, some 10 – 15m from areas of major works.

NSL 2 Accommodation at the Jesuit Community Buildings, some 25m from areas of major works.

NSL 3 Apartments to the east of site on Milltown Road, some 40m from areas of major works.

NSL 4 Houses north of site on Sandford Road, some 50m from areas of major works

Figure 13.5: Identified Sensitive Locations – Residential

The predicted construction noise associated with each of the expected construction activities is presented below for various distances from areas of major works. Not all work types are anticipated to take place across the site, distances between activities and sensitive receivers are taken into account.

Table 13.14: Predicted Construction Noise Emission Levels

Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref.)	Construction Noise Level at Distance (dB L_{Aeq})			
		NSL1 (15m)	NSL2 (25m)	NSL3 (40m)	NSL4 (50m)
Site Preparation	Wheeled Loader Lorry (D3 1)	65	60	56	54
	Tracked Excavator (C2 22)	62	57	53	51
	Dozer (C2.13)	68	63	59	57
	Dump Truck (C4.2)	68	63	59	57
	Cumulative	**72**	**68**	**64**	**62**
Demolition*	Pulveriser on Tracked Excavator (C1.5)	48	56	48	44
	Tracked Crusher (C1.14)	58	66	58	54
	Breaker Mounted on Backhoe (C1.2)	68	76	68	64
	Dump Truck (C4.2)	54	62	54	50
	Cumulative	**69**	**76**	**69**	**64**
Foundations	Option A				
	Tracked Excavator (C2 22)	62	57	53	51
	Dozer (C2.13)	68	63	59	57
	Concrete Pump (C3.25)	68	63	59	57
	Compressor (D7 6)	67	62	58	56
	Poker Vibrator (C4 33)	68	63	59	57
	Dump Truck (C4.2)	68	63	59	57
	Sheet Steel Piles – Hydraulic Hammer (D3.13)	64	62	58	58
	Cumulative	**75**	**71**	**67**	**65**
	Option B				
	Tracked Excavator (C2 22)	62	57	53	51
	Dozer (C2.13)	68	63	59	57
	Concrete Pump (C3.25)	68	63	59	57
	Compressor (D7 6)	67	62	58	56
	Poker Vibrator (C4 33)	68	63	59	57
	Dump Truck (C4.2)	68	63	59	57
	Sheet Steel Piles – Hydraulic Hammer (D3.13)	65	62	59	58
	Piling Rig	66-69	62-65	59-62	50-53
	Cumulative	**76**	**72**	**68**	**65**
	Option C				
	Tracked Excavator (C2 22)	62	57	53	51
	Dozer (C2.13)	68	63	59	57
	Concrete Pump (C3.25)	68	63	59	57
	Compressor (D7 6)	67	62	58	56
	Poker Vibrator (C4 33)	68	63	59	57
	Dump Truck (C4.2)	68	63	59	57
	Sheet Steel Piles – Hydraulic Hammer (D3.13)	64	62	58	58
	Piling Rig	66-69	62-65	59-62	50-53

Phase	Item of Plant (BS 5228-1:2009+A1:2014 Ref.)	Construction Noise Level at Distance (dB L_{Aeq})			
		NSL1 (15m)	NSL2 (25m)	NSL3 (40m)	NSL4 (50m)
	Batching Plant (Lime preparation) (D6.10)	65	65	51	48
	Road Roller (D3.114)	67	67	53	50
	Cumulative	**77**	**73**	**68**	**66**
General Construction	Hand tools	71	66	62	60
	Tower Crane (C4.48)	66	61	57	55
	Pneumatic Circular Saw (D7.79)	65	60	56	54
	Internal fit – out	60	55	51	49
	Cumulative	**73**	**68**	**64**	**62**
Landscaping	Dozer (C2.13)	65	60	56	54
	Dump Truck (C4.2)	58	53	49	47
	Surfacing (D8.25)	65	60	56	54
	Cumulative	**68**	**64**	**60**	**58**

* Demolition limited to area around the Chapel, not required site-wide.

It is important to note that the calculations set out above are based on assumed site activity and a combination of plant items operating simultaneously, as such they are typically worst-case scenarios. The use of construction noise and vibration mitigation measured measures will be employed during the construction phase with a view to minimising noise impacts.

Site Preparation

The cumulative predicted noise level associated with site preparation activities listed in Table 13.14 are predicted to exceed the threshold of 70 dB $L_{Aeq,1hr}$ at 15m distance from works, i.e. the level above which a significant noise impact is predicted to occur. This worst case assumes several plant items in operation at the closest point to a nearby noise sensitive receiver. Note that this impact will be short-term in nature and will only occur when works take place in close proximity to the site boundary.

At distances of 25m and more from works, the predicted cumulative noise levels are below the threshold and therefore a significant impact is not predicted.

Demolition

The cumulative predicted noise level associated with demolition activities listed in Table 13.14 are predicted to be just below the threshold of 70 dB $L_{Aeq,1hr}$, above which a significant noise impact is predicted to occur. Demolition is anticipated only in the area of the Chapel, therefore predicted noise levels are highest at NSL2, where there is a short-term significant impact predicted in the absence of mitigation.

Foundations

At distances of 15-40m from works the cumulative predicted noise levels associated with foundation construction listed in Table 13.14 range from 66 – 80 dB for the options listed and therefore a short-term significant noise impact is predicted.

Options A, B and C are comparable in terms of predicted noise levels, with a variance of 1-2 dB predicted depending on the method.

As works move around the site and move further from noise sensitive receivers, the predicted noise levels associated with the works decrease. The associated construction traffic associated with the foundation construction options is discussed in the Construction Traffic section below.

General Construction

With reference to Table 13.14, the cumulative predicted noise level associated with general construction activities listed in Table 13.14 are predicted to exceed the threshold of 70 dB $L_{Aeq,1hr}$ at 15m distance from works, i.e. the level above which a short-term significant impact is predicted to occur. This worst case assumes several plant items in operation at the closest point to a nearby noise sensitive receiver.

At distances of 25m and more from works, the predicted cumulative noise levels are below the threshold and therefore a significant impact is not predicted.

Landscaping

The cumulative predicted noise level at 15m distance associated with landscaping activities are predicted to be just below the threshold of 70 dB $L_{Aeq,1hr}$ all distances from works, i.e. the level above which a short-term significant noise impact is predicted to occur. This worst case assumes several plant items in operation at the closest point to a nearby noise sensitive receiver.

Construction Traffic

The noise levels associated with mobile plant items such as concrete mixer trucks, loaders etc. operational on site have been included as part of the construction noise assessment and calculated noise levels in Table 13.14. Consideration has also been given to the addition of construction traffic along the site access routes. Access to the development site for construction traffic will be via Milltown Road and the existing entrance on Sandford Road.

It is possible to calculate the noise levels associated with the passing vehicle using the following formula.

$$L_{Aeq,T} = L_{AX} + 10\log_{10}(N) - 10\log_{10}(T) + 20\log_{10}(r_1/r_2)\text{dB}$$

where:

Table 13.15: Equation Variables

Parameter	Description
$L_{Aeq,T}$	is the equivalent continuous sound level over the time period T in seconds
L_{AX}	is the "A-weighted" Sound Exposure Level of the event considered (dB)
N	is the number of events over the course of time period T
r_1	is the distance at which L_{AX} is expressed
r_2	is the distance to the assessment location

A calculation distance of 5m from the road has been used to assess noise levels at the closest buildings along the construction routes. The mean value of Sound Exposure Level for truck moving at low to moderate speeds (i.e. 15 to 45km/hr) is of the order of 82dB L_{AX} at a distance of 5 metres from the vehicle. This figure is based on a series of measurements conducted under controlled conditions.

The construction vehicle numbers for the various construction phases are summarised below:

Table 13.16: Construction Traffic Volumes

Phase		Traffic Flow (Daily Movements)
Site Preparation		140
Demolition		140
Foundations	Option A	128
	Option B	128
	Option C	128
General Construction		140
Landscaping		140

Construction vehicle numbers are anticipated to reach a maximum of 140 no. per day for site preparation, demolition, general construction and landscaping. Assuming trips are spread throughout the workday, the calculated noise level associated with 12 no. construction vehicles per hour is 61 dB $L_{Aeq,1hr}$.

For periods that may require more frequent trips, it is assumed that 20% of the daily vehicle numbers arrived in a one-hour period. The predicted noise level associated with 30 no. construction vehicles in a "peak" hour is 65 dB $L_{Aeq,1hr}$. This level is below the construction noise threshold and the prevailing noise levels along Milltown Road and Sandford Road.

During the foundations construction slightly fewer HGV trips are anticipated over shorter time period. the calculated noise level associated with 16 no. construction vehicles per hour is 63 dB $L_{Aeq,1hr}$. Options B and C require HGV trips over approximately 62 days, while for Options A and D these movements will occur over approximately 68 days. Therefore for these options the impact will prevail over a marginally larger number of days, but not to the point that a significantly different impact is associated.

Therefore a negative, slight to moderate and short-term impact is predicted in the absence of mitigation.

13.5.2 Construction Phase – Vibration

Piling

The main potential source of vibration during the construction programme is associated with piling activities, depending on the methodologies used.

Review of the foundation construction methodology indicates that Option A does not require piling, aside from discreet sections of retaining wall. Therefore, this option is predicted to generate less vibration.

The other options include piling of foundations by either bored piles/continuous flight auguring (Options B and C).

For the purposes of this assessment the expected vibration levels during piling have been determined through reference to published empirical data. The British Standard BS 5228 – Part 2*: Vibration*, publishes the measured magnitude of vibration of rotary bored piling using a 600 mm pile diameter for bored piling into soft ground over rock, (Table D.6, Ref. No. 106):

- 0.54mm/s at a distance of 5m, for auguring;
- 0.22mm/s at a distance of 5m, for twisting in casing;
- 0.42mm/s at a distance of 5m, for spinning off, and;
- 0.43mm/s at a distance of 5m, for boring with rock auger.

Considering the low vibration levels at very close distances to augured piling rigs, vibration levels at the adjoining buildings are not expected to pose any significance in terms of cosmetic or structural damage to any of the protected structures in proximity to the development works or any of the other adjacent buildings. Continuous flight auguring follows a similar mechanism, i.e. no rapid acceleration of the tools in contact with the ground and rely on steady motion and therefore the vibration levels presented are representative of this method.

The range of vibration magnitudes indicate vibration levels at the closest neighbouring buildings noted in Figure 13.5 are likely to be below the limits set out in Table 13.1 to avoid any cosmetic damage to buildings.

Regarding disturbance to building occupants, works undertaken within close proximity to the residential receptors on the site perimeter have the potential to emit perceptible vibration levels.

Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration criteria set out in Table 13.1 during all activities. Further discussion on mitigation measures during this phase are discussed in Section 13.7.

13.5.3 Operational Phase – Noise

Mechanical Plant Noise

Once operational, building services plant items will be required to serve the development. The cumulative operational noise level at the nearest noise sensitive location external to the development will be designed/attenuated to meet the relevant BS 4142 noise criteria for day and night-time periods.

Given the baseline noise levels measured and presented in Section 13.3, appropriate criteria for plant noise levels at the nearest sensitive noise receptors have been derived. Based on the varying baseline noise levels across the site the following apply:

Table 13.17: Proposed Noise Criteria for Plant Noise

Receptor Group	Day, dB $L_{Aeq,1hr}$	Night, dB $L_{Aeq,15min}$
A	45 – 48	45
B	55	47

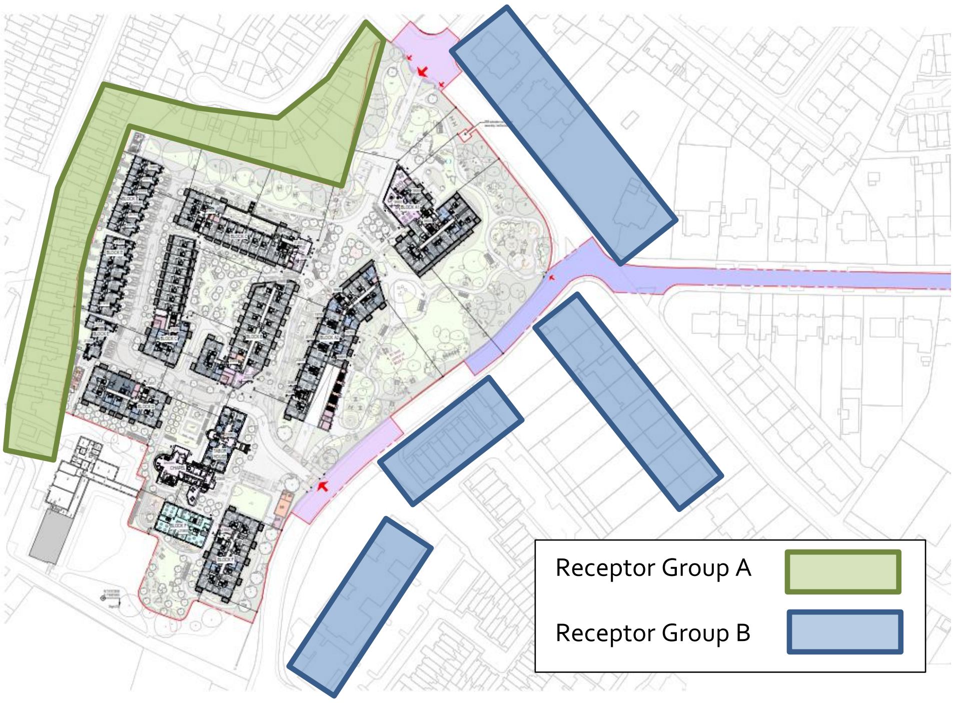


Figure 13.6: Receptor Groups

Additional Traffic on Local Roads

The proposed development has provision of some 335 No. resident parking spaces, 3 No. spaces at the creche, 4 No. set-down and 2 No. taxi spaces. Residents and visitors will journey to and from the development making use of local roads.

Figure 13.7 below illustrates the road links in the vicinity of the proposed site. The traffic flows on these road links have been provided by DBFL Consulting Engineers in the form of Annual Average Daily Traffic (AADT).

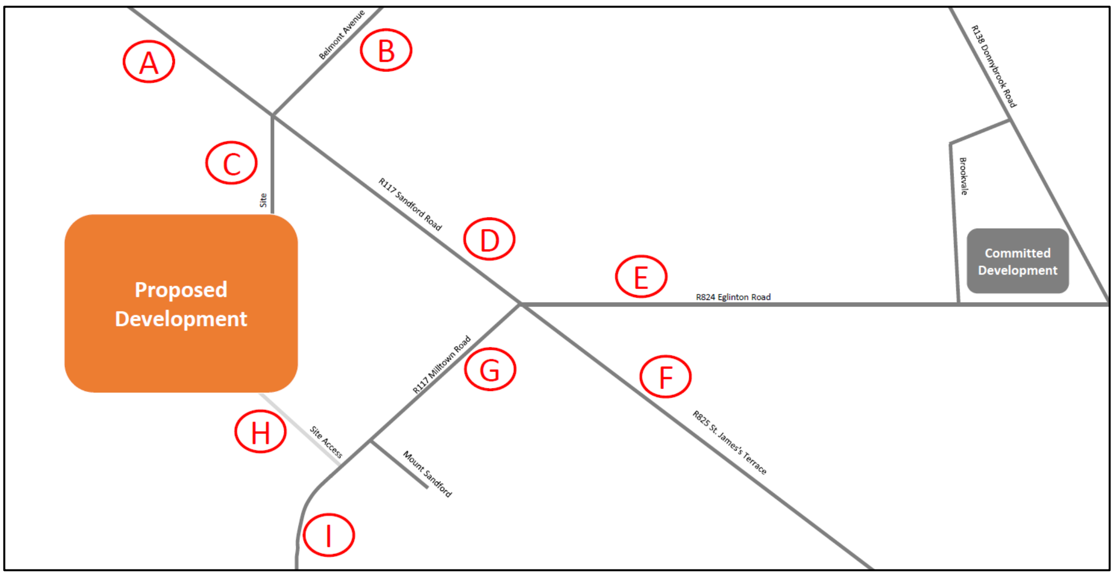


Figure 13.7: Traffic Noise Assessment – Road Links (Source: DBFL)

The predicted changes in noise level on the local road network have been calculated based on the change in traffic flows that have been provided for the various scenarios considered, i.e. Do-Nothing and Do-Something. These are presented in the tables below. This assessment considers the impact of combined traffic flows associated with the proposed development as well as nearby permitted developments.

Road links C and H are located within the proposed development. Link C will replace the existing northern entrance road and serve as a secondary entrance that connects to Sandford Road while Link H is a proposed new entrance road that will connect to the Milltown Road.

Table 13.18: Predicted Change in Traffic Noise Levels - Opening Year

Road Link	Traffic Flows – AADT		
	Do Nothing – 2022	Do Something – 2022 (With Development)	Predicted Change in Noise Level (dB)
A	18437	18956	+0.1
B	5832	5987	+0.1
D	21262	21866	+0.1
E	8064	8320	+0.1
F	11856	11856	+0.0
G	16651	17510	+0.2
I	15866	16700	+0.2

Table 13.19: Predicted Change in Traffic Noise Levels - Design Year

Road Link	Traffic Flows – AADT		
	Do Nothing – 2037	Do Something – 2037 (With Development)	Predicted Change in Noise Level (dB)
A	21721	22240	+0.1
B	6873	7027	+0.1
D	25051	25654	+0.1
E	9492	9749	+0.1
F	13966	13966	+0.0
G	19622	20481	+0.2
I	18697	19531	+0.2

At all external road links under consideration, the predicted changes in noise levels are in the range of 0.0 to 0.2 dB. With reference to Table 13.3 the corresponding impact is negligible. The overall impact is determined to be neutral, imperceptible and permanent.

Entertainment Noise

The following are examples of areas within the development may generate noise levels internally which will have the potential to generate an external impact:

- TV/Cinema room
- Communal areas
- Co-working areas

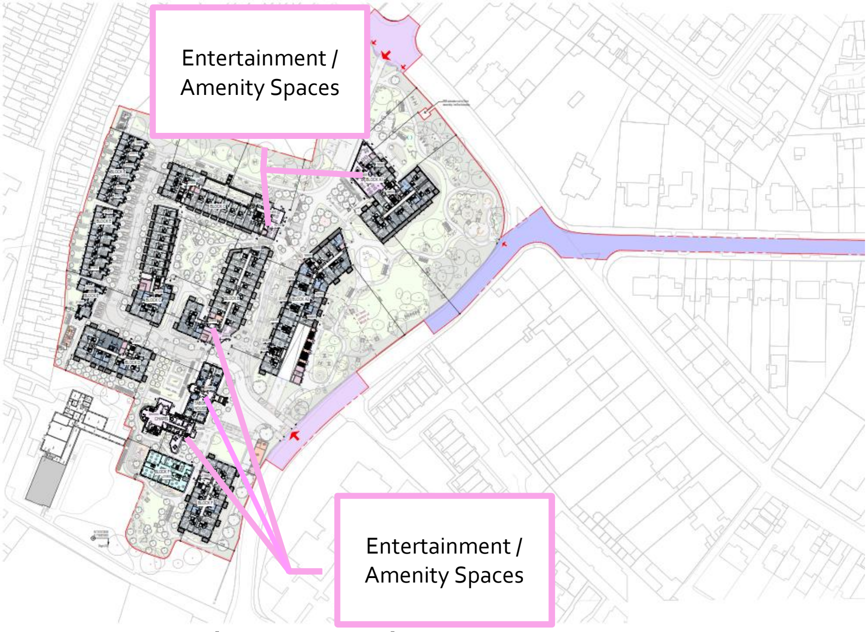


Figure 13.8: Entertainment/Amenity Spaces

The building envelope construction is a combination of precast concrete with brickwork and glazed windows. The solid wall elements will offer high levels of sound insulation, however, the windows will be weakest element.

To ensure that any music noise is inaudible relevant mitigation measures outlined in Section 13.6.2 will be incorporated at the detailed design stage. Where existing buildings are being refurbished and used as amenity space, management of the space and control of noise levels are more relevant.

Creche Play Area

Measurement of noise levels generated by children playing outdoors at several crèches and kindergartens indicate typical noise levels in the order of 56 dB $L_{Aeq,1hr}$ at distance of 5 metres. The nearest noise sensitive receptors are located at the Jesuit community building at ground and first floor levels, approximately 34 and 38m from the creche, respectively. Considering the usage of the creche area (e.g. external areas are only expected to be in use for a portion of the 16 hour daytime period) and the standard noise insulation of the façade, it is predicted that the internal criteria in Table 13.4 will be met in these closest sensitive rooms and also receptors further away, and therefore the resultant noise impact due to the creche is not significant.

13.5.4 Operational Phase – Vibration

There are no significant sources of vibration associated with the operational phase of the proposed development.

13.5.5 Operational Phase – Inward Noise Impact

The development lands in question are bound to the north by Sandford Road and Milltown Road to the east, which dominate noise levels along these boundaries. In order to establish noise levels across the development site an acoustic noise model was developed and calibrated against noise levels measured during the baseline study on site.

13.5.5.1 Noise Model of Study Area

Proprietary noise calculation software was used for the purposes of establishing the prevailing noise levels on the proposed site. The selected software, Brüel & Kjær Type 7810 Predictor, calculates noise levels in accordance with the Calculation of Road Traffic Noise (CRTN - ISBN 0 11 550847 3) issued by the UK Department of Transport in 1988. This is the standard recognised for the prediction of road traffic noise by Transport Infrastructure Ireland (TII) and the Environmental Noise Regulations 2006 SI/140 2006.

13.5.5.2 Noise Model Validation

Noise levels recorded during the unattended survey were used to calibrate the noise model to within 1 dB of the calculated values. The resultant daytime levels output from the model calibration are slightly higher that the average measured levels (UN1) but are representative of periods of higher noise levels measured on site. This is regarded as very strong correlation in respect of predicted noise levels. Noise levels are calculated over daytime periods, i.e. 07:00 to 23:00hrs and night-time periods, 23:00 to 07:00 hrs.

Table 13.20: Calculated and Measured Noise Levels at Development Site

Location	Time Period	Measured Noise Level (dB)	Calculated Noise Level (dB)
UN1	Daytime, $L_{Aeq,16hr}$	58*	62
	Night-time, $L_{Aeq,8hr}$	55	55
NM2	Daytime, $L_{Aeq,T}$	65	66
NM3	Daytime, $L_{Aeq,T}$	73	73

*Measured levels for certain daytime periods reached 62 dB $L_{Aeq,16hr}$. Higher noise level used in assessment.

Figures 13.9 and 13.10 display the calculated noise contours across the site for day and night-time periods at a height of 4m above ground, i.e. the typical height of a first floor window. The results of the modelling exercise demonstrate that highest noise levels are experienced along the north and east of the site in proximity to the road edges and reduce considerably by more than 10 dB towards the central part of the site, in the absence of any development buildings.

Figure 13.9: ProPg Stage 1 – Initial Noise Risk Assessment – Daytime

Figure 13.10: ProPg Stage 1 – Initial Noise Risk Assessment – Night-time

Giving consideration to the noise levels presented in the previous sections the initial site noise risk assessment has concluded that the level of risk across the site lies within the *Medium* to *High* noise risk categories.

ProPG states the following with respect to medium and high risks areas:

Table 13.21: ProPG Noise Risk Categories

Category	Comment
Medium Risk	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development.
High Risk	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. This risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.

Given the above it can be concluded that the development site may be categorised as *Medium* to *High* Noise Risk and as such the Acoustic Design Statement (following here and also in Section 13.6.2) is required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impacts will be avoided in the final development.

It should be noted that ProPG states the following with regard to how the initial site noise risk is to be used:

> *"2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."*

Following the guidance contained in ProPG, therefore, it does not preclude residential development on sites that are identified as having medium or high noise levels. It merely identifies the fact that a more considered approach will be required to ensure the developments on the higher risk sites are suitably designed to mitigate the noise levels. The primary goal of the approach outlined in ProPG is to ensure that the best possible acoustic outcome is achieved for a particular site.

13.5.5.3 Acoustic Design Statement – Part 1

Façade Noise Levels

Noise levels have been predicted across the proposed development site during day and night-time periods using the noise model developed to include the development buildings. Figures 13.11 and 13.12 illustrate the predicted traffic noise levels for daytime and night-time.

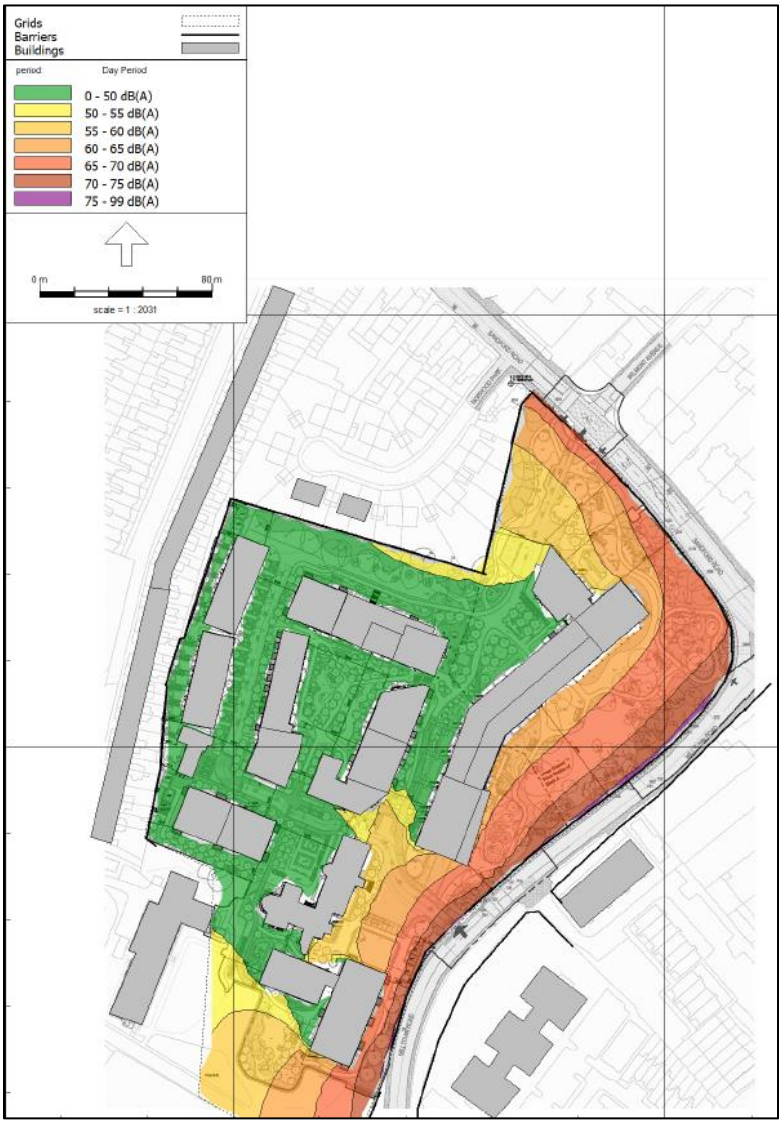


Figure 13.11: ProPg Stage 2 – Predicted Noise Levels – Daytime

Predicted daytime noise levels across the site range from 37 dB in sheltered areas, screened from road traffic, to 74 dB along the eastern boundary which faces on to Milltown Road.

Predicted night-time noise levels are in the range 30 dB to 66 dB, respective of the location across the development site, with the highest noise levels along the eastern boundary which faces on to Milltown Road.

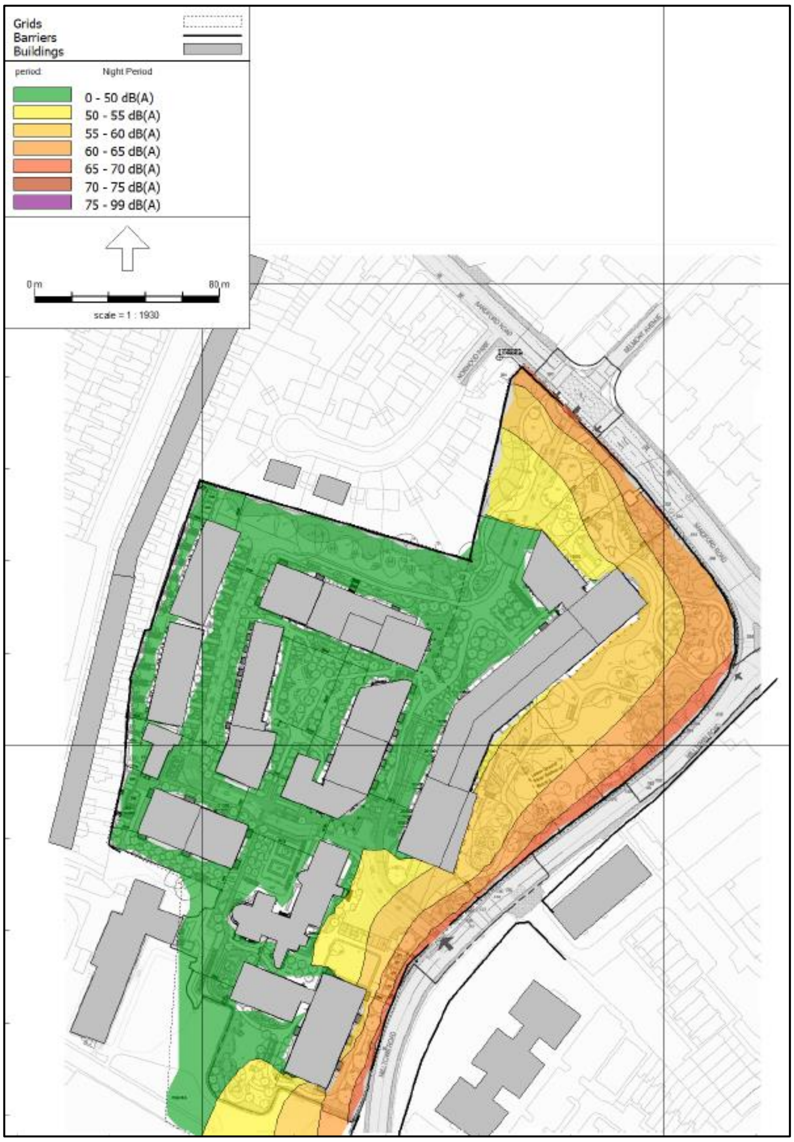


Figure 13.12: ProPg Stage 2 – Predicted Noise Levels – Night-time

Where façade noise levels are less than 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night it is possible to achieve reasonable internal noise levels while also allowing for supplementary ventilation of dwellings with open windows. Therefore, for those properties where the façade noise levels are less than 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night no further mitigation is required, e.g. Blocks B, C, D, E and the western facades of Block A and F.

Where façade levels are above the levels detailed above, the sound insulation performance of the building façade becomes important and a minimum sound insulation performance specification is required for windows and vents to ensure that when windows are closed the internal noise criteria are achieved.

Predicted noise levels on several facades are above a level whereby internal noise levels are achieved with standard double glazing and therefore mitigation in the form of enhanced glazing and ventilators will be required. These facades include:

- Block A – north, east and south façade.

- Block B – south east façade.
- Block F - north, east and south façade.

The specification of this enhanced façade is discussed in Section 13.6.2.

An external assessment maximum level of 71 dB L_{AFmax} has been assumed in the noise intrusion calculations, correcting the measured value for distance. Further assessment in this regard is recommended during the detail design stage of the Proposed Project.

External Noise Levels

Figure 13.11 presents the calculated day time noise levels across the site with the development buildings in place. The existing boundary wall will be retained along sections of the eastern and northern site boundary. The contours are calculated for a height of 1.5m.

External noise levels within the majority of communal open spaces, communal terraces and private balconies across the development site are within the recommended range of noise levels from ProPG of between 50 – 55 dB $L_{Aeq,16hr}$ as illustrated in Figure 13.13.

Outdoor space along the northern and eastern boundaries experience higher noise levels due to proximity to local roads however this is offset somewhat by the desirability of developed urban surroundings and proximity and accessibility of public transport and local amenities. There is also provision of internal communal amenity space in close proximity.

It is considered that the objectives of achieving suitable external noise levels is achieved within the overall site, therefore no further mitigation is required to control external noise levels across amenity areas.

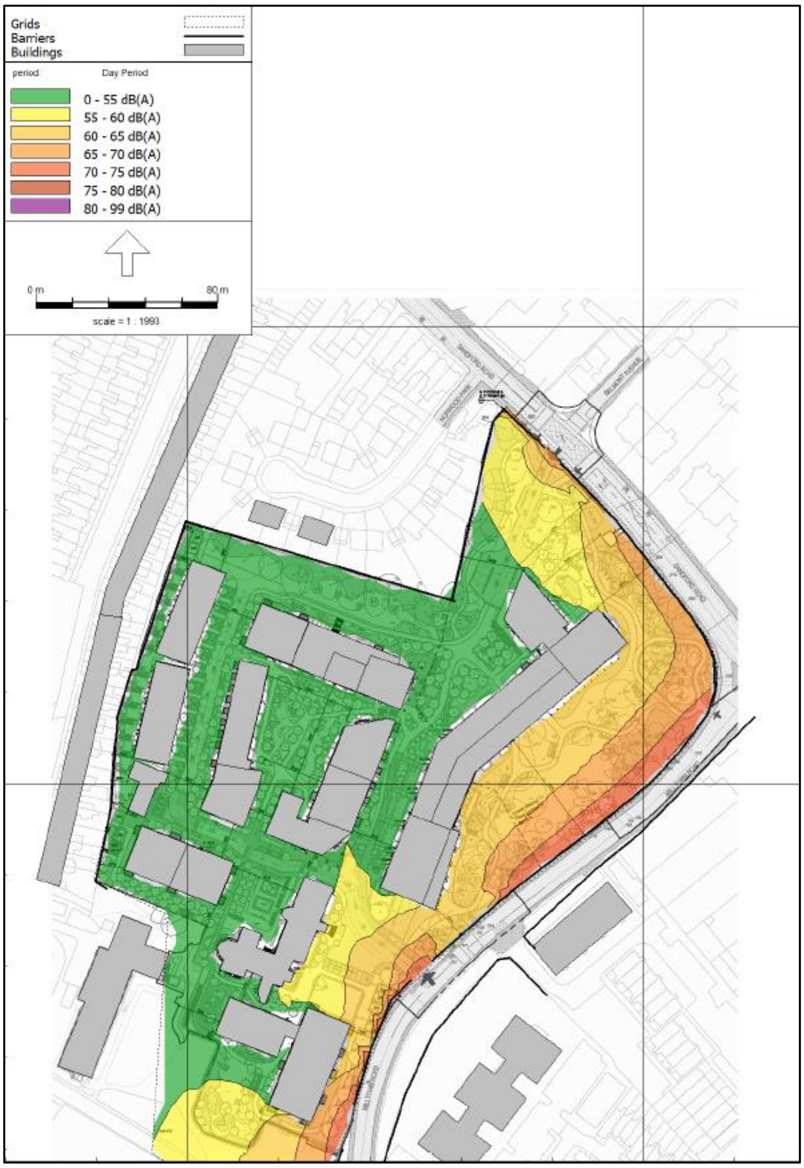


Figure 13.13: Predicted Noise Levels across External Areas (1.5m above ground)

13.6 Mitigation Measures

13.6.1 Construction Phase

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) *Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2*. Whilst construction noise and vibration impacts are expected to vary during the construction phase depending on the distance between the activities and noise sensitive buildings, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts at off-site NSLs are minimised.

The best practice measures set out in BS 5228-1 and BS 5228-2 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;

- noise control at source;
- screening; and,
- liaison with the public.

Construction activities will vary depending on the phase of construction. The following matrix identifies which mitigation measures are applicable to the various phases.

Table 13.22: Mitigation Measures

Construction Phase		Mitigation Measure			
		Selection of quiet plant	**Noise control at source**	**Piling**	**Screening**
Site Preparation		X	X		X
Demolition		X	X		X
Foundations	Option A	X	X		X
	Option B	X	X	X	X
	Option C	X	X		X
General Construction		X	X		X
Landscaping		X	X		X
		Liaison with Public	**Project Programme**	**Monitoring**	**General Measures**
Site Preparation		X	X	X	X
Demolition		X	X	X	X
Foundations	Option A	X	X	X	X
	Option B	X	X	X	X
	Option C	X	X	X	X
General Construction		X	X	X	X
Landscaping		X	X		X

Selection of Quiet Plant

The potential for any item of plant to generate noise should be assessed prior to the item being brought onto the site. The least noisy item will 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.

Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, 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 in consultation with the supplier. For example, resonance effects in panel work or cover plates will 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.

Referring to the potential noise generating sources for the works under consideration, the following best practice migration measures will be considered:

- The lifting of bulky items, dropping and loading of materials will be restricted to normal working hours.
- Mobile plant should be switched off when not in use and not left idling.
- For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud.
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant will 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.

Piling

Piling is the construction activity which is most likely to cause disturbance. General guidance in relation to piling is outlined in the following paragraphs.

Piling programmes will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. If piling works are in progress on a site at the same time as other works of construction or demolition that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

Prior to construction the planner, developer, architect and engineer, as well as the local authority, will be made aware of the proposed method of working of the piling contractor. The piling contractor will in turn have evaluated any practicable and more acceptable alternatives that would economically achieve, in the given ground conditions, equivalent structural results.

On typical piling sites the major sources of noise are essentially mobile and the noise received at any control points will therefore vary from day to day as work proceeds. The duration of piling works is typically relatively short in relation to the length of construction work as a whole, and the amount of time spent working near to noise sensitive areas can represent only a part of the piling period.

Noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover. Impact noise when piling is being driven can be reduced by introducing a non-metallic dolly between the hammer and the driving helmet.

Screening by barriers and hoardings is less effective than total enclosure but can be a useful adjunct to other noise control measures. For maximum benefit, screens should be close either to the source of noise (as with stationary plant) or to the listener. Removal of a direct line of sight between source and listener can be advantageous both physically and psychologically. In certain types of piling works there will be ancillary mechanical plant and equipment that may be stationary, in which case, care should be taken in location, having due regard also for access routes. When appropriate, screens or enclosures should be provided for such equipment.

Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. It is understood that the existing concrete perimeter wall will remain during the construction process and provide a degree of screening.

In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

Liaison with the Public

A designated environmental liaison officer will be appointed to site during construction works. Any noise complaints will be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation/ piling or other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

Monitoring

Construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion. Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise.*

Vibration monitoring stations should continually log vibration levels using the Peak Particle Velocity parameter (PPV, mm/s) in the X, Y and Z directions, in accordance with BS ISO 4866: 2010: *Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures.*

General Good Practice

General good practice measures include:

- The contractor will appoint a site representative responsible for matters relating to noise.

- A noise and vibration monitoring specialist will be appointed to periodically carry out independent monitoring of noise and vibration during random intervals and at sensitive locations for comparison with limits and background levels.

- All ancillary pneumatic percussive tools shall be fitted with mufflers or silences of the type recommended by the manufacturers, and where commercially available, dampened tools and accessories shall be used.

13.6.2 Operational Phase

Mechanical Plant Noise

As part of the detailed design of the development, plant items with appropriate noise ratings and, where necessary, appropriately selected remedial measures (e.g. enclosures, silencers etc.) will be specified in order that the adopted plant noise criteria is achieved at the façades of noise sensitive properties, including those within the development itself.

The assessment outlined earlier in this Chapter has specified cumulative plant noise limits at the nearest noise sensitive properties that must be achieved in order to ensure the impact is acceptable. To achieve these noise limits consideration will be given, at the detailed design stage, to a variety of mitigation measures and forms of noise control techniques. Some examples of these measures are as follows:

- Reduced/quiet modes;

- Duct mounted attenuators on the atmosphere side of air moving plant;

- Splitter attenuators or acoustic louvres providing free ventilation to internal plant areas;

- Solid barriers screening any external plant; and

- Anti-vibration mounts on reciprocating plant.

In addition to the above, it is proposed that the following practices are adopted to minimise potential noise disturbance for neighbours.

- All mechanical plant items e.g. motors, pumps etc. shall be regularly maintained to ensure that excessive noise generated any worn or rattling components is minimised;

- Any new or replacement mechanical plant items, including plant located inside new or existing buildings, shall be designed so that all noise emissions from site do not exceed the noise limits outlined in this document.

Entertainment Noise

The amenity spaces that have entertainment noise associated will be designed at a later stage however to ensure no negative impact associated with these spaces, the following acoustic measures will be incorporated where necessary.

Table 13.23: Acoustic Design Measures – Entertainment Noise

Measure	Description
Appropriate Linings	Proposed constructions (e.g. external walls) should be reviewed in order to determine whether additional measures are required in order to control noise emissions from the highlighted areas. These measures would typically consist of independent wall linings where appropriate.
Glazing	Where glazing is proposed in the design the installed elements should offer an appropriate sound insulation performance in order to minimise noise break out.
Doors	Access to noisy internal areas from external locations may require acoustic lobbies with double doors separated by an appropriate distance.
Ventilation	Ventilation should be supplied by suitably attenuated mechanical means. Once details of the proposed building services installation are known, consideration should be given to the potential for entertainment noise breakout to atmosphere via ductwork; the potential for services noise transfer to both external and internal areas.
Audio System	The audio systems should feature a distributed array of loudspeakers arranged such that the coverage zones are tightly controlled and all patrons are within the "near field" of one or more loudspeakers. This will limit the amount of sound energy incident upon the external walls and in turn help to control the amount of noise transfer and break-out.
Noise Level	Once the measures outlined above are implemented it would be recommended that a maximum permissible noise level be set for each venue (i.e. a noise level that should not be exceeded in order to ensure that noise emissions are kept to an acceptable level).

Inward Noise Impact – Acoustic Design Statement Part 2

As is the case in most buildings, the glazed elements and ventilation paths of the building envelope are typically the weakest element from a sound insulation perspective. In general, all wall constructions (i.e. block work or concrete and spandrel elements) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal.

In this instance, the facades highlighted in Figure 13.14 will be provided with glazing and ventilation that achieves the minimum sound insulation performances as set out in Table 13.24 and Table 13.25. Other facades in the development have no minimum requirement for sound insulation.

Table 13.24: Sound Insulation Performance Requirements for Glazing, SRI (dB)

Façade	Mark-up	Octave Band Centre Frequency (Hz)						R_w
		125	250	500	1000	2000	4000	
Block A (South)	RED	27	29	36	41	42	52	**39**
Block F	RED	27	29	36	41	42	52	**39**
Block A (North)	ORANGE	19	27	36	41	37	42	**37**

The overall R_w and $D_{ne,w}$ outlined in this section are provided for information purposes only. The over-riding requirement is the Octave Band sound insulation performance values which may also be achieved using alternative glazing and ventilation configurations. Any selected system will be required to provide the same level of sound insulation performance set out in Tables 13.24 and 13.25 or greater.

The following performance requirements apply to all ventilation paths from outside the building. This can be achieved by passive acoustic wall or window vents or via mechanical ventilation systems.

Table 13.25: Sound Insulation Performance Requirements for Ventilation, $D_{n,e,w}$ (dB)

Façade	Mark-up	Octave Band Centre Frequency (Hz)						$D_{n,e,w}$
		125	250	500	1000	2000	4000	
Block A (South)	**RED**	35	34	33	38	49	45	**39**
Block F	**RED**	35	34	33	38	49	45	**39**
Block A (North)	ORANGE	30	33	38	37	36	34	**38**

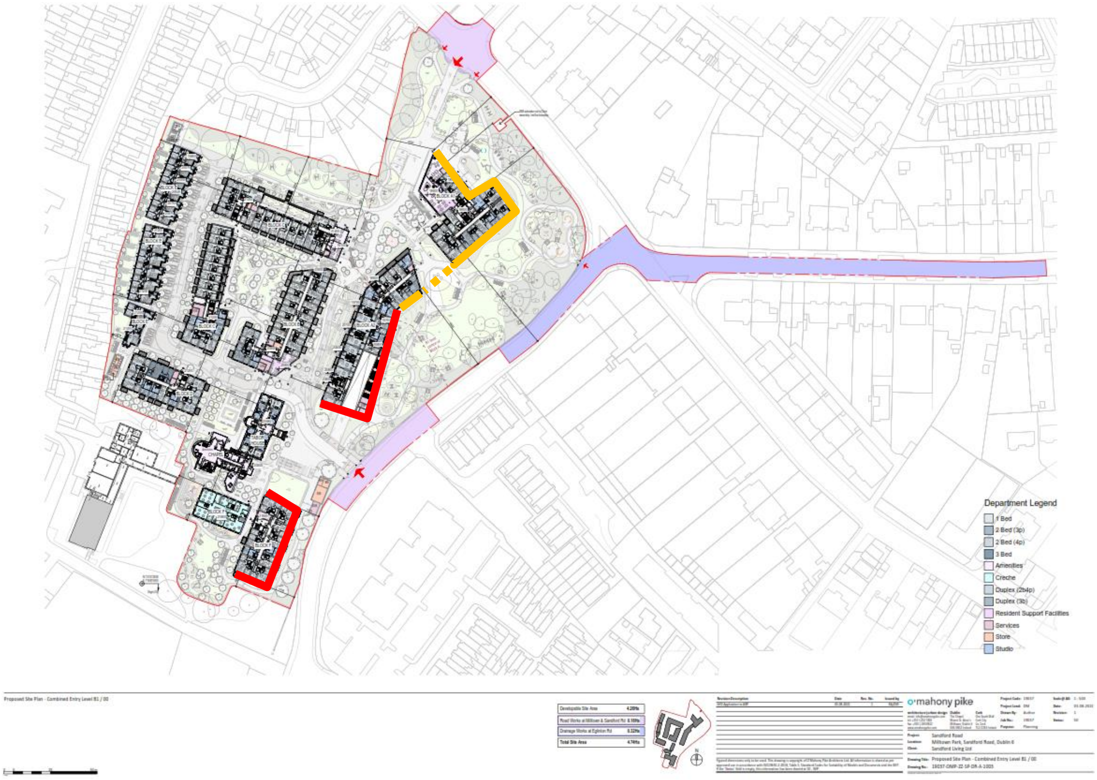


Figure 13.14: Façade Acoustic Requirements

It is important to note that the acoustic performance specifications detailed herein are minimum requirements which apply to the overall glazing and ventilation systems. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc.

The assessment has demonstrated that the recommended internal noise criteria will be achieved through consideration of the proposed façade elements at the design stage. The calculated glazing and ventilation specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage. Consequently, these may be subject to change as the project progresses. There is no acoustic requirement relating to the creche façade. Appropriate internal noise levels are predicted to be achieved with standard double glazing and ventilators.

13.7 Residual Impacts

13.7.1 Construction Phase

Noise

Demolition and piling activities are predicted to exceed the noise threshold of 70dB(A) as defined in Section 13.3.1.1 above which a significant noise impact can occur. However, this significant impact is only predicted to occur when works occur at the closest proximity to the dwellings located on the boundary of the site. In addition, it should be noted that the assessment considers all site equipment to be occurring simultaneously, however, it is unlikely that all items of plant will be in operational simultaneously. Additionally, the predictions only indicate a potential significant noise effect (based on a worst-case scenario) when working at the closest location to the dwellings, with lesser impacts predicted at all other locations across site.

Residual impacts associated with construction activities undertaken adjacent to site boundaries are categorised as:

Quality	*Significance*	*Duration*
Negative	Significant	Short-term

Residual impacts associated with works taking place 40m from receptors are:

Quality	*Significance*	*Duration*
Negative	Moderate	Short-term

Residual impacts associated with construction traffic are:

Quality	*Significance*	*Duration*
Negative	Slight to Moderate	Short-term

Vibration

It is possible that vibration from construction activities will be perceptible at receptor locations, but not of the magnitude that would cause disturbance. The impacts are predicted to be as follows:

Quality	*Significance*	*Duration*
Negative	Not significant	Short-term

13.7.1.1 Operational Phase

Noise

Mechanical Plant and Services Noise

Once cumulative plant noise emissions from the development are designed to achieve the appropriate noise criteria the residual noise impact is as follows:

Quality	*Significance*	*Duration*
Neutral	Imperceptible	Permanent

Additional Traffic on Local Roads

Based on the traffic flows associated with the operation of the proposed development the impacts are predicted to be as follows for assessed local road Links A, B and D-G :

Quality	*Significance*	*Duration*
Neutral	Imperceptible	Permanent

Entertainment Noise

Once measures are implemented with respect to entertainment noise, the impact is predicted to be as follows:

Quality	*Significance*	*Duration*
Neutral	Imperceptible	Permanent

Creche Play Area

The impacts associated with noise from the creche area are categorised as follows:

Quality	*Significance*	*Duration*
Negative	Not significant	Permanent

13.8 Monitoring

13.8.1 Construction Phase

The contractor will be required to ensure construction activities operate within the noise and vibration limits set out within this assessment. The contractor will be required to undertake regular noise and vibration monitoring at locations representative of the closest sensitive locations to ensure the relevant criteria are not exceeded.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: *Acoustics – Description, measurement and assessment of environmental noise.*

Vibration monitoring should be conducted in accordance with BS 6472:2008 *Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting* (human disturbance) and BS ISO 4866:2010 *Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures* (building damage).

13.8.2 Operational Phase

Noise or vibration monitoring is not required once the development is operational.

13.9 Reinstatement

Not applicable in the context of noise and vibration.

13.10 Interactions

13.10.1 General

In compiling this impact assessment, reference has been made to the project description provided by the project co-ordinators, project drawings provided by the project architects and information relating to mechanical plant provided by the mechanical engineers. Noise emission sources from the proposed development during the construction and operational phases will be from traffic. The noise impact assessment has been prepared in consultation with the design team and traffic engineers. Refer to the relevant chapters for additional information. Additional interactions include those relating to Chapter 10 – Lands, Soils and Geology associated with noise impacts during the development of the lands.

13.10.2 Human Health

The potential impacts on human beings in relation to the generation of noise and vibration during the construction phases are that high levels of noise and vibration could cause nuisance to people in nearby sensitive locations. Implementation of the mitigation measures set out and adherence to good practice noise reducing measures will ensure that the short-term, slight to significant, negative impacts on human health will be lessened.

Similarly, during the operational phase, plant selections designed to achieve the relevant noise criteria will result in a residual impact that is long-term, imperceptible and neutral to people in nearby noise sensitive locations. External noise sources have been assessed and mitigation to ensure internal noise levels achieve the relevant noise criteria have been provided.

13.11 Cumulative Impacts

Any noise and vibration impacts resulting from existing developments located in proximity to the proposed development have been captured in the measurement of the baseline environment at and around the proposed site. In this way, cumulative effects, i.e. the proposed development combined with existing developments, has been considered in the assessments set out in this chapter.

In respect of construction noise and vibration, there is potential for cumulative impacts at sensitive locations equidistant to both the proposed development and another development site should significant construction works be occurring simultaneously.

Receivers at further distance would be less vulnerable to cumulative effects, since during the construction phase of the proposed development, construction noise on site will be localised and will therefore likely be the primary noise source at the nearest noise sensitive receivers. A review has been carried out of permitted and proposed developments in proximity to the proposed development site. These sites will also have to adhere to an appropriate noise criteria and where necessary implement mitigation measures to reduce noise impacts. In this way, the risk of cumulative impacts is reduced.

Cumulative impacts will need to be considered and managed in the case that the construction phase of the proposed development occurs simultaneously to other permitted developments. It is recommended that liaison between construction sites is on-going throughout the duration of the construction phase. Contractors should schedule work in a co-operative effort to limit the duration and magnitude of potential cumulative impacts on nearby sensitive receptors. Cumulative construction noise impacts are expected to be negative, significant and short-term.

In respect of the operational phase, traffic flows associated with permitted developments are included in the provided traffic data used in the traffic noise impact assessment in Section 13.5.3, and therefore the potential for a cumulative impact has already been assessed. Future projects or any future currently unpermitted developments of large scale would need to conduct an EIA to ensure that no significant impacts resulting from noise and vibration will occur as a result of those developments.

Table 13.26 Summary of Construction Phase Likely Significant Effects with and without Mitigation / Monitoring

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
Construction Noise & Vibration	Local	Negative	Significant	Short-Term	Direct	Likely	The Contractor will be required to fully implement the noise & vibration mitigation measures outlined	Noise & vibration levels will be monitored during construction	Negative	Slight to Significant	Short-Term	Direct	Likely

Table 13.27 Summary of Operational Phase Likely Significant Effects with and without Mitigation / Monitoring

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
Mechanical Plant and Services Noise	Local	Neutral	Imperceptible	Permanent	Direct	Likely	plant items with appropriate noise ratings and, where necessary, appropriately selected	N/A	Neutral	Imperceptible	Permanent	Direct	Likely

							remedial measures (e.g. enclosures, silencers etc.) will be specified in order that the adopted plant noise criteria is achieved at the façades of noise sensitive properties, including those within the development itself						
Entertainment Noise	Local	Neutral	Imperceptible	Permanent	Direct	Unlikely	The proposed building construction will incorporate suitable sound insulation to control entertainment noise.	N/A	Neutral	Imperceptible	Permanent	Direct	Un-Likely
Additional Traffic on Local Roads	Local	Neutral	Imperceptible	Permanent	Direct	Likely	Not required	N/A	N/A	N/A	N/A	N/A	N/A
Creche Play Area	Local	Negative	Not Significant	Permanent	Direct	Likely	Not required	N/A	N/A	N/A	N/A	N/A	N/A

Inward Noise Impact	Local	Negative	Moderate	Permanent	Direct	Likely	Acoustic glazing and ventilation	N/A	Neutral	Not Significant	Permanent	Direct Likely

13.12 Do-Nothing Impact

In the absence of the proposed development being constructed, the noise environment at the nearest noise sensitive locations and across the development site itself will remain largely unchanged. The noise levels measured and noted during the baseline studies are considered representative of the Do-Nothing scenario. The Do-Nothing scenario is therefore considered neutral impact.

13.13 Difficulties Encountered in Compiling the Chapter

No difficulties were encountered during the formation of this chapter.

13.14 Conclusion

When considering a development of this nature, the potential noise and vibration effects on the surroundings must be considered for two stages: the short-term construction phase and the permanent operational phase.

The assessment of construction noise and vibration and has been conducted in accordance best practice guidance contained in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise and BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Vibration. Subject to good working practice as recommended in the EIAR Chapter, noise associated with the construction phase is not expected to exceed the recommended limit values for noise-sensitive locations beyond 40m from the site boundary and therefore no significant effects are expected. At distances less than 40m from the boundary, construction noise has the potential to exceed the recommended limit values depending on the construction activity occurring. A variety of standard proven best practice noise & vibration mitigation is proposed together with noise & vibration monitoring to ensure that limit values are adhered to.

This chapter demonstrates that the predicted noise levels associated with the operational phase of the proposed development will be within best practice noise limits recommended in Irish guidance, therefore it is not considered that a significant effect is associated with the development.

No significant vibration effects are associated with the operation of the site.

13.15 References

- Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment.
- Directive 2014/52/EU of the European Parliament and of the Council of 16th April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.
- European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (S.I. No. 296 of 2018).
- Dublin Agglomeration Noise Action Plan 2018 – 2023 (NAP).
- BS 8233: 2014: Guidance on sound insulation and noise reduction for buildings.

- British Standard BS 4142: 2014+A1 2019: Methods for Rating and Assessing Industrial and Commercial Sound.
- United Kingdom Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2 (UKHA 2020).
- British Standard BS 5228 (2009 +A1 2014): Code of Practice for Control of Noise and Vibration on Construction and Open Sites Part 1: Noise & Part 2: Vibration.
- British Standard BS 7385 (1993): Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration.
- British Standard BS6472-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting.
- The UK Department of Transport *Calculation of Road Traffic Noise* (hereafter referred to as the CRTN) (UK Department of Transport 1998);
- ISO 1996-1:2016 *Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures* (hereafter referred to as ISO 1996 – 1) (ISO 2016);
- ISO 1996-2:2017 - *Description, measurement and assessment of environmental noise - Part 2: Determination of sound pressure levels* (hereafter referred to as ISO 1996 – 2) (ISO 2017);
- ISO 9613 (1996): Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation.
- EPA Guidelines on the Information to be contained in Environmental Impact Statements, (EPA, 2002).
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), (EPA, 2003).
- EPA Guidelines on the Information to be contained in Environmental Impact Assessment Reports, (Draft August 2017).
- EPA Advice Notes for Preparing Environmental Impact Statements, (Draft, September 2015).
- Professional Practice Guidance on Planning & Noise (ProPG), (IoA, 2017).
- Institute of Acoustics (IOA) document *Good Practice Guide on the Control of Noise from Pubs and Clubs* (March 2003).
- Draft Institute of Acoustics IOA *Code of Practice Guide on the Control of Noise from Pubs and Clubs* (November 1999).

14.0 Material Assets – Waste Management

14.1 Introduction

This chapter of the EIAR comprises an assessment of the likely impact of the proposed development on the waste generated from the development as well as identifying proposed mitigation measures to minimise any impacts.

This chapter was prepared by Chonaill Bradley of AWN Consulting. Chonaill Bradley is a Senior Environmental Consultant in the Environment Team at AWN. He holds a BSc in Environmental Science from Griffith University, Brisbane, Australia. He is an Associate Member of the Chartered Institution of Wastes Management (CIWM). Chonaill has over seven years' experience in the environmental consultancy sector.

A site-specific Construction and Demolition Waste Management Plan (C&D WMP) has been prepared by AWN Consulting Ltd to deal with waste generation during the construction and demolition phases of the project and has been included as Appendix 14.1. The C&D WMP was prepared in accordance with the 'Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects' document produced by the National Construction and Demolition Waste Council (NCDWC) in conjunction with the Department of the Environment, Heritage and Local Government in July 2006.

A separate Operational Waste Management Plan (OWMP) has also been prepared for the operational phase of the development and is included as Appendix 14.2 of this chapter.

These documents will ensure the sustainable management of wastes arising at the development in accordance with legislative requirements and best practice standards.

14.2 Study Methodology

The assessment of the impacts of the proposed development arising from the consumptionof resources and the generation of waste materials, was carried out taking into account the methodology specified in relevant guidance documents, along with an extensive document review to assist in identifying current and future requirements for waste management including national and regional waste policy, waste strategies, management plans, legislative requirements and relevant reports. A summary of the documents reviewed, and the relevant legislation is provided in the C&D WMP and in the OWMP provided in Appendix 14.1 and 14.2.

This Chapter is based on the proposed development, as described in Chapter 3 and considers the following aspects:

- Legislative context;
- Construction phase (including preparation, excavation and levelling); and
- Operational phase.

A desk study was carried out which included the following:

- Review of applicable policy and legislation which creates the legal framework for resource and waste management in Ireland;

- Description of the typical waste materials that will be generated during the demolition, construction and operational phases; and

- Identification of mitigation measures to prevent waste generation and promote management of waste in accordance with the waste hierarchy.

Estimates of waste generation during the demolition, construction and operational phasesof the proposed development have been calculated. The waste types and estimated quantities are based on published data by the EPA in the National Waste Reports and National Waste Statistics, data recorded from similar previous developments, Irish and US EPA waste generation research, other available research sources and waste collection datafrom existing developments.

Mitigation measures are proposed to minimise the effect of the proposed development on the environment during the construction and operational phases, to promote efficient waste segregation and to reduce the quantity of waste requiring disposal. This information is presented in Section 14.6.

A detailed review of the existing ground conditions on a regional, local site-specific scale are presented in Chapter 10 Land, Soil and Geology. Chapter 10 of the EIAR also discussesthe environmental quality of any soils which will have to be excavated to facilitate construction of the proposed development.

14.2.1 Legislation and Guidance

Waste management in Ireland is subject to EU, national and regional waste legislation which defines how waste materials must be managed, transported and treated. The overarching EU legislation is the Waste Framework Directive (2008/98/EC) which is transposed into national legislation in Ireland. The cornerstone of Irish waste legislation is the Waste Management Act 1996 (as amended).

In addition, the Irish government issues policy documents which outline measures aimed to improve waste management practices in Ireland and help the country to achieve EU targets in respect of recycling and disposal of waste. The most recent policy document Waste Action Plan for a Circular Economy – Waste Management Policy in Ireland was published in 2020 and shifts focus away from waste disposal and moves it back up the production chain. The move away from targeting national waste targets is due to the Irish and international waste context changing in the years since the launch of the previous waste policy, "A Resource Opportunity" in 2012. The need to embed climate action in all strands of public policy aligns with the goals of the European Green Deal.

The strategy for the management of waste from the demolition and construction phases is in line with the requirements of the Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects published in 2006. The guidance document Construction and Demolition Waste Management: A handbook for Contractors and Site Managers was also consulted in the preparation of this assessment.

There are currently no Irish guidelines on the assessment of operational waste generation and guidance is taken from industry guidelines, plans and reports including the EMR Waste Management Plan 2015 – 2021, BS 5906:2005 Waste Management in Buildings – Code of Practice, 5. The Dublin City Council (DCC) Dublin City Council (Storage, Presentation and Segregation of Household and Commercial Waste) Bye-Laws 2018, the EPA National Waste Database Reports 1998 – 2018 and the EPA National Waste Statistics Web Resource.

14.3 The Existing Receiving Environment (Baseline Scenario)

In terms of waste management, the receiving environment is largely defined by Dublin City Council (DCC) as the local authority responsible for setting and administering waste management activities in the area. This is governed by the requirements set out in the Eastern-Midlands Region (EMR) Waste Management Plan 2015-2021.

The waste management plan sets out the following targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

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. The Waste Action Plan for a Circular Economy continues with this target of keeping the reuse, recycling and other recovery of construction and demolition waste at or above 70%.

The National Waste Statistics update published by the EPA in August 2020 identifies that Ireland's current progress against this C&D waste target is at 77% and our progress against 'Preparing for reuse and recycling of 50% by weight of household derived paper, metal, plastic & glass (includes metal and plastic estimates from household WEEE)' is at 51%. Both of these targets were required to be met by 12 December 2020 in accordance with the requirements of the Waste Framework Directive, however the EPA are yet to confirm that these were met.

The Dublin City Council Development Plan 2016 – 2022 also sets policies and objectives for the DCC area which reflect those set out in the regional waste management plan.

In terms of physical waste infrastructure, DCC no longer operates any municipal waste landfill in the area. There are a number of permitted and licensed waste facilities located in the Eastern-Midlands Waste Region for management of waste from the construction industry as well as municipal sources. These include soil recovery facilities, inert C&D waste facilities, hazardous waste treatment facilities, municipal waste landfills, material recovery facilities, waste transfer stations and two waste-to-energy facilities.

14.4 Characteristics of the Proposed Development

A full description of the development can be found in Chapter 3. The characteristics of the development that are relevant in terms of waste management are summarised below.

14.4.1 Demolition Phase

There will be a quantity of waste materials generated from the demolition of some of the existing buildings and hardstanding areas on site, as well as from the excavation of the building foundations.

Further detail on the waste materials likely to be generated during the demolition works are presented in the project-specific C&D WMP in Appendix 14.1. The C&D WMP provides an estimate of the main waste types likely to be generated during the C&D phase of the proposed development. The reuse, recycling/recovery and disposal rates have been estimated using the EPA National Waste Reports and these are summarised in Table 14.1.

Table 14.1 Estimated off-site reuse, recycle and disposal rates for demolition waste

Waste Type	Tonnes	Reuse		Recycle/Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Glass	266.3	0	0.0	85	226.3	15	39.9
Concrete, Bricks, Tiles, Ceramics	1508.9	30	452.7	65	980.8	5	75.4
Plasterboard	118.3	30	35.5	60	71.0	10	11.8
Asphalts	29.6	0	0.0	25	7.4	75	22.2
Metal	443.8	5	22.2	80	355.0	15	66.6
Slate	236.7	0	0.0	85	201.2	15	35.5
Timber	355.0	10	35.5	60	213.0	30	106.5
Total	**2958.7**		**545.9**		**2054.8**		**358.0**

14.4.2 Construction Phase

During the construction phase, waste will be produced from surplus materials such as broken or off-cuts of timber, plasterboard, concrete, tiles, bricks, etc. Waste from packaging (cardboard, plastic, timber) and oversupply of materials may also be generated. The construction contractor will be required to ensure that oversupply of materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

In addition, soil & stone will require excavation to facilitate the basement and construction of foundations, along with the installation of underground services. The project engineers have estimated that between c.74,000 m^3 and c. 80,000 m^3 of material will require excavation. It is envisaged that most of this material will be removed offsite site with c. 10,000 m^3 of material expected to be kept for onsite reuse. Table 14.2 shows the proposed foundation options and the associated estimated excavation and removal quantities of material. The proposed variation in quantities of excavated material from the proposed foundation strategy options will have an imperceptible effect between the options. The below estimates will be refined prior to commencement of construction. If the material that requires removal from site is deemed to be a waste, removal and reuse/recycling/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). The volume of waste requiring recovery/disposal will dictate whether a Certificate of Registration (COR), permit or licence is required for the receiving facility. Alternatively, the material may be classed as by-product under Article 27 classification (European Communities (Waste Directive) Regulations 2011, S.I. No. 126 of 2011) subject to meeting certain criteria.

Table 14.2 *Estimated quantum of site soil generation for the different foundation options*

Foundation Option	Quantum of Soil Excavated	Quantum of Soil to be Removed
Standard Pad & Strip Foundations to All Blocks incl. Basement	80,000m^3	70,000m^3
Pads & Strips to All Blocks except Bored Piles to Block D & F	74,000m^3	64,000m^3
Pads & Strips to All Blocks except Ground Improvement to Block E	80,000m^3	70,000m^3

In order to establish the appropriate reuse, recovery and/or disposal route for the soils and stones to be removed off-site, it will first need to be classified. Waste material will initially need to be classified as hazardous or non-hazardous in accordance with the EPA publication Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous. Environmental soil analysis will be carried out prior to removal of the material on a number of the soil samples in accordance with the requirements for acceptance of waste at landfills (Council Decision 2003/33/EC Waste Acceptance Criteria). This legislation sets limit values on landfills for acceptance of waste material based on properties of the waste including potential pollutant concentrations and leachability. It is anticipated that the surplus material will be suitable for acceptance at either inert or non-hazardous soil recovery facilities/landfills in Ireland or, in the unlikely event of hazardous material being encountered, be transported for treatment/recovery or exported abroad for disposal in suitable facilities.

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.

Further detail on the waste materials likely to be generated during the excavation and construction works are presented in the project-specific C&D WMP. The C&D WMP provides an estimate of the main waste types likely to be generated during the C&D phase of the proposed development and these are summarised in Table 14.3.

Table 14.3 Estimated off-site reuse, recycle and disposal rates for construction waste

Waste Type	Tonnes	Reuse		Recycle/Recovery		Disposal	
		%	Tonnes	%	Tonnes	%	Tonnes
Mixed C&D	1125.7	10	112.6	80	900.6	10	112.6
Timber	955.1	40	382.1	55	525.3	5	47.8
Plasterboard	341.1	30	102.3	60	204.7	10	34.1
Metals	272.9	5	13.6	90	245.6	5	13.6
Concrete	204.7	30	61.4	65	133.0	5	10.2
Other	511.7	20	102.3	60	307.0	20	102.3
Total	**3411.2**		**774.3**		**2316.2**		**320.6**

14.4.3 Operational Phase

As noted in Section 14.1, an OWMP has been prepared for the development and is included as Appendix 14.2. The OWMP provides a strategy for segregation (at source), storage and collection of all wastes generated within the building during the operational phase including dry mixed recyclables, organic waste and mixed non-recyclable waste as well as providing a strategy for management of waste glass, batteries, WEEE, printer/toner cartridges, chemicals, textiles, waste cooking oil and furniture.

The total estimated waste generation for the development for the main waste types based on the AWN Waste Generation Model (WGM) is presented in Table 14.4, 14.5 & 14.6 below, and are based on the uses and areas as advised by the project architects (O'Mahony Pike) August 2021.

Table 14.4 *Estimated waste generation for the Residential Unit Blocks*

Waste Type	Waste Volume (m^3/week)			
	Block A1	Block A2	Block B	Block C
Organic Waste	1.44	1.90	1.23	2.22
Dry Mixed Recyclables	10.20	13.02	8.69	15.70
Glass	0.28	0.37	0.24	0.43
Mixed Non-Recyclables	5.37	7.57	4.57	8.26
Total	**17.29**	**22.87**	**14.73**	**26.60**

***Table 14.5** Estimated waste generation for the Residential Unit Blocks, Duplex Units*

Waste Type	Waste Volume (m³/week)			
	Block D	Block E Duplex Units	Block F	Tabor House
Organic Waste	0.56	0.50	1.32	0.33
Dry Mixed Recyclables	3.94	3.56	9.36	2.36
Glass	0.11	0.10	0.26	0.06
Mixed Non-Recyclables	2.07	1.87	4.92	1.24
Total	**6.67**	**6.02**	**15.86**	**4.00**

***Table 14.6** Estimated waste generation for the Creche Unit*

Waste Type	Waste Volume (m³/week)
	Creche
Organic Waste	0.04
Dry Mixed Recyclables	1.40
Glass	0.00
Mixed Non-Recyclables	0.76
Total	**2.20**

The residents and tenants will be required to provide and maintain appropriate waste receptacles within their units to facilitate segregation at source of these waste types. The location of the bins within the units will be at the discretion of the residents. As required, the residents and tenants staff will need to bring these segregated wastes from their units to their allocated Waste Storage Areas (WSAs). All WSA's can be viewed on the plans submitted with the application.

The OWMP seeks to ensure the development contributes to the targets outlined in the EMR Waste Management Plan 2015 – 2021 and the DCC waste Bye-laws.

Mitigation measures proposed to manage impacts arising from wastes generated during the operation of the proposed development are summarised below.

14.5 Potential Impact of the Proposed Project

This section details the potential waste effects associated with the proposed development.

14.5.1 Construction Phase

The proposed development will generate a range of non-hazardous and hazardous waste materials during site excavation, demolition and construction. General housekeeping and packaging will also generate waste materials as well as typical municipal wastes generated by construction employees including food waste. Waste materials will be required to be temporarily stored on site pending collection by a waste contractor. If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the development and on adjacent developments. The indirect effect of litter issues is the presence of vermin within the development and the surrounding areas. In the absence of mitigation measures the effect on the local environment is likely to be short term, significant and negative.

The use of non-permitted waste contractors or unauthorised waste facilities could give rise to inappropriate management of waste and result in indirect negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices. However, in the absence of mitigation, the effect on the local and regional environment is likely to be short term, significant and negative.

Wastes arising will need to be taken to suitably registered/permitted/licenced waste facilities for processing and segregation, reuse, recycling, recovery, and/or disposal as appropriate. There are numerous licensed waste facilities in the Eastern Midlands region which can accept hazardous and non-hazardous waste materials and acceptance of waste from the proposed development would be in line with daily activities at these facilities. At present, there is sufficient capacity for the acceptance of the likely C&D waste arisings at facilities in the region. The majority of demolition and construction materials are either recyclable or recoverable. In the absence of mitigation measures the effect on the local environment is likely to be short term, significant and negative.

There is a quantity of excavated material which will need to be excavated to facilitate the proposed development. A detailed review of the existing ground conditions on a regional, local site-specific scale are presented in Chapter 10. It is anticipated that between c. 64,000m^3 and c. 70,000m^3 of excavated material will need to be removed offsite, however it is envisaged that c.10,000m^3 of excavated material will be reused onsite. Correct classification and segregation of the excavated material 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. However, in the absence of mitigation, the effect on the local and regional environment is likely to be short term, significant and negative.

14.5.2 Operational Phase

The potential impacts on the environment of improper, or a lack of, waste management during the operational phase would be a diversion from the priorities of the waste hierarchy which would lead to small volumes of waste being sent unnecessarily to landfill. However, in the absence of mitigation**,** the effect on the local and regional environment is likely to be *short-term*, *significant* and *negative.*

The nature of the development means the generation of waste materials during the operational phase is unavoidable. Networks of waste collection, treatment, recovery and disposal infrastructure are in place in the region to manage waste efficiently from this type of development. Waste which is not suitable for recycling is typically sent for energy recovery. There are also facilities in the region for segregation of municipal recyclables which is typically exported for conversion in recycled products (e.g. paper mills and glass recycling). If waste material is not managed and stored correctly, it is likely to lead to litter or pollution issues at the development and on adjacent developments. The knock-on effect of litter issues is the presence of vermin within the development and the surrounding areas.

However, in the absence of mitigation, the effect on the local environment is likely to be long term, significant and negative.

Waste contractors will be required to service the development on a regular basis to remove waste. The use of non-permitted waste contractors or unauthorised facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices. However, in the absence of mitigation, the effect on the local environment is likely to be long term, significant and negative.

In the absence of mitigation measures the potential impact of operational waste generation from the development is considered to be long-term, not significant and negative.

14.6 Avoidance, Remedial & Mitigation Measures

This section outlines the measures that will be employed in order to reduce the amount of waste produced, manage the wastes generated responsibly and handle the waste in such a manner as to minimise the effects on the environment.

14.6.1 Construction Phase

As previously stated, a project specific C&D WMP has been prepared in line with the requirements of the requirements of the guidance document issued by the Department of Environment Heritage, Local Government (DoEHLG) and is included as Appendix 14.1. Adherence to the high-level strategy presented in this C&D WMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the demolition, excavation and construction phases of the proposed development. Prior to commencement, the contractor(s) will be required to refine/update the C&D WMP or submit an addendum to C&D WMP to DCC to detail specific measures to minimise waste generation and resource consumption and provide details of the proposed waste contractors and destinations of each waste stream.

A quantity of soil, stone and made ground which will need to be excavated to facilitate the proposed development. Project Engineers have estimated that between c. 64,000m^3 and c. 70,000m^3 of excavated material will need to be removed offsite, however it is envisaged that c. 10,000m^3 excavated material will be reused onsite. Correct classification and segregation of the excavated material 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.

In addition, the following mitigation measures will be implemented:

- Building materials will be chosen with an aim to 'design out waste';
- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery – it is anticipated that the following waste types, at a minimum, will be segregated:
    - Concrete rubble (including ceramics, tiles and bricks);
    - Plasterboard;

- Metals;
- Glass; and
- Timber.

- Left over materials (e.g. timber off-cuts, broken concrete blocks/bricks) and any suitable construction materials shall be re-used on-site, where possible;

- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site;

- Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required);

- A waste manager will be appointed by the main contractor(s) to ensure effective management of waste during the excavation and construction works;

- All construction staff will be provided with training regarding the waste management procedures;

- All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal;

- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities; and

- All waste leaving the site will be recorded and copies of relevant documentation maintained.

Nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, if required. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the EC (Waste Directive) Regulations (2011). EPA approval will be obtained prior to moving material as a by-product.

These mitigation measures will ensure that the waste arising from the construction phase of the development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations and the Litter Pollution Act 1997, the EMR Waste Management Plan (2015-2021). It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will encourage sustainable consumption of resources.

14.6.2 Operational Phase

As previously stated, a project specific OWMP has been prepared and is included as Appendix 14.2. Implementation of this OWMP will ensure a high level of recycling, reuse and recovery at the development. All recyclable materials will be segregated at source to reduce waste contractor costs and ensure maximum diversion of materials from landfill, thus achieving the targets set out in the EMR Waste Management Plan 2015 – 2021 and abiding by the DCC waste bye-laws.

In addition, the following mitigation measures will be implemented:

- On-site segregation of all waste materials into appropriate categories including (but not limited to):
    - Organic waste;
    - Dry Mixed Recyclables;
    - Mixed Non-Recyclable Waste;
    - Glass;
    - Waste electrical and electronic equipment (WEEE);
    - Batteries (non-hazardous and hazardous);
    - Cooking oil;
    - Light bulbs;
    - Cleaning chemicals (pesticides, paints, adhesives, resins, detergents, etc.);
    - Furniture (and from time to time other bulky waste); and
    - Abandoned bicycles.

- All waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly identified with the approved waste type to ensure there is no cross contamination of waste materials;

- All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available; and

- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.

These mitigation measures will ensure the waste arising from the development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations, the Litter Pollution Act 1997, the EMR Waste Management Plan (2015 - 2021) and the DCC waste bye-laws. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

14.7 Residual Impacts

The implementation of the mitigation measures outlined in Section 14.6 will ensure that the high rate of reuse, recovery and recycling is achieved at the development during the demolition, excavation and construction phases as well as during the operational phase. It will also ensure that European, National and Regional legislative waste requirements with regard to waste are met and that associated targets for the management of waste are achieved.

14.7.1 Construction Phase

A carefully planned approach to waste management as set out in Section 14.6 and adherence to the C&D WMP during the construction and demolition phase will ensure that the effect on the environment will be short-term, imperceptible and neutral.

14.7.2 Operational Phase

During the operational phase, a structured approach to waste management as set out in

Section 14.6 and adherence to the OWMP will promote resource efficiency and waste minimisation. Provided the mitigation measures are implemented and a high rate of reuse, recycling and recovery is achieved, the predicted effect of the operational phase on the environment will be long-term, imperceptible and neutral.

14.8 Monitoring

The management of waste during the construction phase should be monitored to ensure compliance with relevant local authority requirements, and effective implementation of the C&D WMP including maintenance of waste documentation.

The management of waste during the operational phase should be monitored to ensure effective implementation of the OWMP by the building management company and the nominated waste contractor(s).

14.8.1 Construction Phase

The objective of setting targets for waste management is only achieved if the actual waste generation volumes are calculated and compared. This is particularly important during the demolition, excavation and construction phases where there is a potential for waste management to become secondary to progress and meeting construction schedule targets. The C&D WMP specifies the need for a waste manager to be appointed who will have responsibility to monitor the actual waste volumes being generated and to ensure that contractors and sub-contractors are segregating waste as required. Where targets are not being met, the waste manager should identify the reasons for targets not being achieved and work to resolve any issues. Recording of waste generation during the project will enable better management of waste contractor requirements and identify trends. The data should be maintained to advise on future projects.

14.8.2 Operational Phase

During the operational phase, waste generation volumes should be monitored against the predicted waste volumes outlined in the OWMP. There may be opportunities to reduce the number of bins and equipment required in the WSAs where estimates have been too conservative. Reductions in bin and equipment requirements will improve efficiency and reduce waste contactor costs.

14.9 Reinstatement

In the event that the proposed development is discontinued, there is not likely to be any significant impacts on waste management at the site.

14.10 Cumulative Impacts

14.10.1 Construction Phase

If multiple permissions remain in place for both residential and commercial developments within the vicinity of the proposed Project. In a worst-case scenario, multiple developments in the area could be developed concurrently or overlap in the Construction Phase. Due to the high number of waste contractors in the Dublin region there would be sufficient contractors available to handle waste generated from a large number of these sites simultaneously, if required. Similar waste materials would be generated by all the developments.

Other developments in the area will be required to manage waste in compliance with national and local legislation, policies and plans which will minimise/mitigate any potential cumulative effects associated with waste generation and waste management. As such the effect will be short-term, not significant and neutral**.**

14.10.2 Operational Phase

The nature of the development means the generation of waste materials during the Operational Phase is unavoidable. Waste estimations for the Operational Phase of thE proposed Project are provided in Table 14.4, 14.5 & 14.6. Networks of waste collection, treatment, recovery and disposal infrastructure are in place in the region to manage waste efficiently from this type of development. At present, there is sufficient capacity for the acceptance of the likely operational waste arisings at facilities in the region. Waste which is not suitable for recycling is typically sent for energy recovery. There are also facilities in the region for segregation of municipal recyclables which are typically exported for conversion into recycled products (e.g. paper mills and glass recycling). At present, there is sufficient capacity for the acceptance of the likely operational waste arisings at facilities in Europe.

Waste contractors will be required to service the proposed Project on a regular basis to remove waste. The use of non-permitted waste contractors or unauthorised facilities could give rise to inappropriate management of waste and result in negative environmental impacts or pollution. It is essential that all waste materials are dealt with in accordance with regional and national legislation, as outlined previously, and that time and resources are dedicated to ensuring efficient waste management practices. The potential impact of operational waste generation from the proposed Project is considered to be long-term, not significant and neutral.

Table 14.7 Summary of Construction Phase Likely Significant Effects with and without out Mitigation / Monitoring

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
Litter Pollution	Local	Negative	Significant	Short-Term	Direct	Likely	The Contractor will be required to fully implement the C&D WMP throughout the duration of the proposed construction phase.	The Contractor will review and maintain waste records and site audits	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Unlicensed Waste Collection (Illegal Dumping)	Local & Regional	Negative	Significant	Long-Term	Direct	Likely	All waste leaving the site will be recorded and copies of relevant documentation maintained.	A register will be maintained and reviewed. A copy of all waste collection permits will be maintained.	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Insufficient Waste Facilities	Local & Regional	Negative	Significant	Short-Term	Direct	Likely	All waste leaving the site will be recorded and copies of relevant documentation maintained.	A register will be maintained and reviewed. A copy of all waste collection permits will be maintained.	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Lack of waste Classification	Local & Regional	Negative	Significant	Short-Term	Direct	Likely	All waste material leaving site will be	An appointed Waste Manager will	Neutral	Not Significant	Short-Term	Direct	Un-Likely

							correctly classified and segregation prior to removal where possible.	monitor all onsite waste segregation and classification					

Table 14.8 Summary of Operational Phase Likely Significant Effects with and without out Mitigation / Monitoring

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
Unlicensed Waste Collection (Illegal Dumping)	Negative	Negative	Significant	Long-Term	Direct	Likely	The Operator / Facilities Manager will ensure that all waste leaving the Site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.	The Operator / Facilities Manager will maintain waste receipts onsite for a period of 7 years and make available to DCC as requested.	Neutral	Not Significant	Short-Term	Direct	Un-Likely
Poor Waste Segregation	Negative	Negative	Significant	Long-Term	Direct	Likely	The Operator / Facilities Manager will ensure that all waste materials will be stored in colour coded bins or other suitable receptacles in designated,	Waste generation volumes will be monitored by the Operator / Facilities Manager.	Neutral	Not Significant	Short-Term	Direct	Un-Likely

							easily accessible locations. Bins will be clearly identified with the approved waste type to ensure there is no cross contamination of waste materials.						
Litter Pollution	Negative	Negative	Significant	Short-Term	Direct	Likely	The Operator / Facilities Manager will ensure that all waste collected from the Site of the proposed Development will be reused, recycled or recovered, where possible, with the exception of those waste streams where appropriate facilities are currently not available	Waste storage areas will be monitored by the Operator / Facilities Manager.	Neutral	Not Significant	Short-Term	Direct	Un-Likely

14.11 'Do-Nothing' Impact

If the proposed development was not to go ahead there would be no demolition, excavation, construction or operational waste generated at this site. There will be a neutral effect on the environment.

14.12 Difficulties Encountered in Compiling the Chapter

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.

There is a number of licensed, permitted and registered waste facilities in the Fingal region and in the surrounding counties. However, these sites may not be available for use when required or may be limited by the waste contractor selected to service the development in the appropriate phase. In addition, there is potential for more suitably placed waste facilities or recovery facilities to become operational in the future which may be more beneficial from an environmental perspective.

The ultimate selection of waste contractors and waste facilities would be subject to appropriate selection criteria proximity, competency, capacity, serviceability, and cost.

14.13 Interactions

Adherence to the mitigation measures outlined in Section 14.6 will ensure that there are no significant impacts on resource or waste management from the proposed development. The management of waste during the construction phase in accordance with the C&D WMP and during the operational phase in accordance with the OWMP will meet the requirements of regional and national waste legislation and promote the management of waste in line with the priorities of the waste hierarchy.

14.13.1 Land & Soils

During the construction phase excavated soil, stone and made ground (between c.74,000m^3 and c. 80,000 m^3) will be generated from the excavations required to facilitate site levelling, construction of the basement and construction of new foundations. It is estimated that c. between c. 64,000m^3 and c. 70,000m^3 of excavated material will need to be removed offsite, however it is envisaged that c. 10,000m^3 material will be reused onsite. Where material has to be taken off site it will be taken for reuse or recovery, where practical, with disposal as last resort. Adherence to the mitigation measures in Chapter 14 and the requirements of the C&D WMP, will ensure the effect is long-term, imperceptible and neutral.

14.13.2 Transportation

Local traffic and transportation will be impacted by the additional vehicle movements generated by removal of waste from the site during the construction and operational phases of the development. The increase in vehicle movements as a result of waste generated during the construction phase will be temporary in duration. There will be an increase in vehicle movements in the area as a result of waste collections during the operational phase but these movement will be imperceptible in the context of the overall traffic and transportation increase and has been addressed in Chapter 15 Transportation. Provided the mitigation measures detailed in Chapter 15 and the requirements of the OWMP (included as Appendix 14.2) are adhered to, the effects should be short to long-term, imperceptible and neutral.

14.13.3 Population & Human Health

The potential impacts on human beings in relation to the generation of waste during the demolition, construction and operational phases are that incorrect management of waste. This could result in littering which could cause a nuisance to the public and attract vermin. A carefully planned approach to waste management and adherence to the project specific C&DWMP and OWMP, will ensure appropriate management of waste and avoid any negative impacts on the local population, and the interaction will be long-term, imperceptible and neutral.

14.14 References

- Waste Management Act 1996 (No. 10 of 1996) as amended. Sub-ordinate and associated legislation include:

  - European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended.
  - Waste Management (Collection Permit) Regulations 2007 (S.I. No. 820 of 2007) as amended.
  - Waste Management (Facility Permit and Registration) Regulations 2007 (S.I No. 821 of 2007) as amended.
  - Waste Management (Licensing) Regulations 2000 (S.I No. 185 of 2000) as amended.
  - European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014) as amended.
  - Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended.
  - Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015).
  - European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014).
  - European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended.
  - Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended.
  - European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015).
  - Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended.
  - Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended.
  - European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011).
  - European Union (Properties of Waste which Render it Hazardous) Regulations 2015 (S.I. No. 233 of 2015) as amended.
  - Protection of the Environment Act 2003, (No. 27 of 2003) as amended.
  - Litter Pollution Act 1997 (S.I. No. 12 of 1997) as amended.
  - Eastern-Midlands Region Waste Management Plan 2015 – 2021 (2015).
  - Department of Environment and Local Government (DoELG) Waste Management –
  - Changing Our Ways, A Policy Statement (1998).
  - Forum for the Construction Industry – Recycling of Construction and Demolition Waste.

- Department of Environment, Communities and Local Government (DoECLG), A Resource Opportunity - Waste Management Policy in Ireland (2012).
- Department of Environment, Heritage and Local Government, Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (2006).
- FÁS and the Construction Industry Federation (CIF), Construction and Demolition Waste Management – a handbook for Contractors and Site Managers (2002).
- Dublin City Council (DCC), Dublin City Council Development Plan 2016-2022 (2015).
- Planning and Development Act 2000 (S.I. No. 30 of 2000) as amended.
- EPA, Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous (2015).
- 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.
- Environmental Protection Agency (EPA), National Waste Database Reports 1998 – 2012.
- 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).
- BS 5906:2005 Waste Management in Buildings – Code of Practice.
- DoEHLG, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities (2020).
- DCC, Dublin City Council (Storage, Presentation and Segregation of Household and Commercial Waste) Bye-Laws (2018)
- Department of Communications, Climate Action and Environment (DCCAE), Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025 (2020).

15.0 TRANSPORTATION

15.1 Introduction

This section of the report assesses and evaluates the likely impact of the proposed development on the existing transportation system in the vicinity of the site, as well as identifying proposed mitigation measures to minimise any identified impacts arising from the proposed residential development at Sandford Road, Dublin 6.

The material assets considered in this traffic section include pedestrian, bicycle, public transport (bus, light rail) infrastructure and associated services in addition to the local road network and associated junction nodes.

15.2 Expertise and Qualifications

This chapter was prepared by DBFL Consulting Engineers - Robert Kelly BA, BAI(Hons), MA, PG DipConstLaw, CEng, MIEI with over 15 years' experience in the Traffic Engineering and Transportation Planning and Helen Gendy BA, BAI, MA with over 2 years' experience as a Traffic and Transportation Engineer. Robert Kelly and Helen Gendy both have experience in the preparation of Environmental Impact Assessment Reports for a range of residential and commercial developments.

15.3 Methodology

The purpose of this assessment is to quantify the existing transport environment and to detail the results of assessment work undertaken to identify the potential level of transport impact generated as a result of the proposed residential development. The scope of the assessment covers transport and sustainability issues including vehicular access and pedestrian, cyclist and public transport connectivity. Recommendations contained within this chapter are based on existing and proposed road layout plans, site visits, traffic observations and junction vehicle turning count data. Our methodology incorporated a number of key inter-related stages, including;

- **Background Review:** This important exercise incorporated three parallel tasks which included (a) an examination of the local regulatory and development management documentation; (b) an analysis of previous 'transport' related, strategic and site specific studies of development and transport infrastructure proposals across the Milltown area, and (c) a review of planning applications to establish the legal status of various third party development schemes that were either considered within the strategic 'transport' studies or which have emerged and received full planning permission since.
- **Site Audit:** A site audit was undertaken to quantify existing road network characteristics and identify local infrastructure management arrangements, in addition to establishing the level of accessibility to the site in terms of walking, cycling and public transport. An inventory of the local road network was also developed as this stage of the assessment.
- **Traffic Counts:** Junction turning counts were undertaken and analysed with the objective of establishing local traffic characteristics in the immediate area of the proposed residential development.
- **Trip Generation:** A trip generation exercise has been carried out to establish the potential level of vehicle trips generated by the proposed residential development.

- **Trip Distribution:** Based upon existing traffic characteristics and anticipated travel patterns of the proposed residential development, a trip distribution exercise has been undertaken to assign site generated trips across the local network.
- **Network Analysis:** Undertook detailed computer simulations to assess the operational performance of key junctions in the post development 2022 Opening Year, 2027 Interim Year and 2037 Design Year development scenarios in accordance with the NRA/TII document 'Traffic and Transport Assessment Guidelines' (2014).

Our approach to the study accords with policy and guidance both at a national and local level. Accordingly, the adopted methodology responds to best practices, current and emerging guidance, exemplified by a series of publications, all of which advocate this method of analysis. Key publications consulted include;

- *'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment'* (Department of Housing, Planning & Local Government, 2018);
- *'Guidance on the preparation of the Environmental Impact Assessment Report'* (European Commission, 2017);
- *'Guidelines on the information to be contained in Environmental Impact Statements'* (EPA, 2002);
- *'Draft Advice Notes for Preparing Environmental Impact Statements'* (EPA, 2015);
- *'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports'* (EPA, 2017);
- Transport Infrastructure Ireland's (TII's) *'Traffic & Transport Assessment Guidelines'* (2014);
- *'Guidelines for the Environmental Assessment of Road Traffic'* (Institute of Environmental Management & Assessment, 2003);
- *'The Dublin City Development Plan 2016 – 2022'* (DCC, 2016);
- *'Transport Strategy for the Greater Dublin Area 2016 – 2035'* (NTA, 2016);
- *'Design Manual for Urban Roads and Streets'* (DTTAS & DHPLG, 2013); and
- *'National Cycle Manual'* (NTA, 2011).

The assessment of effects of the proposed development on material assets are assessed in terms of quality (positive, neutral or negative effects), significance (imperceptible, not significant, slight, moderate, significant, very significant or profound effects), extent, context, probability (likely, unlikely effects) and duration (temporary, short term, long term or permanent effects) in line with the criteria set out in Table 3.3 'Description of Effects' of the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, August 2017).

15.4 Receiving Environment

15.4.1 Site Location

The proposed development site is located between Sandford Road and Milltown Road, Dublin 6. The subject site is within approximately 5 km south of Dublin City Centre and approximately 6 to 13 minutes walking distance to parts of Ranelagh village and 6 to 10 minutes to parts of Donnybrook. The site is ideally located to benefit from sustainable travel options including pedestrian/cycle facilities and public transport (Bus and Luas Green Line services). The general location of the subject site in relation to the surrounding road network is illustrated in Figure 15.1 below, whilst Figure 15.2 shows the indicative extent of the subject site lands.

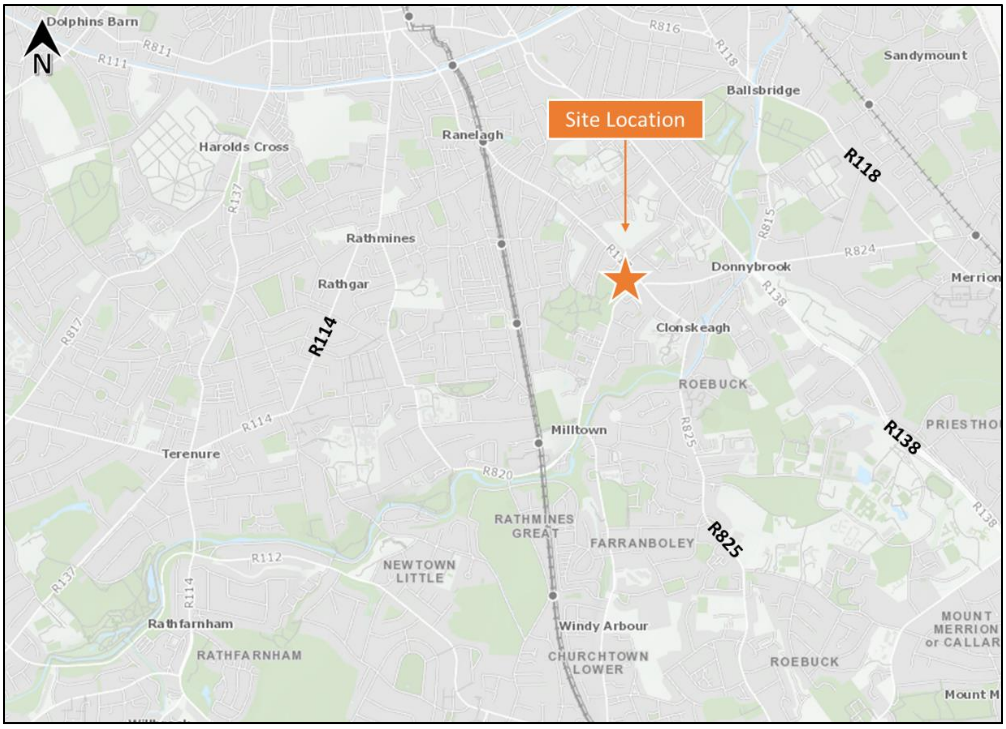


Figure 15.1: Site Location

(Source: GeoHive)

Figure 15.2: Indicative Site Boundary

(Source: GeoHive)

15.4.2 Road Network

The subject development site is located immediately south of Sandford Road (R117). Sandford Road is a wide single carriageway road with one lane in each direction which contains on road cycle lanes on both sides of the road. Travelling Northwest bound, the Sandford Road will connect the subject site to Dublin City Centre via Ranelagh. Whereas travelling south bound it will connect the site to Clonskeagh and UCD Belfield.

The Milltown Road (R117) is immediately east of the subject site. Milltown Road is a single carriageway road with one lane in each direction. Milltown Road extends from Sandford Road on the north and leading to Churchtown and Dundrum southbound.

The R824 Eglinton Road is a single carriageway with one lane in each direction. The road provides mandatory cycle lanes along both sides of the road. Eglinton Road connects the subject site to Stillorgan Road.

The R138 Stillorgan Road is a four-lane dual carriageway road with a bus lane and bicycle lane in each direction. It is currently a major bus corridor (QBC). Stillorgan Road becomes Donnybrook Road northwest from Donnybrook Church. The R138 Donnybrook Road is a single carriageway with two general traffic and one cycle lane southeast bound and one general traffic, a bus lane and cycle lane northwest bound.

Figure 15.3 below illustrates the location of the subject site within the context of the existing road network.

Figure 15.3: Existing Road Network

(Source: Google Maps)

15.4.3 Existing Pedestrian Facilities

All the immediate routes leading to and from the subject site benefit from the provision of street lighting and pedestrian footways. Sandford Road is a regional road with the speed limit of 50kph and incorporates dedicated footpaths on both sides of the road and contains signalized pedestrian crossings.

The R117 Milltown Road is a regional road with a speed limit of 50kph and pedestrian footways provided on both sides of the roads. Public lighting is provided on one side of the road. The Milltown Road/Sandford Road/Eglington Road signalised junction which is in the immediate vicinity of the proposed site access contains pedestrian crossings on all arms.

The subject site is highly accessible to pedestrians and cyclists from Sandford Road and Milltown Road. The scheme proposals for the subject site will ensure pedestrians are given priority within the internal site layout to ensure desire lines within the site are accommodated, providing a good level of service, ensuring the risk of pedestrian conflict with vehicles is minimised and providing attractive convenient connections to external key walking desire lines. The internal site layout will provide a safe short-cut through the site from Milltown Road to Sandford Road and vice versa.

The proposed new access arrangements to the site will include the provision of dedicated pedestrian crossing facilities along key desire lines.

Detailed transport linkages for the existing scenarios detailing distances to surrounding Public Transport is presented in a separate Drawing No. 190226-DBFL-TR-ST-DR-C-1002 submitted with the planning application package.

Figure 15.4 to Figure 15.7 below illustrates existing pedestrian facilities along the roads surrounding the subject site.

Figure 15.4: Existing Pedestrian Facilities along Sandford Road and Milltown Road

Figure 15.5: Existing Pedestrian Facilities along Sandford Road in vicinity of existing site access

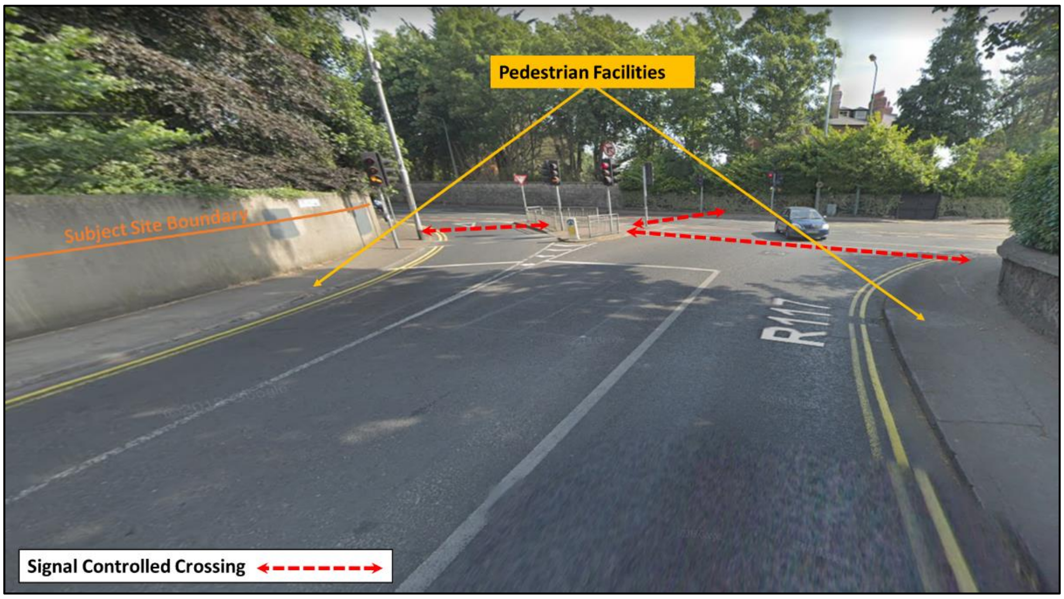


Figure 15.6: Existing Pedestrian Facilities along Milltown Road at junction with Sandford Road/Eglington Road

Figure 15.7: Existing Pedestrian Facilities along R824 Eglinton Road

15.4.4 Existing Cycling Facilities

In the immediate vicinity of the subject site, cyclists benefit from existing cycle facilities along Sandford Road and Eglinton Road which contains mandatory cycle lanes on both sides with some sections of advisory lanes.

Milltown Road currently does not provide dedicated cycle facilities. However, cyclists can share the road surface with other road users. In addition to the cycle facilities outlined above, there are also a variety of other cycling facilities available on the routes leading to the subject site and are illustrated in Figure 15.8 to Figure 15.10.

Figure 15.8: Existing Cycle Facilities along Sandford Road

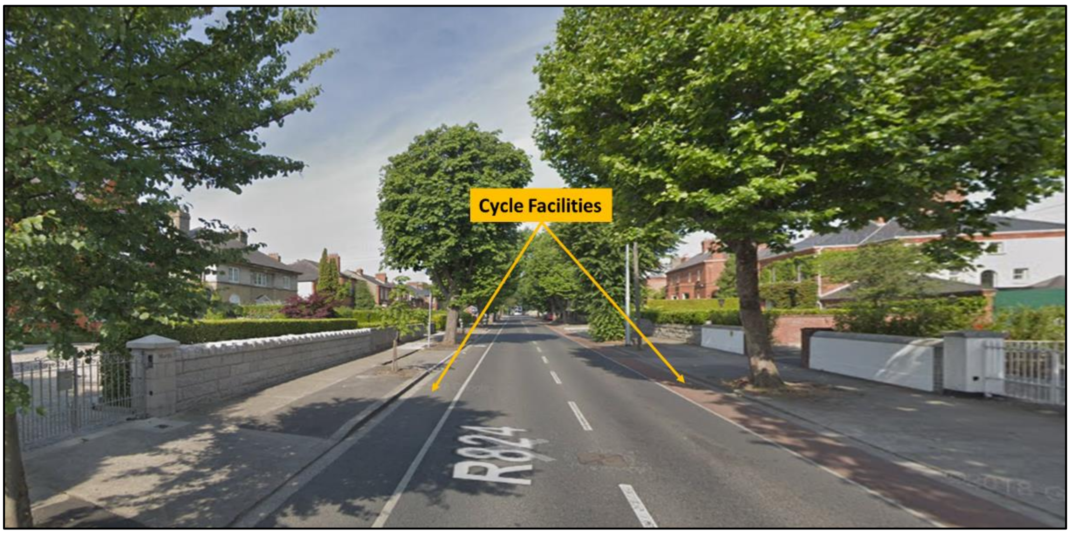


Figure 15.9: **Existing Cycle Facilities along Eglinton Road**

Figure 15.10: **Existing Cycle Network** (Existing Cycle Facility Type Dublin South Central – Sheet E7 GDA)

A separate Drawing No. 190226-DBFL-TR-ST-DR-C-1002 is submitted with the Application Package which illustrates existing transportation linkages.

15.4.5 Public Transport – LUAS

The LUAS Green Line service runs from Brides Glen in Cherrywood to Broombridge in Cabra, routing through a number of locations including Leopardstown, Stillorgan, Dundrum and Dublin City Centre in addition to other destinations along its route. The proposed development site benefits from a high level of accessibility to the Luas Green Line. The

Beechwood Luas stop is within 1km walking distance of the subject site. Also, Cowper and Ranelagh stops are within similar walking distance as illustrated in Figure 15.11 overleaf.

As shown in Table 15.1 below, the Green Line LUAS at the Beechwood Luas stop operates at a high frequency, with many services provided between the first tram and the last tram of the day for either the northbound or the southbound direction. The trams operate at a 3 – 5 minute frequency during peak hours and at a frequency between 12 – 15 minutes for the off peak duration.

Table 15.1 Green Line LUAS Frequency at Beechwood *(Source: LUAS)*

	Southbound Towards Sandyford/Brides Glen			Northwards Towards Parnell/Broombridge		
	Mon – Fri	Sat	Sun	Mon – Fri	Sat	Sun
First Tram	05:38	06:38	07:08	05:44	06:44	07:14
Last Tram	00:49	00:49	23:49	00:32	00:32	23:32

The subject site will also benefit from the improved connectivity through the LUAS Cross City service, providing connections to Dublin City Centre North, Phibsborough and Broombridge.

Figure 15.11: Walking Routes to LUAS Green Line Stops

15.4.6 Public Transport – Bus

The Sandford Road site is ideally located to avail of a multitude of existing bus services including the 11, 61, 44 adjacent to the subject site along the Milltown Road and Sandford Road. All the other routes listed in Table 15.2 below run along the R138 Stillorgan Road; Bus Stop No. 775 is approximately 600m away from the subject site. Details of existing bus services with direction and frequency are provided in the Table 15.2 below.

Further connections to bus routes such as Go-Ahead route no. 18, from Palmerstown to Sandymount, with bus stops serving the route north west to the subject site in Ranelagh town centre, can be made using the services listed in Table 15.2 below.

Table 15.2 Bus Service Frequency (No. of Services) *(Source: Dublin Bus and Go-Ahead Ireland)*

Dublin Bus Route No.	Direction	Mon-Fri	Sat	Sun
		Frequency (No. of Services)		
11	Wadelai Park to Sandyford Business Park	43	34	27
61	Eden Quay to Whitechurch	17	15	13
44	DCU to Enniskerry	17	16	14
7b	Wadelai Park to Sandyford Business Park	4	0	0
7d	Eden Quay to Whitechurch	1	0	0
25x	UCD Belfield to Lucan	2	0	0
39	Burlington Road to Ongar	38	35	31
39a	UCD Belfield to Ongar	96	79	61
41x	UCD Belfield toKnocksedan	3	0	0
46a/e	Phoenix Park to Black Rock Station, Dun Laoighre	81	61	58
67x/66x	UCD Belfield to Celbridge, Maynooth	17	0	0
116	Parnell Square to Whitechurch	1	0	0
118	Kiltiernan – Eden Quay	2	0	0
145	Heuston Rail Station to Ballywaltrim	96	65	44
155	Ikea to Bray Rail Station	53	53	47

In addition to the bus services listed above, Aircoach stops 773 and 779 are both easily accessible on the R138 Stillorgan Road, providing residents with a direct connection to Dublin Airport.

In conclusion, the site is already strategically located to avail of excellent sustainable travel options in the form of public transport as well as walking and cycling links. A number of schemes being developed by the National Transport Authority, such as the proposed BusConnects, the GDA Cycle Network Plan and proposed extensions to the LUAS network, will see further improvements to infrastructure and services thereby increasing the attractiveness of the use of sustainable modes as means for accessing the development.

15.4.7 Local Amenities

The subject development site is very well placed in terms of the availability of local amenities. There are a number of schools within walking distance of the subject site including Saint Mary's National School, Sandford Park School, The Teresian School and Sandford Parish National School. A number of colleges such as Alexandra College Dublin and Gonzaga College SJ are located in the vicinity of the subject site.

Furthermore, the subject site benefits from good access to leisure facilities such as Milltown Golf Club and Elm Park Golf and Sports Club. The subject site is close to retail facilities such as Tesco Express and SuperValu. The site also benefits from being within the vicinity of the Donnybrook, Ranelagh, Milltown, Clonskeagh and Rathmines neighbourhood centres, which provide many local amenities.

There are also a number of healthcare facilities surrounding the subject site which include the Glenmalure Day Hospital, Clonskeagh Hospital and the Donnybrook Primary Care Centre.

15.4.8 Road Safety Review

With the objective of ascertaining the road safety record of the immediate routes leading to/from the subject site, the collision statistics as detailed on the Road Safety Authority's (RSA) website (www.rsa.ie) have been examined. The RSA website includes basic information relating to reported collisions over the most recent twelve-year period, from 2005 to 2016 inclusive.

The RSA database records details where collision events have been officially recorded such as when the Garda have been present to formally record details of the incident.

In reference to Figure 15.12 and Table 15.3, of 23 no. recorded incidents, only 4 were serious, the most recent of which occurred in 2016.

A cluster of 13 incidents have occurred at the R117 Milltown Road / R117 Sandford Road / R824 Eglinton Road signalised junction. Of these incidents, the only 2 serious incidents at the junction, in addition to another 4 minor incidents all occurred over 10 years ago between 2005 - 2008. The remaining 7 incidents at the junction between 2011 and 2016 have all been minor collisions. The junction has since been upgraded to enhance the safety of all road users.

Table 15.3 Collision Records *(Source: RSA)*

Ref	Severity	Year	Vehicle	Circumstances	Day	Time	Casualty
1	Minor	2011	Car	Rear end, straight	Tuesday	1900-2300	1
2	Minor	2015	Bicycle	Other	Friday	1000-1600	1
3	Minor	2006	Motorcycle	Head-on right turn	Friday	1000-1600	1
4	Minor	2007	Car	Other	Sunday	0700-1000	1
5	Minor	2010	Bicycle	Other	Sunday	2300-0300	1
6	Minor	2015	Bicycle	Other	Wednesday	1900-2300	1
7	Serious	2016	Motorcycle	Angle, both straight	Tuesday	1900-2300	1
8	Serious	2013	Bicycle	Other	Tuesday	0700-1000	1
9	Minor	2011	Car	Other	Wednesday	0700-1000	1
10	Minor	2008	Bus	Rear end, straight	Saturday	2300-0300	1
11	Minor	2005	Motorcycle	Angle, right turn	Thursday	1600-1900	1
12	Minor	2006	undefined	Angle, right turn	Thursday	1900-2300	1
13	Minor	2006	Car	Rear end, left turn	Thursday	1000-1600	1
14	Minor	2006	Car	Other	Saturday	1000-1600	1

15	Serious	2006	Bicycle	Other	Monday	0700-1000	1
16	Serious	2008	undefined	Angle, both straight	Tuesday	1000-1600	1
17	Minor	2011	Car	Other	Tuesday	2300-0300	1
18	Minor	2012	Car	Pedestrian	Wednesday	1000-1600	1
19	Minor	2012	Bus	Other	Saturday	2300-0300	1
20	Minor	2012	Car	Other	Saturday	1000-1600	1
21	Minor	2013	Motorcycle	Head-on conflict	Sunday	1600-1900	1
22	Minor	2015	Goods Vehicle	Angle, both straight	Saturday	1000-1600	3
23	Minor	2016	Bicycle	Other	Sunday	1600-1900	1

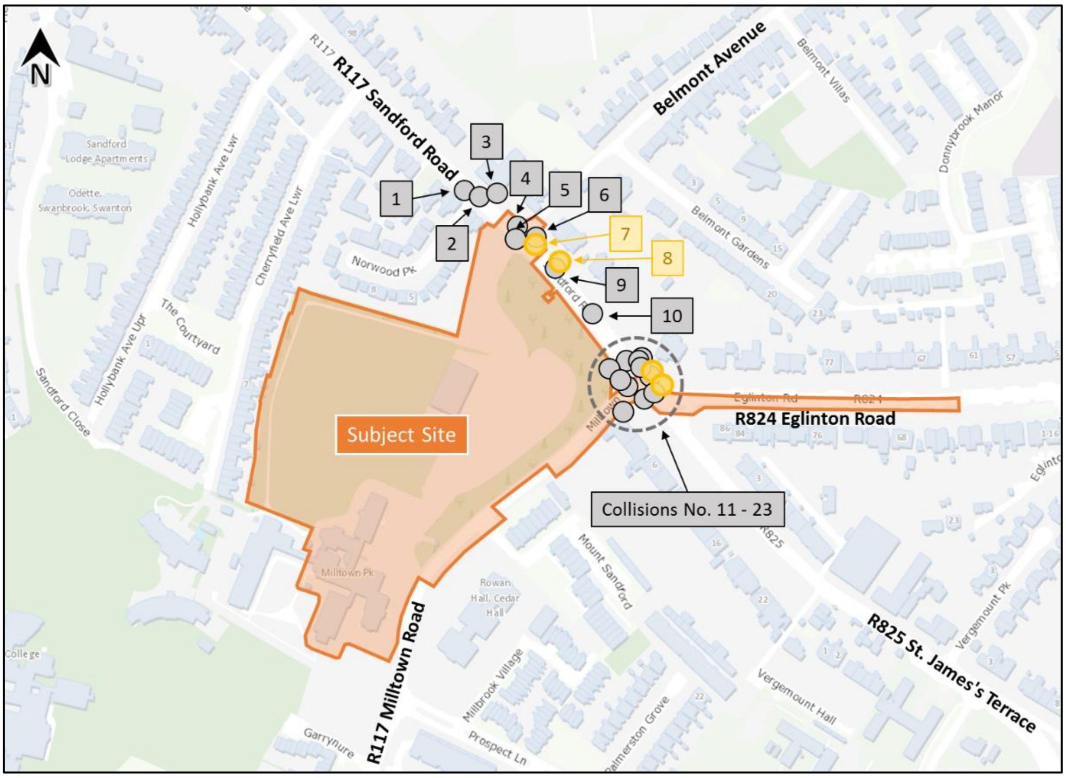


Figure 15.12: Collision Records

(Source: RSA)

The review of the RSA data available reveals that there are no apparent trends in collisions which have occurred in the vicinity of the subject site during the most recent 12-year period (2005-2016).

15.4.9 Proposed Cycle Network

The subject site is located within the "*Dublin South CENTRAL*" as outlined within the Greater Dublin Area Cycle Network Plan (published by the NTA in 2013). The South CENTRAL Sector "*extends outward from the city centre through Ranelagh and fans out to include the areas of Clonskeagh, Milltown, Goatstown, Dundrum, Ballinteer, Sandyford and Stepaside*". In the vicinity of the subject site the Plan proposals include the following key routes as indicated in Figure 15.13 below: -

- **Primary Route 11:** This will directly serve the subject site which will run along Sandford Road. Travelling Northwest bound, route 11 will connect the subject site to Dublin City Centre via Ranelagh. Whereas travelling south bound it will connect the site to Clonskeagh. It is understood from pre planning discussions with Dublin City Council officials that this scheme will include segregated cycle facilities along the Sandford Road as well as enhanced pedestrian crossing facilities at junctions along the route such as the Eglington Road/Sandford Road/Clonskeagh Road/Milltown Road junction in addition to an upgrade to the existing site access junction on Sandford Road incorporating Belmont Avenue. It is anticipated that this scheme may be delivered via a Section 38 (of the Roads Act) Process in 2021/22.
- **Orbital Route SO3:** From Rathgar and Dartry to Milltown, Clonskeagh and Ballsbridge, mostly along the proposed Dodder Valley Greenway. This route links to UCD at Clonskeagh. There is a connection from Tallaght via Route 9A at Oldbridge Road in Templeogue. The greenway is currently under construction in a number of phases by South Dublin and Dublin City Council. The greenway will be accessible from the site via Sandford Road and Eglington Road.
- **Secondary Route 11B:** This will directly serve the subject site. It will run from Sandford Road along Milltown Road and Lower Churchtown Road and will connect the subject site to Churchtown and Dundrum.

Figure 15.13: Proposed Cycle Routes (Source: Proposed Cycle Network Dublin South West Sheet N7 GDA Cycle Network Plan)

15.4.10 Proposed BusConnects

In July 2018 the National Transport Authority (NTA) published a consultation report entitled 'Dublin Area Bus Network Redesign Public Consultation Report'. The report introduces a number of significant changes to the bus services within Dublin including: -

- *"Services to be arranged along seven cross-city super-frequent spines*
- *Dramatic increase in the numbers of orbital services*
- *Increase in the number of all-day high-frequency services*
- *Move to a simplified two-fare system*
- *A new route numbering system".*

"Under the proposals, the level of bus service will increase by 27%. This includes services on 11 brand-new orbital routes that will operate on a 15-minute frequency or better, in the north, south and west of the network area."

Since the initial BusConnects proposals, the final network redesign (September 2020) has been published. The proposed development site is ideally located to benefit from the enhanced accessibility levels that will be delivered by the BusConnects. The subject site will be directly serviced by the following BusConnects proposed routes.

- **E-Spine:** will serve the site with frequency of every 4-5 minutes in peak period. It will run along Stillorgan Road approximately 600m away from the subject site and connects the site to Ballymun, City Centre and Foxrock Church.
- **Route 86:** will directly serve and connect the site to Ticknock, Goatstown and Mountjoy Square with a frequency of every 30 minutes.
- **Route 87:** will directly serve and connect the site to Belarmine, Dundrum and Mountjoy Square with a frequency of every 60 minutes.
- **Route 88:** will directly serve and connect the site to Enniskerry-Belarmine, Dundrum and Mountjoy Square with a frequency of every 60 minutes.

Figure 15.14 below illustrates the BusConnects proposed routes that will serve the subject site.

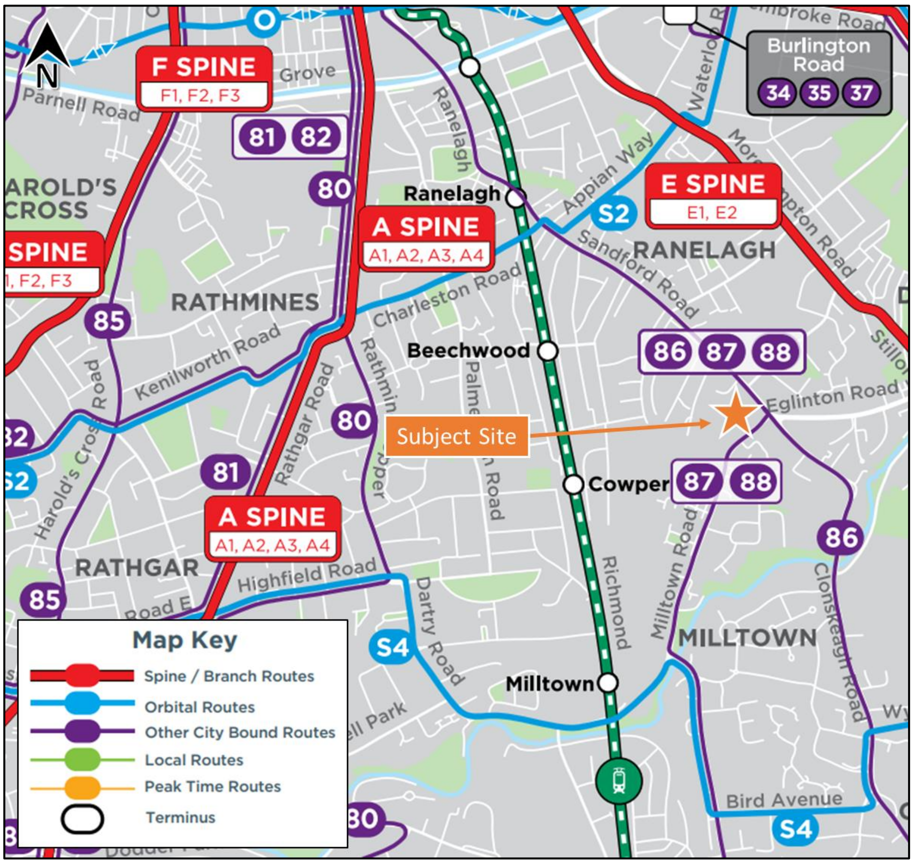


Figure 15.14: Proposed Bus Services (Source: BusConnects)

A separate Drawing No. 190226-DBFL-TR-ST-DR-C-1003 is submitted with the Application Package which illustrates proposed transportation linkages.

15.4.11 Proposed LUAS and Metro

According to current proposals by the NTA & TII, the proposed MetroLink will operate from Charlemont, immediately south of the Grand Canal, and will provide links to City Centre locations and Dublin Airport, terminating in Swords.

Residents of the proposed development will be able to avail of the proposed Metro Line through the Luas Green Line Stops, Cowper, Beechwood (1km from the subject site), Ranelagh or Milltown and interchange at the Charlemont Luas Stop to access the underground metro.

Other proposed extensions to the Luas network include a Lucan Line operating from the City Centre to Lucan and the extension of the Green Line south from Brides Glen to Bray. Figure 15.15 shows the existing Luas network with the proposed service extensions and Metro Line.

Figure 15.15: Proposed LUAS and Metro Extension (Source: NTA)

15.5 Potential Impact of the Proposed Project

15.5.1 Construction Stage Impacts

15.5.1.1 Management of Construction Activities

All construction activities on-site will be governed by a Construction Traffic Management Plan (CTMP), the details of which will be agreed in full with Dublin City Council prior to the commencement of construction activities on site.

The principal objective of the CTMP is to ensure that the impacts of all building activities generated during the construction of the proposed development upon both the public (off-site) and internal (on-site) workers environments, are fully considered and proactively managed / programmed respecting key stakeholders thereby ensuring that both the public's and construction workers safety is maintained at all times, disruptions minimised and undertaken within a controlled hazard free / minimised environment. The impact of the construction period will be temporary in nature.

15.5.1.2 Construction Traffic

Construction traffic will generally be confined to weekdays (0700-1900, subject to conditions of a planning permission) and will consist of the following two principal categories:

- Private vehicles owned and driven by site construction staff and by full time supervisory staff.

- Excavation plant, dumper trucks and delivery vehicles involved in site development works and material delivery vehicles for the following: granular fill materials, concrete pipes, manholes, reinforcement steel, ready-mix concrete and mortar, concrete blocks, miscellaneous building materials, etc.

On-site employees will generally arrive before 08:00, thus avoiding the traditional morning peak hour traffic. The traffic surveys conducted by IDASO in February 2020 established the morning peak hour as occurring between 08:15 – 09:15. These employees will generally depart after 16:00. Appropriate on-site parking and compounding will be provided to prevent overflow onto the local network. Deliveries will be actively controlled and subsequently arrive at a dispersed rate during the course of the working day.

Based upon the experience of similar developments, a development of this type and scale would at a maximum necessitate approximately 40 No. staff on site at any one time, subsequently generating no more than 30 No. two-way vehicle trips during the peak AM and PM periods over the period of the phased construction works. Although the number of staff and light goods vehicles, transporting staff, will fluctuate over the period of construction works, the consideration of the worst-case scenario (40 staff members, 30 LGVs) provides a conservative assessment of the resultant traffic and transportation impacts of the subject development during the construction phase.

It is anticipated that the proposed development would be constructed over a period of approximately 34 No. months in accordance with the preliminary construction programme. Following the completion of the initial site clearance works, the generation of HGV movements during the build period will be evenly spread throughout the day and as such will not impact significantly during the peak traffic periods. For this scale of development, we do not expect HGV two-way vehicle movements to exceed 16 No. vehicles per hour during the busiest period of construction 'build' works (Table 15.4).

Table 15.4 Projected Construction Traffic Flows

	HGV	LGV	Total (vehs)	Total (pcus)
Daily	64	60	124	207
AM Peak Hour	16	3	19	40
Afternoon Peak	16	0	16	37
PM Peak Hour	16	3	19	40

Based on a preliminary review of the existing survey data and proposed site levels we estimate that approximately 80,000 m^3 of material will require excavation. Whilst an element of the material will be reused on-site (c. 10,000 m^3) it is still predicted that approx. 70,000 m^3 of material will require removal during the construction phase earthworks. This equates to 4,375 No. truckloads based on a tipper truck capacity of 16m^3. At 8 No. loads removed per hour, 16 No. two-way HGV movements per hour and 64 loads removed per day this equates to 68 No. days of earthmoving works as part of the adopted worst-case assessment to clear the entire site in one single construction activity.

Table 15.5 Construction Phase Earthworks for Worst-Case Scenario

Material to be excavated and removed off site	70,000 m^3
Total no. truckloads to be removed	4,375
Loads removed per day	64
Loads removed per hour	8
Two-way HGV movements per hour	16
Days of earthmoving works	68
Weeks of earthmoving activity	14

**Assumptions:* 1 HGV vehicle = 2.3 PCUs, Tipper truck capacity = 16m^3, 2 tipper trucks excavating at any one time, trucks departing every 20 minutes.*

For the proposed Sandford Road development 3 No. foundation options have been considered. This transportation assessment has assumed the worst-case option for the above listed volume of material requiring removal and therefore HGV truckloads generating a traffic impact. Furthermore, the level of development assumed in the opening year would result in a greater traffic impact than that generated as a result of the most onerous of the 3 No. foundation options thereby providing a conservative and comprehensive assessment of the traffic impacts resulting from the subject site.

Table 15.6 below compares the quantum of soil requiring removal per foundation option considered and the resulting number of HGV loads and inbound and outbound trips required to remove this quantum of soil. As shown below, Option No. 3 results in the highest number of inbound and outbound trips and this has been the construction traffic scenario adopted within this assessment.

Table 15.6 Foundation Options Traffic Generation Comparison

Foundation Option No.	Foundation Option Description	Quantum of Soil Removal (Inc. road and civil works)	Quantum of Trip Generation to Remove Soil
1	Standard Pad & Strip Foundations to All Blocks incl. Basement	70,000m^3	4,375 loads 8,750 trips inbound & outbound
2	Pads & Strips to All Blocks except Bored Piles to Block D & F	64,000m^3	4,000 loads 8,000 trips inbound & outbound
3	Pads & Strips to All Blocks except Ground Improvement to Block E	70,000m^3	4,375 loads 8,800 trips inbound & outbound

An appropriate control and routing strategy for HGVs can also be implemented for the duration of site works as part of the CTMP. It is not proposed to utilise any roads with weight/height restrictions as part of the routing of HGVs during the construction phase.

A significant benefit of the subject development site's characteristics is that all construction traffic vehicle parking demands can be accommodated on-site thereby minimising the impact upon the operational performance and safety levels of the adjacent public road network.

Considering the site's proximity to the strategic road network, it is concluded that construction traffic will not give rise to any significant traffic concerns or impede the operational performance of the local road network and its surrounding junctions. The level of significance of the above findings are categorised in Section 9.6.1.

As the development most likely will be delivered in several phases, a scenario exists where both construction traffic and development traffic will contribute to the total development traffic flows, after the initial occupation of the completed phases of the development. This potential traffic scenario would not result in as great a level of traffic as the traffic forecast for the entire built and occupied development conservatively assumed for the 2022 Opening Year within this assessment.

During the construction stage it is anticipated that the proposed development would result in a temporary negative impact on the traffic environment in the immediate vicinity of the subject site. The vehicle trips would be generated from LGVs used by construction staff to travel to the site and by HGVs transporting materials to and from the site. Section 15.6.1 provides the potential mitigation measures to be taken at construction stage to lower the number of vehicle trips to and from the site during construction stage and the measures to minimise the impact of the generated traffic on the surrounding road environment.

15.5.2 Operation Stage Impacts

15.5.2.1 Committed Developments Overview

Following a review of DCC online planning portal, DBFL have established the extent of existing third party developments, as located within the traffic catchment of the subject Sandford Road site, which currently benefit from a planning permission but have yet to be constructed/occupied.

Fully permitted developments in the nearby areas which include a car parking provision, and thereby generating vehicle trips which can contribute to the traffic flows along the road corridors modelled as part of this assessment have been considered. The committed developments taken into consideration have been chosen based upon the vehicle trips from committed vehicles which could potentially route through the local roads modelled as part of this traffic assessment (R117 Sandford Road, R117 Milltown Road, R825 St. James's Terrace and R824 Eglinton Road).

A number of committed developments within the proposed development's traffic catchment propose no car parking or no change in the net car parking available as part of the development. These developments are not deemed to generate any vehicle trips and as such have not been included in the subject site's traffic model.

DBFL have subsequently included the following third-party development proposals as a 'committed development' within the network assessment.

15.5.2.2 Committed Development Trip Generation (ABP Ref. PL29S.307267)

East of the subject development, planning permission was granted for 148 no. residential apartment units (Ref. PL29S.307267) at Eglington Road in Donnybrook, Dublin 4.

Its location relative to the subject site is shown on Figure 15.16 below. This committed development is bounded by Donnybrook Road to the east; the development's site access will be via Brookvale Road.

DBFL consider that the permitted development will generate an impact on the local road network due to its proximity to the subject site and as such it is included as a committed development.

In order to determine the level of traffic generated by this third-party residential development, DBFL utilised the vehicle trips included within the committed development's Traffic Assessment and Parking Strategy Report. Table 15.7 below shows the vehicle trips generated by the Eglinton Road development which depart/arrive via the R824 Eglinton Road, and are therefore distributed on the subject site assessed traffic network.

***Table 15.7 Committed Development Vehicle Trips (*ABP Ref. PL29S.307267)**

Land Use	Unit/GFA	AM Peak Hour (via R824)			PM Peak Hour (via R824)		
		Arr	Dep	Total	Arr	Dep	Total
BTS Apartments	148	1	5	6	3	1	4

In reality, the development most likely will be delivered in a phased manner, however for the purposes of conducting a conservative assessment of the traffic impacts of the development it has been assumed that the entire development will be constructed by 2022.

15.5.2.3 Committed Development Trip Generation (ABP Ref. PL29S.307375)

West of the subject development at Sandford Close, planning permission was granted (Reg. Ref. 2189/20) for the demolition of the southern portion of the Sandford Lodge residential development in order to construct 36 no. residential apartment units in the form of 2 no. three storey terraces. The location of the committed development relative to the subject site is shown in Figure 15.16 below.

The Sandford Lodge development has been granted by DCC and An Bord Pleanála (Ref. PL29S.307375) and therefore has been included in the traffic assessment of the proposed development in order to provide a robust assessment.

In order to determine the level of traffic generated by this third-party residential development, DBFL utilised the same trip rates as those utilised for the proposed subject development for the Build-to-Sell (BTS) apartment land uses as shown in Table 15.11 below. Table 15.8 below summarises the predicted peak hour AM and PM traffic generated by the committed residential development.

Table 15.8 Committed Development Vehicle Trips (ABP Ref. PL29S.307375)

Land Use	Unit/GFA	AM Peak Hour			PM Peak Hour		
		Arr	Dep	Total	Arr	Dep	Total
BTS Apartments	36	2	8	10	7	2	9

15.5.2.4 Committed Development Trip Generation (DCC Ref. 2582/16)

To the north of the subject site, planning permission was granted by DCC (Reg. Refs. 2582/16, 3312/20) for the demolition of existing sheds and the construction of 4 no. detached houses at 91 Belmont Avenue. The location of the committed development relative to the subject site is shown in Figure 15.16 below.

In order to determine the level of traffic generated by this third-party residential development, DBFL used the Trip Rate Information Computer System (TRICS) to generate trip rates for houses as shown in Table 15.9 below. Table 15.9 below also summarises the minimal predicted peak hour AM and PM traffic generated by the committed residential development.

Table 15.9 Committed Development Vehicle Trips (*DCC Ref. 2582/16*)

Land Use – Houses	Unit/GFA	AM Peak Hour			PM Peak Hour		
		Arr	Dep	Total	Arr	Dep	Total
Trip Rates	4	0.124	0.337	0.461	0.338	0.166	0.503
Vehicle Trips		0.5	1.3	1.8	1.4	0.7	2.1

15.5.2.5 Committed Development Trip Generation (ABP Ref. 300024-17)

Located on the R825 Clonskeagh Road, southeast of the subject development, planning permission was granted for the development of the Paper Mills site, bounded by the River Dodder to the East. The development proposes the construction of 116 no. apartments with the associated car parking provided at basement and surface level. The location of the committed development relative to the subject site is shown in Figure 15.16 below.

The Paper Mills development site has been granted by DCC (Refs. 3159/17, 2308/16,2620/14) and An Bord Pleanála (Ref. 300024-17) and therefore has been included in the traffic assessment of the proposed development in order to provide a robust assessment.

In order to determine the level of traffic generated by this third-party residential development, DBFL utilised the same trip rates as those utilised for the proposed subject development for the Build-to-Sell (BTS) apartment land uses as shown in Table 15.11 below. Table 15.10 below summarises the predicted peak hour AM and PM traffic generated by the committed residential development.

Table 15.10 Committed Development Vehicle Trips **(ABP Ref. 300024-17)**

Land Use	Unit/GFA	AM Peak Hour			PM Peak Hour		
		Arr	Dep	Total	Arr	Dep	Total
BTS Apartments	116	6	25	31	24	8	32

Figure 15.16: Location of Committed Developments

In addition to the aforementioned permitted developments, a number of nearby residential and mixed developments have been granted by DCC (3301/20, 2115/19, 3513/20). These committed developments are not considered to impact the surrounding road network as they propose a 'car-free' development or no net change in the number of car parking spaces proposed. As such these developments have not been included within the transportation assessment for the proposed development due to their lack of impact on the surrounding road network.

15.5.2.6 Proposed Development Trip Generation

A review of trip generation factors contained within the TRICS database was carried out. TRICS data is primarily UK based, although a number of Irish sites have recently been included and the number of Irish sites continues to expand. Nevertheless, we consider that TRICS will provide a reasonable indication of traffic generation from the proposed development.

Notwithstanding the above, internal research undertaken by TRICS has shown that there is no direct evidence of trip rate variation by country or region. The use of English, Scottish or Welsh data can be equally applicable to Ireland if users take into account important site selection filtering factors such as levels of population, location type, local public transport provision, and development size and car ownership level, amongst others.

Data supplied for inclusion in TRICS undergoes a procedure of validation testing, and there is no evidence from this procedure suggesting that data from Ireland bears any significant fundamental differences to that from the other countries included. Consequently, we consider that TRICS will provide a reasonable indication of traffic generation from the proposed development.

Table 15.11 below includes the predicted trip generations and our estimate of the likely traffic flows in and out of the proposed development during the morning and evening peak hour periods using data from TRICS.

Table 15.11 Proposed Development Trip Rates (TRICS)

Land Use	Unit/GFA	AM Peak Hour			PM Peak Hour		
		Arr	Dep	Total	Arr	Dep	Total
BTS Apartments	Per Unit	0.054	0.214	0.268	0.204	0.066	0.271
BTR Apartments	Per Unit	0.072	0.144	0.215	0.104	0.085	0.188
Creche	Per 100m^2	2.511	2.248	4.759	1.957	2.352	4.309

Based on the above trip rates, potential peak hour traffic generation is calculated based on 671 no. apartments and one 400m^2 creche. Table 15.12 summarises the predicted peak hour AM and PM traffic generated by the proposed development. The creche use within the development is not anticipated to generate notable external vehicle trips as it will be predominately catering towards the residents of the Sandford site and the local catchment within the community. As such the trip rates for the creche land use have been discounted by a factor of 0.6.

Table 15.12 Proposed Development Vehicle Trips

Land Use	Unit/GFA	AM Peak Hour			PM Peak Hour		
		Arr	Dep	Total	Arr	Dep	Total
BTS Apartments	67	4	14	18	14	4	18
BTR Apartments	604	43	87	130	63	51	114
Creche	400m^2	4	4	8	3	4	7
Total	671	51	105	156	80	59	139

15.5.2.7 Trip Distribution

The associated residential vehicle trips have been assigned to the surrounding road network based on the surveyed traffic movements (Appendix 15.1) passing the site based on the following assumptions.

In the Opening Year 2022, we have assumed that the full development of 671 residential units will be complete and occupied in order to provide a conservative assessment of the development's traffic impacts. In this 2022 scenario we have assumed the following distribution (as per the existing traffic surveys) for the subject residential development:

- 4% of all AM vehicle trips will travel northwest on the R117 Sandford Road;
- 34% of all AM vehicle trips will travel south on the R117 Milltown Road;
- 62% of all AM vehicle trips will travel northeast on the R117 Milltown Road;
- 4% of all PM vehicle trips will travel northwest on the R117 Sandford Road;
- 62% of all PM vehicle trips will travel south on the R117 Milltown Road; and
- 34% of all PM vehicle trips will travel northeast on the R117 Milltown Road.

15.5.2.8 Traffic Growth

An Opening Year of 2022 has been assumed for this assessment. In accordance with TII (NRA) Guidance, Future Design years (+5 and +15 years) of 2027 and 2037 have also been adopted.

The TII Project Appraisal Guidelines (PAG) have been utilised to determine the traffic growth forecast rates. The traffic growth forecast rates within the PAG ensures local and regional variations and demographic patterns are accounted for.

Table 6.1 within the PAG provides Annual National Traffic Growth Factors for the different regions within Ireland. The subject site lies within 'Dublin' with the growth factors as outlined within Table 15.13 below.

Table 15.13 National Traffic Growth Forecasts: Annual Growth Factors
(Extract from Table 6.1 PAG)

Metropolitan Area	Low Sensitivity Growth Rates				Central Growth Rates				High Sensitivity Growth Rates			
	2016-2030		2030-2040		2016-2030		2030-2040		2016-2030		2030-2040	
	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV	LV	HV
Dublin	1.0146	1.0280	1.0034	1.0116	1.0162	1.0295	1.0051	1.0136	1.0191	1.0328	1.0087	1.0172

Applying the annual factors (medium growth) as outlined in Table 15.9 above for the adopted Opening Year of 2022 and Future Horizon Years of 2027 (+5 years) and 2037 (+15 years), the following growth rates have been adopted to establish corresponding 2022, 2027 and 2037 baseline network flows: -

- 2020 to 2022 – 1.0327 (or 3.27%);
- 2020 to 2027 – 1.1191 (or 11.91%); and
- 2020 to 2037 – 1.2169 (or 21.69%).

15.5.2.9 Assessment Scenarios

Two different traffic scenarios have been assessed, namely (a) the 'Base' (Do Nothing) traffic characteristics and (b) the 'Post Development' (Do Something) traffic characteristics.

The proposed development traffic flows have then been added to the network's 'Base' (Base + Committed Development) traffic flows to establish the new 'Post' Development traffic flows. Base Flows for the future design years were based on Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections published by Transport Infrastructure Ireland (TII).

In Summary the following scenarios are considered at the residential site at Sandford Road:

Do Nothing

- A1 – 2022 Base Flows + Committed Developments
- A2 – 2027 Base Flows + Committed Developments
- A3 – 2037 Base Flows + Committed Developments

Do Something

- B1 – 2022 Do Nothing (A1) + Proposed Development Flows
- B2 – 2027 Do Nothing (A2) + Proposed Development Flows
- B3 – 2037 Do Nothing (A2) + Proposed Development Flows

15.5.2.10 Assessment Periods

The weekday AM and PM peak hour flows have been identified in traffic survey as occurring between 08:15 - 09:15 and 16:45 - 17:45 respectively. These peak hour periods form the basis of the network assessments.

15.5.2.11 Network Impact

The Institute of Highways and Transportation document 'Guidelines for Traffic Impact Assessments' states that the impact of a proposed development upon the local road network is considered material when the level of traffic it generates surpasses 10% and 5% on normal and congested networks respectively. When such levels of impact are generated, a more detailed assessment should be undertaken to ascertain the specific impact upon the network's operational performance. These same thresholds are reproduced in the TII document entitled Traffic and Transport Assessment Guidelines (2014).

In accordance with the IHT and NRA guidelines, assessments have been undertaken to establish the potential level of impact upon the key junctions of the local road network. To enable this calculation to be undertaken, the analysis took account of the following:

- 2022 Opening Year (Do Nothing & Do Something);
- 2027 Future Design Year Scenario (Do Nothing & Do Something); and
- 2037 Future Design Year Scenario (Do Nothing & Do Something).

Table 15.10 and Figure 15.17 detail the percentage impact of the relevant key junctions for the 2022, 2027 and 2037 design years. The following junctions have been included within the transport assessment:

- **Junction 1** – Northern Site Access / R117 Sandford Road / Belmont Avenue;

- **Junction 2** – R117 Sandford Road / R825 St. James's Terrace / R117 Milltown Road / R824 Eglinton Road; and
- **Junction 3** – Southern Site Access / R117 Milltown Road / Mount Sandford.

Figure 15.17: Increase in Vehicle Trips Generated Through Key Site Junctions 2037 Do Something – 671 Units

Table 15.14 Network Impact Assessment

Junction ID	Location	2022		2027		2037	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
1	Northern Site Access / R117 Sandford Road / Belmont Avenue	3.63%	1.88%	3.36%	1.74%	3.09%	1.60%
2	R117 Sandford Road / R825 St. James's Terrace / R117 Milltown Road / R824 Eglinton Road	3.57%	2.06%	3.30%	1.90%	3.04%	1.75%
3	Southern Site Access / R117 Milltown Road / Mount Sandford	10.47%	10.23%	9.66%	9.44%	8.89%	8.68%

The resulting percentage in traffic flows for the 2022, 2027 and 2037 (with full development) is established as exceeding the 10% impact threshold for Junction 3 only. As Junction 3 did exceed the 10% threshold required under the Institution of Highways and Transportation document 'Guidelines for Traffic Impact Assessments', a junction performance analysis has been conducted as required by the guidance document.

During the complete and occupied operational stage of the subject site, a slight long-term traffic impact will be made on the local road environment stemming from residential and employee trips to and from the site. As can be seen from the table above, Junction 1 (Northern Site Access / R117 Sandford Road / Belmont Avenue) and Junction 2 (R117 Sandford Road / R825 St. James's Terrace / R117 Milltown Road / R824 Eglinton Road) are minimally affected throughout the design years considered. Junction 3, Southern Site Access / R117 Milltown Road / Mount Sandford, experiences a marginally higher traffic impact, though it does not indicate any capacity concerns for the junction. Section 15.6.2 below outlines various mitigation measures to be implemented during the operational stage to discourage the use of private vehicles and encourage the uptake and use of active and sustainable modes of transportation.

15.6 Mitigation Measures

15.6.1 Construction Phase

An Outline Construction and Environmental Management Plan (CEMP) has been prepared as part of the planning application with an associated Preliminary Construction Management Plan (PCMP). The PCMP includes an Outline Traffic Management Plan as well as incorporating a range of integrated control measures and associated management activities with the objective of minimising the potential impacts of construction activities associated with the development. The following initiatives will be implemented to avoid, minimise and/or mitigate against the anticipated construction period impacts:

- During the pre-construction phase, the site will be securely fenced off/hoarded off from adjacent properties, public footpaths and roads;

- Appropriate on-site parking (temporary parking for the duration of construction works) and compound area will be provided to prevent overflow onto the local network;

- A large proportion of construction workers are anticipated to arrive in shared transport and car sharing will be encouraged. It is likely that some numbers of the construction team will be brought to/from the site in vans/minibuses, which will serve to reduce the trip generation potential;

- Delivery vehicles to and from the site will be spread across the course of the working day, therefore, the number of HGVs travelling during the peak hours will be relatively low;

- Truck wheel washes will be installed at construction entrances;

- Any specific recommendations with regard to construction traffic management made by Dublin City Council will be adhered to;

- Potential localised traffic disruptions during the construction phase will be mitigated through the implementation of industry standard traffic management measures such as the use of traffic signage. These traffic management measures shall be designed and implemented in accordance with the Department of Transport's Traffic Signs Manual "*Chapter 8 Temporary Traffic Measures and Signs for Roadworks"* and "*Guidance for the Control and Management of Traffic at Roads Works – 2nd Edition*" (2010);

- Site entrance point/s from the public road will be constructed with a bound, durable surface capable of withstanding heavy loads and with a sealed joint between the access and public highway. This durable bound surface will be constructed for a distance of 10m from the public road;

- Material storage zones will be established in the compound area and will include material recycling areas and facilities;

- 'Way finding' signage will be provided to route staff / deliveries into the site and to designated compound / construction areas;

- Dedicated construction haul routes will be identified and agreed with Dublin City Council prior to commencement of activities on-site; and

- On completion of the works, all construction materials, debris, temporary hardstands etc. from the site compound will be removed off-site and the site compound area reinstated in full on completion of the works.

15.6.2 Operational Phase

A package of integrated mitigation measures has been identified to off-set the additional local demand that the proposed residential development at the subject site could potentially generate as a result of the forecast increase in vehicle movements by residents of the scheme. The identified measures and associated timescale for their implementation are summarised below.

- **Parking Management Strategy** - A management regime has been set out (and accompanies this planning application) which will be implemented by the development's management company to control access to the on-site car parking spaces thereby actively managing the availability of on-site car parking for residents and visitors to the development. This provision equates to a car parking ratio of approximately 0.50 car parking spaces per residential unit. The signing of a rental agreement or purchase of one of the proposed residential apartments will not include access to a designated on-site parking space. All potential residents (prior to signing rental agreement) will be notified that the proposed scheme is a 'low car allocation' development with no access (or guarantee thereof) to the limited on-site residents car parking provision. Nevertheless, all residents of the proposed residential apartment scheme will have the opportunity to apply to the on-site management company for a resident's car parking permit (updated weekly, fortnightly, monthly, quarterly or annually) and subsequently access to a dedicated (assigned) on-site basement car parking space. A charge will be applied to obtain a permit with the objective of covering the associated management costs and discouraging long term usage of the car parking space.

- **Management** – A preliminary Mobility Management (MMP) has been compiled (Appendix 15.2) with the aim of guiding the delivery and management of co-ordinated initiatives by the scheme promotor to be implemented upon occupation of the site. The MMP will ultimately seek to encourage sustainable travel practices for all journeys to and from the proposed development.

- **Infrastructure** – Infrastructure measures identified to reduce reliance of private vehicles include the provision of ample secure cycle parking on site, meeting the minimum guidance (*Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities, 2020, DHPLG*), and ensuring a design which promotes permeability for pedestrians and cyclists to, through and from the development. The lower level of car parking provision for the development will also act as a powerful mobility management measure, ensuring against an overprovision of parking and a resultant over reliance on the private vehicle.

- **Infrastructure** – Junction enhancements have been identified and proposed at the R117 Sandford Road site access junction, including an upgrade to the existing controlled pedestrian crossing to a toucan crossing, with the objective of creating a highly permeable environment for pedestrians and cyclists and the tightening of corner radii on the Belmont Avenue arm, with dropped kerbs and tactile paving providing a safer informal crossing than the existing scenario. A signalised toucan crossing is also proposed at the R117 Milltown Road, adjacent to the site access location, facilitating safe connections for pedestrians and cyclists.

- **Car Sharing** – The provision of 10 No. dedicated car share (GoCar and development-owned) spaces at surface and basement level for the use of the scheme's residents and staff. The availability of these on-site provide a viable alternative to residents needing to own a private vehicle whilst still having access to a car as and when required.

15.7 Residual Impacts

15.7.1 Construction Phase

Provided the above mitigation measures and management procedures are incorporated during the construction phase, the residual impact on the local receiving environment will be temporary in nature and neutral in terms of quality and effect.

The significance of each of the projected impacts are detailed in Table 15.15 for the following key junctions:

- **Junction 1** – Northern Site Access / R117 Sandford Road / Belmont Avenue;
- **Junction 2** – R117 Sandford Road / R825 St. James's Terrace / R117 Milltown Road / R824 Eglinton Road; and
- **Junction 3** – Southern Site Access / R117 Milltown Road / Mount Sandford.

The significance of the impacts has been determined in accordance with the classifications stipulated within the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports - Draft (EPA, August 2017).

Table 15.15 Impact Significance – Construction Phase

Ref	Environment Character	Quality / Scale of Impact	Impact Significance	Duration
1	Low Sensitivity	Neutral	Imperceptible	Temporary
2	Low Sensitivity	Negative - Low	Not Significant	Temporary
3	Low Sensitivity	Negative - Low	Not Significant	Temporary

15.7.2 Operational Phase

15.7.2.1 Network Performance

In order to analyse and assess the impact of the proposed development on the surrounding road network, a traffic model of the junctions was analysed for the schemes following opening, interim and design years:

- 2022 Opening Year (671 residential units + 400 m² creche);
- 2027 Interim Year (671 residential units + 400 m² creche); and
- 2037 Future Horizon Year (671 residential units + 400 m² creche).

The following key junction has been analysed as it exceeded the 10% threshold required under the Institution of Highways and Transportation document 'Guidelines for Traffic Impact Assessments':

- **Junction 3** – Southern Site Access / R117 Milltown Road three-arm priority-controlled junction.

The operational assessment of the junction network has been undertaken using the Transport Research Laboratory (TRL) computer package PICADY for one priority junction. When considering priority-controlled and roundabout junctions, a Ratio of Flow to Capacity (RFC) of greater than 85% (0.85) would indicate a junction to be approaching capacity, as operation above this RFC value is poor and deteriorates quickly.

For the PICADY analyses a 90-minute AM and PM period has been simulated, from 08:00 to 09:30 and 16:30 to 18:00, respectively. The traffic flows were entered using an Origin-Destination table for the peak hours.

The evaluation of the operational performance of the key off site junctions following the implementation of the proposed residential scheme is summarised below for the Do Nothing (DN) and the Do Something (DS) scenario.

Existing – Do Nothing (DN): The potential level of traffic generated by committed developments and the existing baseline flows travelling across the network.

Proposed – Do Something (DS): The original development traffic in addition to the Base scenario (Existing – Do Nothing).

The evaluation of the operational performance of the key junctions across the local road network both prior to and following the implementation of the proposed residential development are summarised below in Table 15.16 based upon the findings of the PICADY and TRANSYT based junction assessments.

Table 15.16 Junction Operational Performance Evaluation (RFC values)

Scenario		Junction 3		
		2022	2027	2037
Do Something	AM	12%	12%	12%
	PM	11%	11%	13%

For Junction 3, the southern site access, the results of the PICADY assessment indicate that the priority-controlled junction will operate within capacity for all "Do Something" scenarios, with a maximum RFC value of 13% for the 2037 Do Something PM peak hour.

15.7.2.2 Impact Significance

The implementation of the mitigation measures outlined above, including the MMP, will ensure that the residual effect on the local receiving environment is both managed and minimised. In reference to Table 15.14, the analysis predicts the scale of residual impact, during both the 2022 and 2037 design years, as being below 5% on the surrounding links, with the exception of following links as shown in Table 15.17.

Table 15.17 Links with Impact >5%

Link		Peak Hour	2022 Do Something	2037 Do Something
3	Southern Site Access / R117 Milltown Road / Mount Sandford	AM	10.47%	8.89%
		PM	10.23%	8.68%

With regards to the TII thresholds, the 2022 and the 2037 analysis, the principal site access junction at Milltown Road demonstrates that the proposed development will generate an impact greater than 5%. As a result, the junction's 2037 Design Year scenario has been subject to detailed analysis as discussed above in the previous paragraphs and in line with the criteria set out within the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports – Draft (EPA, August 2017).

The significance of each of the projected impacts at each of the key nodes following the introduction of the identified mitigation works is detailed within the following table for the adopted worst case (e.g. peak hours) 2037 Future Year scenarios.

Table 15.18 Impact Significance – 2037 Design Year

Ref	Peak Hour	Environment Character	Quality / Scale of Impact	Impact Significance	Duration
3	AM	Low Sensitivity	Negative - Low	Not Significant	Short-term

[redacted]	PM	Low Sensitivity	Negative - Low	Not Significant	Short-term

As shown in Table 15.18 above, the impact significance for both the AM and PM peak hours of the 2037 design year scenario is 'Not Significant' with the proposed development resulting in an environmental impact of only a 'Short-term' duration.

15.8 Monitoring

15.8.1 Construction Phase

During the construction stage, the following monitoring exercises are proposed:

- Compliance with construction vehicle routing practices;
- Compliance with construction vehicle parking practices;
- Internal and external road conditions; and
- Timing of construction activities.

15.8.2 Operational Phase

As part of the MMP process, bi-annual post occupancy surveys are to be carried out in order to determine the success of the measures and initiatives as set out in the proposed MMP document. The information obtained from the monitoring surveys will be used to identify ways in which the MMP measures and initiatives should be taken forward in order to maintain and further encourage sustainable travel characteristics.

15.9 Reinstatement

15.9.1 Construction Phase

The construction works areas will be reinstated following completion of development with landscaped areas provided where proposed. The majority of works will be restricted to the footprint of the site for the proposed development with upgrades required to public road to construct the proposed site access junctions including toucan crossings as well as service connections . Excavated topsoil and subsoil will be reused in reinstatement and landscaping where appropriate or dealt with in the appropriate manner i.e. sent for soil recovery as appropriate.

15.9.2 Operational Phase

No reinstatement requirements have been identified in relation to the operational phase of the proposed development.

15.10 Interactions

The following summaries briefly outline the interaction between each factor discussed in this EIAR and transportation. Further reference should be made to Chapter 20 'Interactions and Cumulative Impacts' for a detailed account of potential interactions and resulting impacts.

15.10.1 Air Quality

Overall, the impact of the interaction between air quality and traffic is considered long-term, imperceptible and neutral. Refer to the relevant chapters for additional information.

15.10.2 Noise and Vibration

The noise emission sources from the proposed development during the construction and operational phases will be from traffic. The noise impact assessment has been prepared in consultation with the design team and traffic engineers. Refer to the relevant chapters for additional information.

With the implementation of mitigation measures the interaction between construction noise and vibration and transportation will be short-term, slight to significant and neutral. In the operation stage, the interaction will be permanent, imperceptible and neutral.

15.10.3 Population and Human Health

Construction and operational stage traffic and traffic management measures have the potential to affect journey amenity or economic activity as a result of increased congestion or access restrictions.

The increased infrastructure for sustainable travel modes can contribute towards modal shift in travel patterns and increased physical activity. Employment and economic activity will be generated during the construction stage of the project. Refer to the relevant chapters for additional information.

Provided that mitigation measures and management procedures detailed in Chapter 15 are implemented, the residual impact on the local receiving environment during the construction stage will be short-term, imperceptible and neutral.

The implementation of mitigation measures such as the implementation of the Mobility Management Plan will ensure that the residual effect on the local receiving environment is both managed and minimised. The promotion of sustainable modes of transport from the site, the large quantum of bicycle parking provided and the incorporation of permeable links through the site will contribute towards a modal shift in travel patterns and increased physical activity, which will have a positive, significant and long-term effect on the area.

15.10.4 Land and Soils

The volumes of surplus soils generated by the scheme and the earthworks import requirement will affect construction stage traffic generation. Measures to optimize design and minimize material generation are detailed in the relevant chapters.

Mitigation measures proposed will ensure that the potential impacts of the proposed development on land, soils and the geological environment do not occur during the construction phase and that any residual impacts will be short term, imperceptible and neutral.

15.10.5 Water and Hydrology

Construction and operational stage traffic have the potential to impact on water quality via hydrocarbon spills and leaks and via increased sediment/particle loading on trafficked surfaces. Measures to mitigate against impacts are detailed in Chapter 11 and the impact of the interaction is considered to be short-term, imperceptible and neutral.

15.10.6 Waste Management

It is important that construction and operational impacts in relation to issues that may arise along the local road network, in addition to increases in vehicle emissions and waste attributable to the proposed scheme, are addressed. Suitable mitigation measures aimed at reducing these impacts are identified below and further detailed in Chapter 14. Provided the mitigation measures are implemented, the interaction will be short to long-term, imperceptible and neutral.

15.10.6.1 Construction & Demolition Waste Management

The principle of 'Duty of Care' in Waste Management Act 1996-2008 states that the waste producer is responsible for waste from the time it is generated through to its legal disposal (including its method of disposal). Waste materials generated by earthworks, demolition and construction activities will be managed according to the Department of the Environment, Heritage and Local Government's 2006 Publication – Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects.

Waste minimisation and prevention shall be the main responsibility of the Contractor who will ensure the following:

- Use of precast / prefabricated materials where possible;
- "Cut" materials generated by the construction works to be re-used onsite where possible, through various works resulting in a;
    - o Reduction in the requirement for virgin aggregate materials from quarries;
    - o Reduction in energy required to extract, process and transport virgin aggregates; and
    - o Reduced HGV movements associated with the delivery of imported aggregates to the site.
- Materials will be ordered on a 'just in time' basis to prevent over supply and site congestion;
- Materials will be correctly stored and handled to minimise the generation of damaged materials;
- Materials will be ordered in appropriate sequence to minimise materials stored on site; and
- Sub-contractors will be responsible for similarly managing their wastes.

The minimisation and prevention of wastes will reduce the total number of HGVs accessing and egressing the site through the appointed haulage routes and thereby reduce the potential impact on the site's surrounding traffic network.

Construction and demolition waste will be managed in accordance with a Construction & Demolition Waste Management Plan which outlines the planning, prevention, management, duty of care and tracking of all construction and demolition waste.

Construction and demoltion will be planned to identify and implement ways to prevent, reduce, reuse and recycle waste. Work will be planned with waste minimisation in mind.

15.10.6.2 Operational Waste Management

The typical non-hazardous and hazardous wastes that will be generated at the proposed development will include the following: Dry Mixed Recyclables (DMR), organic waste, glass and Mixed Non-Recyclable (MNR) / general waste. Wastes will be segregated into the above waste types to ensure compliance with waste legislation and guidance while maximising the re-use, recycling and recovery of waste with diversion from landfill wherever possible.

Waste storage and collection arrangements at the proposed development have been prepared with due consideration of the proposed site layout and location as well as best practice standards, local and national waste management requirements including those of DCC. In particular, consideration has been given to the following documents:

- BS 5906:2005 Waste Management in Buildings – Code of Practice;
- EMR Waste Management Plan 2015 – 2021;
- Dublin City Council Development Plan 2016 – 2022 (Appendix 10);
- DCC, Bye-Laws for the Storage, Presentation and Collection of Household and Commercial Waste (2013); and
- DoHLGH, Sustainable Urban Housing: Design Standards for New Apartments, Guidelines for Planning Authorities (2020).

There are numerous private contractors that provide household and commercial waste collection in the Dublin City area. All waste contractors servicing the proposed development must hold a valid waste collection permit for the specific waste types collected. All waste collected must be transported to registered, permitted and / or licensed facilities only.

It is recommended that waste collection times / days are staggered for the different waste types to reduce the number of bins required to be presented for collection / emptying at the collection points within and outside the site at any one time. In accordance with the DCC Waste Bye-Laws waste collections can only take place between 6am and 9pm on a given collection day and waste cannot be presented for collection before 6pm on the day before collection.

Waste will be presented for collection in a manner that will not endanger health, create a risk to traffic, harm the environment or create a nuisance through odours or litter.

15.11 Cumulative Impacts

The analysis detailed above represents an appraisal in terms of potential cumulative impacts for a typical weekday as it is focused upon the key two busiest periods of the day (e.g. AM and PM peak hours). During the other 22 hours of the day, traffic flows are predicted to be significantly lower resulting in the network operating with additional reserve capacity to that forecast for the peak hour periods.

Furthermore, if any of the adjacent zoned lands in the area were to be developed, aside from those included as a committed development, this would have an effect on the local road network. However, the scale of any potential impact would be fully assessed during the planning procedures for any of these individual third-party developments (which currently do not benefit from planning permission).

Nevertheless, the utilisation of TII's growth rates does take some account of the potential additional traffic that such third party sites could generate. The TII Project Appraisal Guidelines (PAG) have been utilised to determine the traffic growth forecast rates for the Dublin Metropolitan Area as outlined in Section 15.5.2.7 of this chapter. The traffic growth forecast rates within the PAG ensures local and regional variations and demographic patterns are accounted for.

In reference to the findings of the network simulation and associated junction modelling analysis undertaken and detailed in the previous section, the proposed priority-controlled site access junctions will have sufficient reserve capacity to accommodate the associated future increases in additional traffic movements.

Table 15.19 Summary of Construction Phase Likely Significant Effects with and without out Mitigation / Monitoring

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
Congestion on the local road network as a result of HGVs during the Construction Stage.	Local	Negative	Significant	Short-Term	Direct	Likely	An appropriate control and routing strategy for HGVs and the phasing of construction vehicles throughout the day.	Compliance with construction vehicle routing practices.	Neutral	Slight	Short-Term	Direct	Un-Likely
Additional HGVs required due to improper storage, material damage or lack of reuse of construction materials.	Local	Negative	Moderate	Short-Term	Direct	Likely	Material storage zones will be in use as well as the conducting of regular inventory checks to ensure reuse of available material.	Compliance with construction waste management practices.	Neutral	Not Significant	Short-Term	Direct	Un-Likely

Table 15.20 Summary of Operational Phase Likely Significant Effects with and without out Mitigation / Monitorin

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	**Extent**	**Quality**	**Significance**	**Duration**	**Type**	**Probability**			**Quality**	**Significance**	**Duration**	**Type**	**Probability**
An increase in traffic flow causes capacity issues at local junctions	Local	Negative	Significant	Medium-term	Direct	Un-Likely	A detailed parking management strategy and MMP have outlined the various methods with which private car ownership will be deterred and sustainable transport options promoted.	Bi-annual occupancy surveys as part of the MMP process will be conducted to determine efficacy of measures and to further encourage a modal shift.	Neutral	Slight	Medium-term	Direct	Un-Likely

15.12 'Do-Nothing' Impacts

In the absence of the proposed development, the overall operational performance of the existing junctions on the surrounding road network will be impacted by the forecast background network traffic growth (should that growth arise) and the following committed developments:

- 148-Unit Residential Development at Eglington Road (ABP Ref. PL29S.307267)
- 36-Unit Residential Development at Sandford Close (ABP Ref. PL29S.307375)
- 4-Unit Residential Development at Belmont Avenue (Reg. Ref. 2582/16)
- 116-Unit Residential Development at Clonskeagh Road (ABP Ref. 300024-17)
- 100-BTR Unit Shared Accommodation at Kiely's Pub (Reg. Ref. 3301/20)
- 203-Bed Student Accommodation at Alexandra College (Reg. Ref. 2115/19)
- Mixed Use Development of 49-BTR units, and 231 m^2 retail space at Donnybrook Road (Reg. Ref. 3513/20)

15.13 Difficulties Encountered in Compiling the Chapter

There were no material difficulties encountered in compiling and assessing the data for this EIAR sufficient to prevent modelling of the likely transport effects of the proposed development. The analysis reported within this chapter is based upon the traffic survey data specifically commissioned for this appraisal and undertaken in February 2020, prior to any traffic flow impact as a result of the Covid-19 pandemic.

15.14 Conclusion

The purpose of this EIAR chapter was to quantify the existing transport environment and to detail the results of assessment work undertaken to identify the potential level of transport impact generated as a result of the construction and operational phases of the proposed residential development.

It is concluded that there are no traffic or transportation related reasons that should prevent the granting of planning permission for the proposed residential development.

15.15 References

- 'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment' (Department of Housing, Planning & Local Government, 2018);
- 'Guidance on the preparation of the Environmental Impact Assessment Report' (European Commission, 2017);
- 'Guidelines on the information to be contained in Environmental Impact Statements' (EPA, 2002);
- 'Draft Advice Notes for Preparing Environmental Impact Statements' (EPA, 2015);

- 'Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports' (EPA, 2017);
- Transport Infrastructure Ireland's (TII's) 'Traffic & Transport Assessment Guidelines' (2014);
- 'Guidelines for the Environmental Assessment of Road Traffic' (Institute of Environmental Management & Assessment, 2003);
- 'The Dublin City Development Plan 2016 – 2022' (DCC, 2016);
- 'Transport Strategy for the Greater Dublin Area 2016 – 2035' (NTA, 2016);
- 'Design Manual for Urban Roads and Streets' (DTTAS & DHPLG, 2013); and
- 'National Cycle Manual' (NTA, 2011).
- Bus Connects website (www.busconnects.ie);
- Traffic Signs Manual 'Chapter 8 Temporary Traffic Measures and Signs for Roadworks', Department of Transport;
- 'Guidance for the Control and Management of Traffic at Roads Works – 2nd Edition' (Department of Transport, 2010);
- Dublin Bus website (www.dublinbus.ie);
- 'Greater Dublin Area Cycle Network Plan' (National Transport Authority, 2013);
- Ordnance Survey Ireland (www.osi.ie);
- 'Guidelines for Traffic Impact Assessments', (The Institution of Highways and Transportation, 1994);
- Transport for Ireland (www.transportforireland.ie);
- Transport Infrastructure Ireland (www.tii.ie).

16.0 MATERIAL ASSETS – SITE SERVICES

16.1 Introduction

The Material Assets – Site Services Chapter of this EIAR has been prepared by Brendan Keogh (BA BAI PGradDip CEng MIEI) of DBFL Consulting Engineers. Brendan Keogh is a Chartered Professional Engineer with over 15 years' experience in the design and construction of civil engineering projects. Projects have included works associated with the commercial, industrial, energy, residential and public infrastructure sectors.

This chapter of the EIAR comprises of an assessment of the likely impact of the proposed development on existing utility services in the vicinity of the site as well as identifying proposed mitigation measures to minimise any impacts.

The material assets considered in this chapter of the EIAR include Power, Gas and Telecommunications. Note that Surface Water Drainage, Foul Drainage and Water Supply are addressed in Chapter 11 (Water & Hydrology).

In summary, the proposed development ("the site") comprises of 671 residential dwelling (604 No. Build to Rent and 67 No. Build to Sell) on a c. 4.26 ha site (developable area). The development also includes a creche with outdoor play area and communal internal amenities (co-working space, lounges, libraries and multi-purpose hall).

The proposed development will also include the following associated engineering infrastructure:

- Provision of a new vehicle access off Milltown Road (primary vehicle access to the proposed development facilitating access to the basement carpark as well as serving pedestrians and cyclists). This new site access shall be a priority junction. A Toucan Crossing is also proposed in the vicinity of the Milltown Road access to improve facilities for vulnerable road users.

- Retain existing entrance on Sandford Road (facilitates pedestrian and cycle access as well as limited vehicle access to the northern end of the site). Improvements to existing pedestrian crossing point in the vicinity of the Sandford Road entrance is also proposed. There is no vehicular access from Sandford Road to the basement carpark, the forecourt area adjacent to Tabor House and the duplex units along the western boundary (which are all served exclusively from Milltown Road).

- Provision of an additional access points for pedestrians and cyclists adjacent to the junction of Sandford Road / Milltown Road.

- Provision of internal site roads including associated footpaths.

- Provision of on-site surface water drainage infrastructure which will discharge from the site along its south-eastern boundary via Milltown Road and the junction of Milltown Road / Sandford Road prior to discharging to the existing public surface water drainage network in Eglinton Road (proposed 300mm diameter pipe extending approximately 300m from the proposed development site boundary to the outfall location which includes replacement of approx. 160m of the existing 225mm diameter drainage network along Eglington Road).

- Provision of foul drainage and water supply infrastructure and connections.

16.2 Methodology

Assessment of the likely impact of the proposed development on existing utility services in the vicinity of the site included a desktop review of the following information and has been informed by the EPA "Guidelines on the Information to be Contained in Environmental Impact Assessment Reports", Draft August 2017.

- ESB Networks Utility Plans (refer to Appendix 16.1)
- Gas Networks Ireland Service Plans (refer to Appendix 16.1)
- Eir E-Maps (refer to Appendix 16.1)

A GPR Utility Survey has also been carried out along Sandford Road, Milltown Road and Eglinton Road (refer to Appendix 16.2).

Assessment of the likely impact of the proposed development on existing utility services in the vicinity of the site has been informed by the EPA "Guidelines on the Information to be Contained in Environmental Impact Assessment Reports", Draft August 2017.

16.3 Receiving Environment

16.3.1 Power

An ESB Networks Utility Plan plan is included in Appendix 16.1 showing the location of existing electrical services in the vicinity of the site.

Existing Medium Voltage (MV)/Low Voltage (LV) underground cables are located adjacent to the site's northern-eastern boundary (Sandford Road) and south-eastern boundary (Milltown Road). Existing HV underground cables are also located along Milltown Road.

Existing LV overhead lines (public lighting) are located adjacent to the site's south-eastern boundary (Milltown Road).

16.3.2 Gas

Gas Networks Ireland Service Plans are included in Appendix 16.1 showing the location of gas distribution pipes in the vicinity of the site.

Low pressure and medium pressure Gas Networks Ireland distribution pipelines are located adjacent to the site (along Sandford Road and Milltown Road).

The Gas Networks Ireland Service Plans shows a low-pressure service pipe entering the site along Milltown Road. This pipe formerly served the Jesuit's lands to the west of the site. Service separation works have been carried out to cap this gas supply within the site (an alternative gas supply route has been established for the Jesuit's lands).

16.3.3 Telecoms

Eir E-Maps are included in Appendix 16.1 showing the location of telecommunications infrastructure in the vicinity of the site.

Telecommunications infrastructure is located along Sandford Road and Milltown Road (immediately adjacent to the site's northern-eastern boundary and south-eastern boundary).

Information obtained from National Broadband Ireland's website (www.nbi.ie/map) indicate that broadband speeds of 30mbps or greater are available in the locality of the site.

16.4 Characteristics of the Proposed Development

16.4.1 Power

Power supply for the proposed development will be taken from the existing ESB Network located along the site's northern-eastern boundary (Sandford Road) and south-eastern boundary (Milltown Road).

Existing LV overhead lines (public lighting) located in the immediate vicinity of the proposed site entrance off Milltown Road may need to be undergrounded as part of the proposed development if required by the ESB.

16.4.2 Gas

Gas supply for the proposed development will be taken from the existing Gas Networks Ireland network located along the site's northern-eastern boundary (Sandford Road) and south-eastern boundary (Milltown Road).

16.4.3 Telecoms

Communications connections for the proposed development will be taken from the existing Eir network located along the site's northern-eastern boundary (Sandford Road) and south-eastern boundary (Milltown Road).

16.5 Identification of Potential Impacts

16.5.1 Construction Phase

There is potential for interruption to power, public lighting, gas and telecoms infrastructure while carrying out road works along Sandford Road and Milltown Road (e.g. formation of site access, provision of utility connections for the proposed development or construction of boundary treatment) and while constructing the surface water drainage outfall (Milltown Road, the junction of Milltown Road / Sandford Road and Eglinton Road).

Similarly undergrounding of the existing LV overhead lines (public lighting) in the immediate vicinity of the proposed site entrance off Milltown Road (if required by the ESB) may lead to interruption to public lighting.

These impacts without mitigation are considered to have a negative / significant / short-term.

16.5.2 Operational Phase

On completion of the construction phase, there will be no further impact on electrical, gas or telecommunications supplies.

16.5.3 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

16.6 Ameliorative, Remedial or Reductive Measures

16.6.1 Construction Phase

The following measures are proposed in order to avoid interruption to power, public lighting, gas and telecoms infrastructure while carrying out road works along Sandford Road and Milltown Road and while constructing the surface water drainage outfall (Milltown Road, the junction of Milltown Road / Sandford Road and Eglinton Road)

Once the measures noted below are implemented, the impact on power, gas and telecoms infrastructure is considered to be neutral / non-significant / short-term.

- Contractor to prepare Method Statement detailing proposals for works in the vicinity of existing utilities including detail of process to minimise potential for interruption to power, gas and telecoms infrastructure. Contractor's method statement to be agreed with PSDP (Project Supervisor for the Design Process).

- Contractor to locate and record all services on site prior to commencement of excavations.

- A GPR utility survey has been carried out along Sandford Road, Milltown Road and Eglinton Road to confirm the location of power, gas and telecommunications infrastructure. This survey is to be supplemented with slit trench investigation as required by the contractor in advance of commencing works along Sandford Road, Milltown Road and Eglinton Road.

- Contractor to obtain utility company network plans and arrange observation as required.
- Connections to the existing power, gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.
- Contractor to comply with HSA Code of Practice for Avoiding Danger from Underground Services (refer to Appendix 16.3).
- Contractor to prepare and implement a Construction Traffic Management Plan that will be agreed with the Design Team and Local Authority and which will ensure the safety of the public during construction (note, an outline Traffic Management Plan is included in the Preliminary Construction Management Plan).
- All personnel using machinery/plant to have undergone training on the use of said machinery/plant. Ongoing site supervision to be undertaken to ensure all use of machinery/plant is in accordance with the training undertaken.

16.6.2 Operational Phase

On completion of the construction phase there will be no further impact on electrical, gas or telecommunications supplies. No mitigation measures are proposed in relation to the site services described in this chapter.

16.7 Predicted Impact of the Proposed Development

16.7.1 Construction Phase

Implementation of measures outlined in Section 16.6.1 will ensure that the potential impacts of the proposed development on site services do not occur during the construction phase and that any residual impacts will be short term.

16.7.2 Operational Phase

Demand from the proposed development during the operational phase is not predicted to impact on the existing power, gas and telecoms networks.

16.7.3 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

16.8 Monitoring

No specific monitoring is proposed in relation to electrical, gas and telecommunications infrastructure.

16.9 Reinstatement

Reinstatement of any excavations, trenches etc. relating to the provision of electrical, gas and telecommunications connections is to be carried out in accordance with the relevant utility provider's requirements.

16.10 Interactions and Potential Cumulative Impacts

16.10.1 Interactions

Soils and Geology

Trench excavations to facilitate site service installation will result in exposure of subsoils to potential erosion. Mitigation measures are outlined in Chapter 10 Land & Soils, Section 10.6 (i.e. service trenches to be backfilled as soon as practicable to minimise potential erosion of subsoils).

The impact of the interaction is considered to be short-term, imperceptible and neutral.

16.10.2 Potential Cumulative Impacts

Other development in the vicinity of the site is likely to have similar impacts during the construction phase in relation to Material Assets – Site Services.

Should the construction phase of the developments coincide with development of the site, potential cumulative impacts are not anticipated once similar ameliorative, remedial and reductive measures are implemented.

Table 16.1 Material Assets – Site Services – Summary of Construction Phase Likely Significant Effects with and without out Mitigation / Monitoring

		Impact Without Mitigation					Mitigation Measures	Monitoring	Impact With Mitigation / Monitoring				
Likely Significant Effect	Extent	Quality	Significance	Duration	Type	Probability			Quality	Significance	Duration	Type	Probability
Interruption to power, gas and telecoms infrastructure	Adjacent Utility Network	Negative	Significant	Short-Term	Direct	Likely	Contractor to locate all services prior to commencement of excavations. GPR survey to be supplemented with slit trenches as required.	Monitor compliance with HSA Code of Practice for Avoiding Danger from Underground Services	Neutral	Not Significant	Short-Term	Direct	Un-Likely

17.0 MICROCLIMATE - WIND

17.1 Introduction

The purpose of this chapter is to outline the predicted microclimate wind conditions experienced within and surrounding the proposed Sandford Road development located in Dublin 6.

The proposed method for compliance validation is via the industry best practice standard for pedestrian comfort (Lawson Criteria). The Lawson Criteria sets acceptable levels of wind speed and velocity for various human activities.

Given the specific location of the buildings and recorded metrological data available for the area, and standard interpolation calculation procedures, it is possible to predict the expected wind speeds and their annual occurrence.

This chapter was completed by:

- Dónal O'Connor, an Associate, Senior Energy Engineer with OCSC (M&E). He is a Chartered Engineer and holds an MSc. (Distinction) in Sustainable Energy from University College Cork and has also completed a BSc. (First Class Honours) in Civil and Environmental Engineering. He has been active in the field of energy efficiency and sustainable energy for over 9 years, with a primary focus on consultancy.

- Carlota Álvarez, an Energy Engineer with OCSC (M&E). She has a B.Eng. (Hons) in Marine Engineering and over 4 years' experience working as an Energy & Sustainability Engineer. She has worked on a range of projects from Part L, Overheating, Wind and now concentrates on leading the Daylight and Sunlight section of OCSC, where she has experience with EIAR chapters.

17.2 Study Methodology

The section outlines the methodology used in the assessment of the pedestrian wind comfort conditions within and surrounding the proposed development.

17.2.1 Pedestrian Comfort Compliance

The Lawson criteria gives guidance to quantify the effect of wind velocity on pedestrian comfort and safety. The Lawson recommended guidance indicates that for the comfort and safety assessment of the wind environment, it is not only the velocity of wind that is considered but also the frequency of occurrence of these velocities. The frequency of occurrences is used here as an indicator of the likely duration of certain wind speeds. The Lawson criteria indicates that the threshold mean hourly wind speed for each pedestrian activity should not be exceeded for more than 5% of the time to maintain pedestrian comfort as outlined in Table 17.1.

Pedestrian activity	Threshold mean hourly wind speed not to be exceeded for more than 5% of the time [m/s]
Business Walking	10
Leisurely Walking	8
Standing	6
Sitting	4

Table 17.1: Lawson Criteria for Pedestrian Comfort

There are 2 No. additional classes to quantify the safety conditions for typical or sensitive (e.g. frail or a cyclist) pedestrians which are summarised in Table 17.2.

Pedestrian activity	Threshold mean hourly wind speed not to be exceeded more than 0.023% of the time [m/s]
Typical Pedestrian	20
Sensitive Pedestrian	15

Table 17.2: Lawson Criteria for Safety Assessment

17.2.2 Assessment Methodology

The methodology adopted for the study combines the use of Computational Fluid Dynamics (CFD) to predict air flow patterns and wind velocities around the proposed development, the use of wind data from the nearest suitable meteorological station and the recommended comfort and safety standards (The Lawson Criteria).

The study considered the following factors:

- The effect of the geometry, height and massing of the proposed development and existing surroundings on local wind speed and direction;
- The wind speed as a function of the local environment such as topography, ground roughness and nearby obstacles (buildings, bridges, etc.);
- The effects of site location (open field, inner city, etc.);
- Orientation of the buildings relative to the prevailing wind direction; and
- The pedestrian activity to be expected (long term sitting, standing or short term sitting, leisure and business walking).

17.2.2.1 Extent of CFD Study Area

The extent of the built area that is represented in the computational domain is dependent on the influence of the features on the region of interest which includes the site and its nearby surroundings. The analytical CFD model analyses the proposed development. It also includes existing buildings surrounding the development with the extent of the buildings included in the study area illustrated in Figure 17.1. The analytical CFD model is assessed against the full Lawson Criteria to identify the pedestrian comfort and safety conditions within and surrounding the development.

The analytical CFD model has been constructed based on the information provided below:

- 3D Revit model and drawings received from OMP Architects;
- Landscape drawings received from Cameo & Partners;
- Available aerial photographic data via Google Maps;
- Meteorological wind data for Dublin Airport.

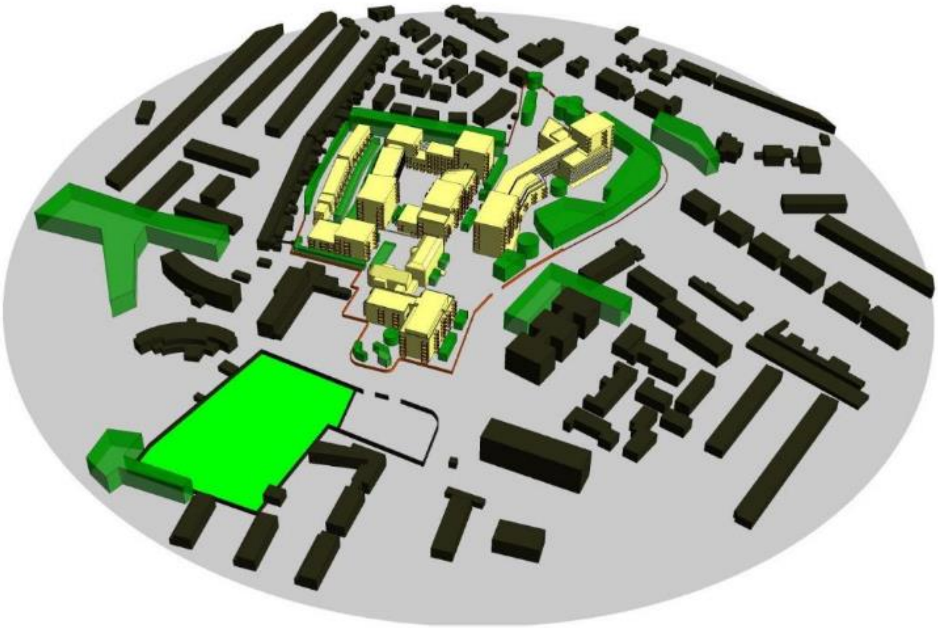


Figure 17.1: Extent of CFD Study Area

17.2.3 Wind Profile

A rectangular computational domain was created to simulate the effect of the atmospheric boundary layer surrounding the region of interest. The extents of the computational domain are illustrated in Figure 17.2, where H is the height of the highest tower within the proposed development. The dimensions of the domain, e.g. 5H are typical values for a CFD wind study with a larger distance downstream of the project site, i.e. 15H which ensures that the boundary layer does not create any artificial blockages.

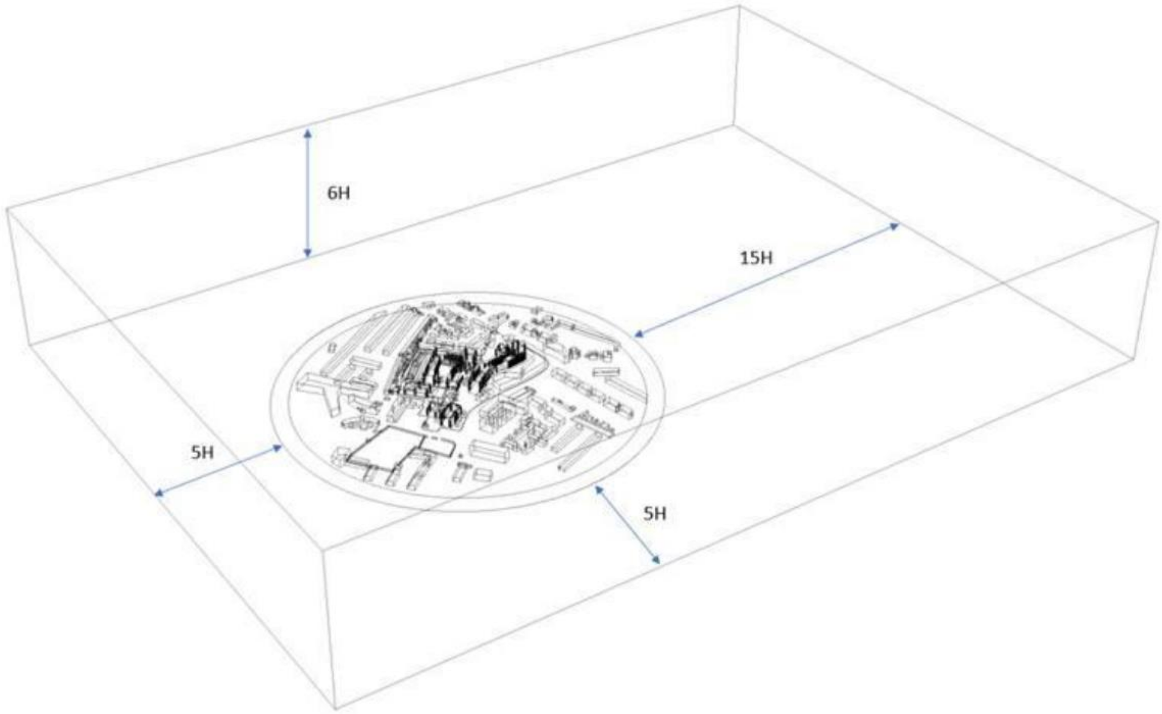


Figure 17.2: Computational Domain Surrounding the Region of Interest

An atmospheric boundary layer wind profile (v_{wind}) is applied to the boundaries of the computational model. To incorporate the effect of small height differences and small objects at street level, which are not explicitly included in the model, a roughness has been applied to the ground surface of the detailed CFD model. For the wind profile a roughness length (z_o) of 0.4 m has been estimated.

Based on the reference velocity, reference height, and roughness length, a wind profile can be defined. The wind profile v_{wind} is defined as follows.

$$v_{wind} = v_{ref} \cdot \left(\frac{\ln\left(\frac{z}{z_0}\right)}{\ln\left(\frac{z_{ref}}{z_0}\right)} \right)$$

Where

v_{wind}	Wind velocity	[m/s]
v_{ref}	Reference velocity	[m/s]
z	Height above the ground	[m]
z_0	Roughness length	[m]
z_{ref}	Reference height	[m]

17.2.4 Wind Factor

The CFD simulations are used to calculate the wind factor. The wind factor is a factor which indicates if the wind speed is locally increased (wind factor > 1.0) or decreased (wind factor < 1.0) due to buildings (or other geometry), relative to the applied reference wind speed at 10m height. The wind factor is independent of the magnitude of the reference wind speed at 10m height, making the obtained wind factor valid for all wind speeds in a specific wind direction range. Hence, one simulation can be applied per wind direction covering all wind speeds in this direction.

To explain the wind factor in more detail, the wind factor results for the 0-degree wind direction (i.e. North) are illustrated in Figure 17.3. The wind factor vectors that are coloured green, cyan or dark blue indicate that the local wind speed has been reduced (wind factor < 1.0), while wind factor arrows which are coloured yellow, orange or red indicate the local wind speed has increased (wind factor > 1.0). Using the wind factors, the quantity of hours that a wind speed is exceeded can be calculated (per wind direction) which is then used to assess compliance against the Lawson Criteria.

The wind factor results for all 12 No. wind directions are included in Section 17.4.2.4.

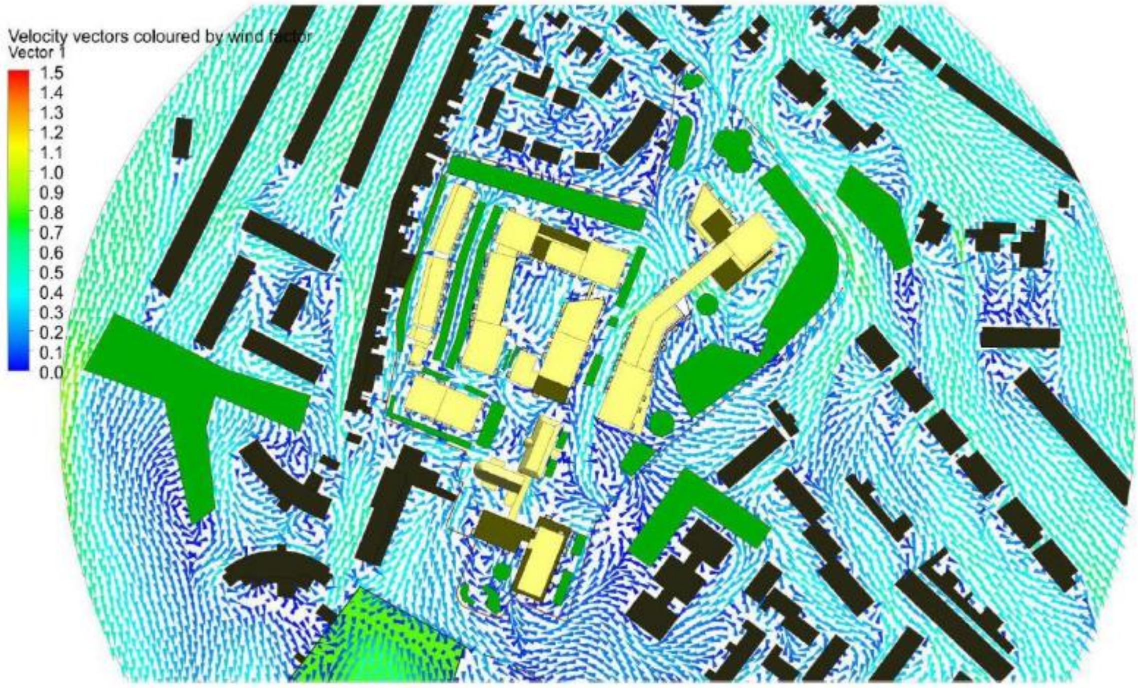


Figure 17.3: Wind Factor – 0 Degree (N) Wind Orientation

17.2.5 CFD Modelling

The CFD simulation has been performed using the software package ANSYS CFX version 2020 R2. This software package can be used for a large range of applications and has been extensively validated.

A full 3D CFD model of the proposed development and surrounding buildings was created and split into a large number of control volumes or cells. The standard equations for fluid motion and energy transport are applied to each cell. The equations are then solved using numerical techniques. The CFD settings used for the analysis are summarised in Table 17.3.

CFD Settings	Description
Grid type	Hybrid, mixture of tetrahedrons, pyramids and prisms

Cell size	Dynamic, ranging from 0.025 up to 2 m at the building surfaces and streets, growing with a factor of 1.05 to a maximum of 10 m in the volume
Number of cells	75 million
Simulation type	Steady state
Convergence	RMS maximum 1·10-4
Timestep	2.5 s
Number of Iterations	1000
Fluid	Air fixed properties
Turbulence model	RANS, RNG Kappa-Epsilon model
Walls	Smooth, no slip
Ground Surface	Rough, no slip
Wind volume	Profile for velocity and turbulence
Roughness	Volumetric sources for momentum and turbulence
Vegetation	Volumetric loss coefficient

Table 17.3: Summary of CFD Model Settings

17.2.6 Assumptions and Limitations

Computational Fluid Dynamic (CFD) is a widely recognised method for modelling airflow problems and as computer power develops, it increasingly improves its applicability. However, there are some limitations with CFD in relation to the modelling of wind environments. The method uses mean hourly wind values and presents a limitation to capture gusts.

The Lawson criteria for pedestrian comfort focuses on the effect of wind and do not factor in other environmental variables such as air temperature, solar radiation and relative humidity. However, overlaying all these factors would be a complex process and Lawson's simplified method presents the best available methodology for anticipating wind effects in the built environment on pedestrian comfort.

The buildings were modelled as blocks, i.e. with smooth surfaces and sharp corners, which is generally sufficient detail to represent buildings in airflow modelling. This assumption is industry accepted as further detail to the model such as the window reveals and façade texture would add an impractical and unnecessary complexity to the model without adding greater quality results. Furthermore, the large existing and proposed trees which would have an impact on the assessment have been modelled with a different loss coefficient assigned to the deciduous trees which takes account of the loss of foliage during the winter months. Landscaping features such as pergolas and trellis structures were not modelled within the simulation as they would provide an extra level of complexity to an otherwise large and complex CFD model.

17.3 Existing Receiving Environment

This section examines the wind conditions on the existing receiving environment prior to the construction of the proposed development. Wind climate data over a 30 year period has been analysed to provide a statistical assessment of the expected wind conditions and resultant pedestrian comfort conditions within the existing site.

17.3.1 Site Location

The proposed site is located at Milltown Park, Sandford Road, Dublin 6 and is illustrated in Figure 17.4. It is evident from the image the site is located in a predominantly residential area with varying densities and a mix of retail, educational and commercial buildings. With the predominant wind direction being from the south-west, there are a number of large open sports fields to the south-west of the site which are part of Gonzaga College. However, even though the site is predominantly open, it can be considered quite sheltered due to the density of buildings surrounding the site. The site is located approximately 2.6 km from the coast, however, due the density of development between the site and the coast, coastal winds are not expected to impact on the site.

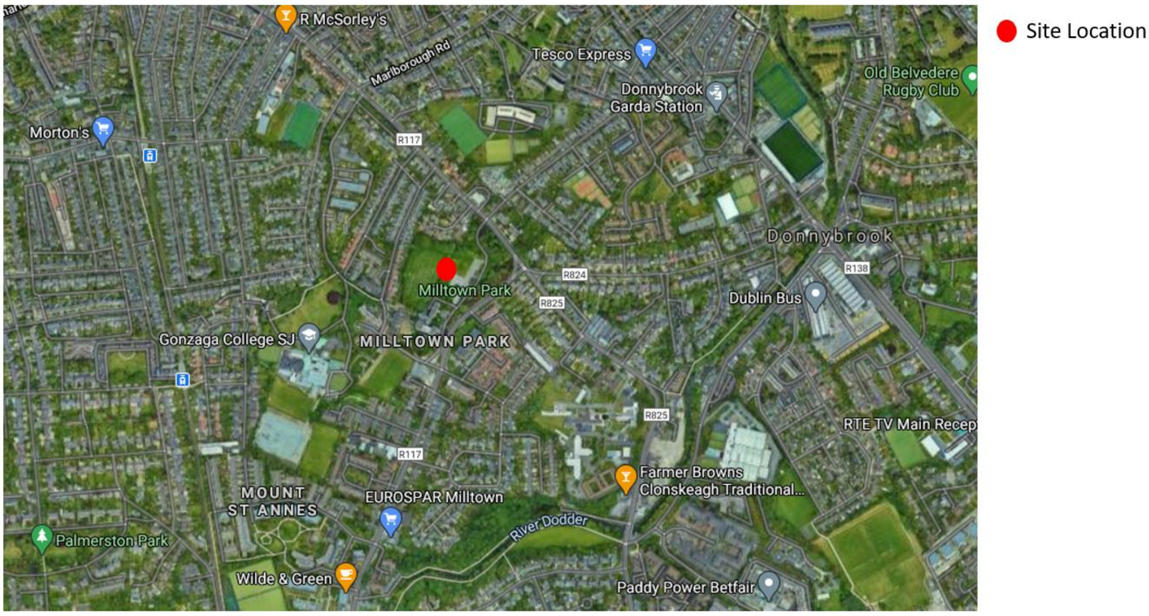


Figure 17.4: Site Location

(Source: Google Maps)

17.3.2 Existing Site

The existing site is illustrated in Figure 17.5 with the approximate site boundary outlined in red. The existing site is predominantly open with a large number of mature trees and hedging surrounding the site. There are a number of existing buildings to the south of the site. Two (2) of these buildings will be retained and refurbished as part of the proposed development, i.e. Tabor House and the Chapel. The site can be considered well sheltered due to the extent of existing trees surrounding the site and the high stone wall that is present along the majority of Milltown Road and Sandford Road.

Figure 17.5: Existing Site

(Source: Google Maps)

17.3.3 Wind Climate

The wind climate analysis is based on the wind data obtained from the Dublin Airport weather station (approximately 12 km from the proposed site) which incorporates hourly wind data over a 30-year period (1990 to 2020). Based on the data outlined in Table 17.4, more than 93% of the total hours in the year have a wind speed between 0 – 10 m/s, while approximately 50% of the wind comes from the SSW, WSW and W direction.

Wind dir. / Speed [m/s]	N 0 [hrs]	NNE 30 [hrs]	ENE 60 [hrs]	E 90 [hrs]	ESE 120 [hrs]	SSE 150 [hrs]	S 170 [hrs]	SSW 210 [hrs]	WSW 240 [hrs]	W 270 [hrs]	WNW 300 [hrs]	NNW 330 [hrs]	Total [hrs]	Total [%]
0-1	9	7	3	7	11	10	6	6	8	8	8	9	92	1.1%
1-2	43	28	12	31	61	54	33	33	39	46	53	43	476	5.4%
2-3	54	51	41	76	121	110	55	85	107	116	92	55	963	11.0%
3-4	44	53	68	106	141	123	49	124	178	194	138	68	1296	14.8%
4-5	35	45	71	87	125	129	41	141	241	240	141	65	1361	15.5%
5-6	24	35	54	60	96	119	39	148	247	248	112	54	1236	14.1%
6-7	17	29	35	43	63	90	34	139	235	201	76	38	1001	11.4%
7-8	10	20	26	28	41	69	27	112	201	160	47	26	767	8.8%
8-9	7	12	16	19	25	44	21	85	166	124	27	17	564	6.4%
9-10	4	7	12	14	12	30	16	59	125	97	16	9	401	4.6%
10-11	2	4	7	9	10	19	10	37	83	62	8	4	255	2.9%
11-12	1	2	3	6	5	11	5	23	53	44	5	2	160	1.8%
12-13	1	2	1	3	3	5	2	13	31	24	3	1	89	1.0%

13-14	0	0	1	1	2	4	1	8	19	11	1	0	48	0.5%
14-15	0	0	0	1	1	1	0	5	11	7	1	0	27	0.3%
15-16	0	0	0	1	0	1	0	2	6	4	0	0	14	0.2%
16-17	0	0	0	0	0	0	0	1	3	2	0	0	6	0.1%
17-17	0	0	0	0	0	0	0	0	1	1	0	0	2	0.0%
17-19	0	0	0	0	0	0	0	0	1	0	0	0	1	0.0%
19-20	0	0	0	0	0	0	0	0	1	0	0	0	1	0.0%
Total (hrs)	252	295	350	492	717	819	339	1021	1766	1589	728	392	8760	100%
Total (%)	2.9%	3.4%	4.0%	5.6%	8.2%	9.3%	3.9%	11.7%	20.2%	17.1%	8.3%	4.5%	100%	-

Table 17.4: Frequency of Wind Velocity Occurrence per Wind Direction

Figure 17.6 graphically illustrates the data in Table 17.4 above and illustrates the percentage of hours per wind direction over the 30-year period (1990 – 2020) for the 12 no. wind directions. It is evident from the figure below the predominant wind directions are SSW, WSW and W.

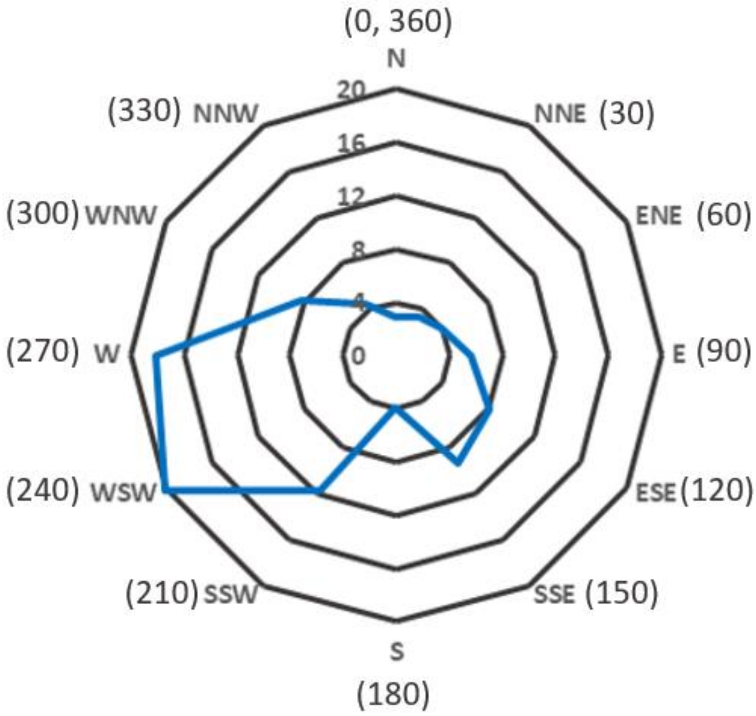


Figure 17.6: Percentage of Hours per Wind Direction (Dublin Airport 1990 – 2020)

The hourly wind data is the basis for the wind climate analysis. The number of hours that wind occurs from a given wind direction and velocity influences the local wind climate. The CFD simulation is used to calculate the wind-factor (local wind velocity relative to reference wind velocity). The wind-factor is a measure to calculate the number of hours that a given threshold wind velocity is exceeded based on statistical wind data.

17.3.4 Summary

Based on the assessment carried out on the existing site and the statistical analysis of 30 years of climate data from the nearby Dublin airport (Met Eireann), the existing site can be considered well sheltered from the prevailing wind directions and is considered a comfortable environment for pedestrians with wind speeds not exceeding the business walking class as per the Lawson criteria.

17.4 Potential Impact of the Proposed Development

This section summarises the impact the proposed development will have on the existing receiving environment during both the construction and operational phases.

17.4.1 Construction Phase

The assessment of the wind microclimate during the construction phase has been based on professional judgement by reviewing the existing site conditions and the expected conditions once the development is in place via the CFD modelling. It is expected the wind microclimate will gradually adjust from the existing conditions to the final modelled scenario as construction progress develops.

17.4.2 Operational Phase

The impact during the operational phase has been determined using CFD modelling with the methodology used in the assessment outlined in Section 17.2.

The number of hours for all wind directions are summed to calculate the total number of hours that a given pedestrian activity class exceeds the 5% yearly threshold with the Lawson results presented in the following sections.

17.4.2.1 Ground/Street Level

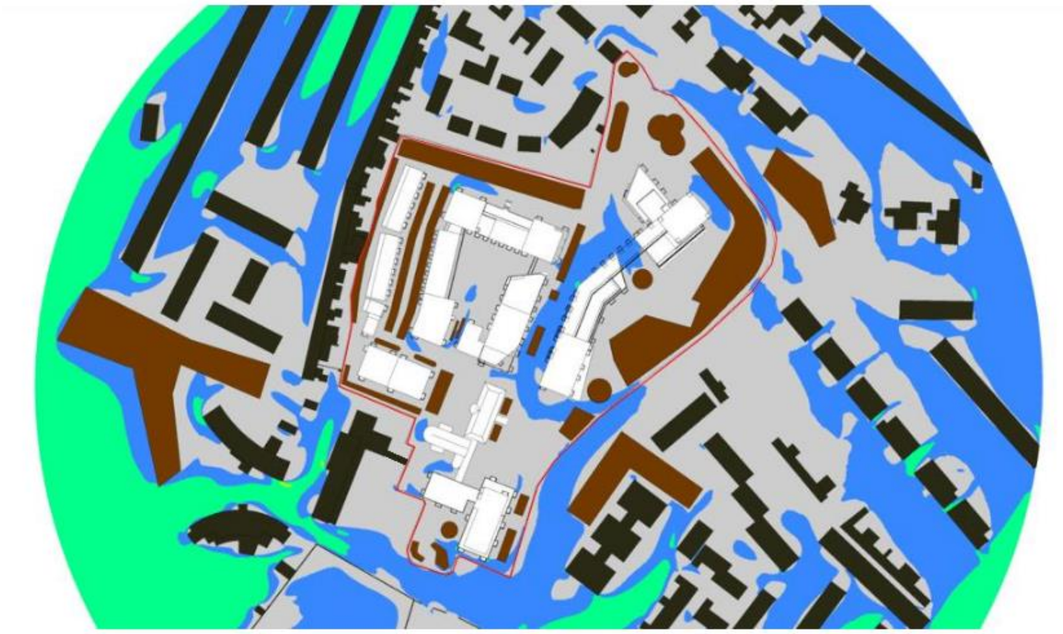
The pedestrian wind comfort results at ground/street level (1.5m above ground level) are included in this section and are summarised as follows:

- As illustrated in Figure 17.7, most areas at street level are suitable for sitting (areas highlighted in grey). Note, the areas under the trees (hatched in dark brown) will also comply with the "Sitting" class.

- The majority of the remaining areas that do not comply with the "Sitting" class are suitable for "Standing" (areas highlighted in blue).

- The pedestrian comfort at ground/street level is excellent throughout the development with the layout of the buildings and the existing and proposed trees having a significant positive effect in terms of mitigating excessive wind speeds.

- Based on the results presented, the proposed development will have an imperceptible impact on the pedestrian wind comfort at street level.



Business Walking Class Exceeded
Suitable for Business Walking
Suitable for Leisurely Walking
Suitable for Standing
Suitable for Sitting

Figure 17.7: Pedestrian Wind Comfort Results – Ground/Street Level
(Approx. Site Boundary Outlined in Red, Areas under Trees Hatched in Dark Brown, Adjacent Buildings Hatched in Black)

17.4.2.2 Shared Amenity Spaces

The pedestrian wind comfort results (0.8m above floor level) on the shared rooftop amenity spaces and the amenity space on 1st floor level are included in this section and are summarised as follows:

- The Lawson results for the shared rooftop and 1st floor amenity areas are illustrated in Figure 17.8 with the majority of amenity spaces suitable for "Sitting" (areas highlighted in grey).

- There are certain areas where the "Sitting" class is exceeded, however these areas are suitable for "Standing" (areas highlighted in blue).

- As outlined within the limitations section of this report, landscaping features such as small trees and hedging were not modelled due to the complexity that they would add to the CFD model. The proposed landscaping design (refer to Figure 17.29, 17.30, 17.31 and 17.32) will ensure that all rooftop amenity areas will be even more comfortable than what is illustrated below.
- Based on the results presented, the proposed development will have an imperceptible impact on the pedestrian wind comfort on the shared rooftop amenity spaces and the amenity space on the 1st floor level.

Figure 17.8: Pedestrian Wind Comfort Results – Shared Amenity Spaces

17.4.2.3 Private Balconies & Terraces

The pedestrian wind comfort results (0.8m above floor level) on all private balconies and terraces are included in this section and are summarised as follows:

- As private balconies and terraces are not considered common pedestrian areas they have not been assessed against the typical comfort classes for pedestrian comfort. However, they have been assessed based on the safety criteria with the most stringent condition being considered, i.e. "sensitive pedestrian" (refer to Table 17.2).
- Features integrated into the design such as inset balconies and solid balustrades at more exposed locations ensure that all private balconies and terraces are considered safe based on the sensitive pedestrian class. The results as illustrated in Figure 17.9, 17.10, 17.11 and 17.12.
- Based on the results presented, the proposed development will have an imperceptible impact on the safety of pedestrians on the private balconies and terraces.

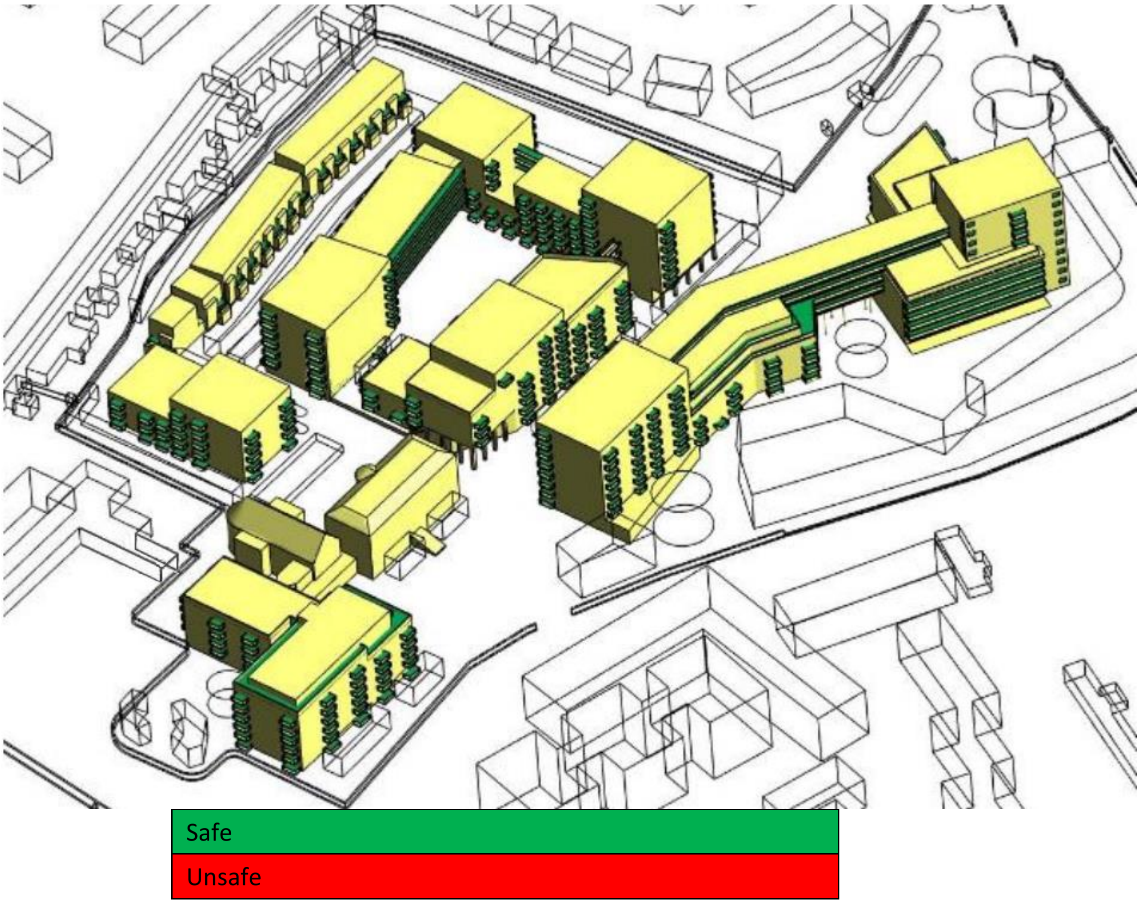


Figure 17.9: Pedestrian Wind Comfort Results – Private Balconies & Terraces (View 1)

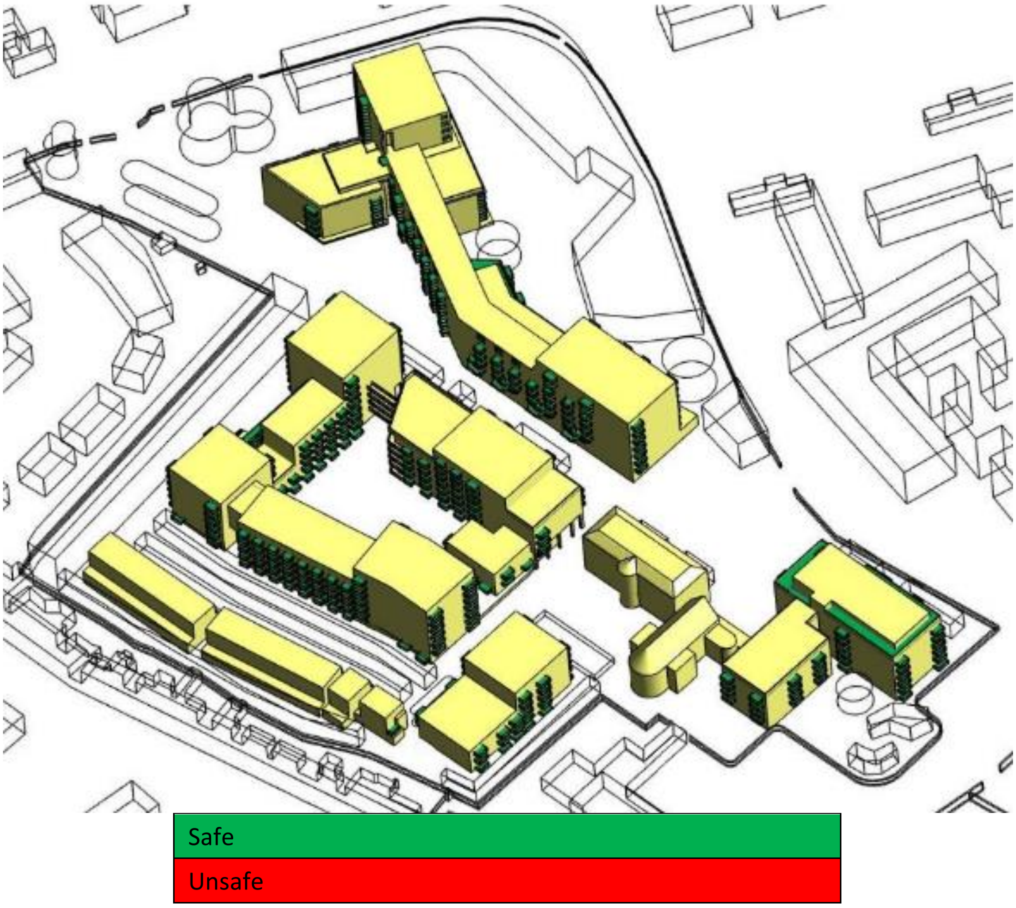


Figure 17.10: Pedestrian Wind Comfort Results – Private Balconies & Terraces (View 2)

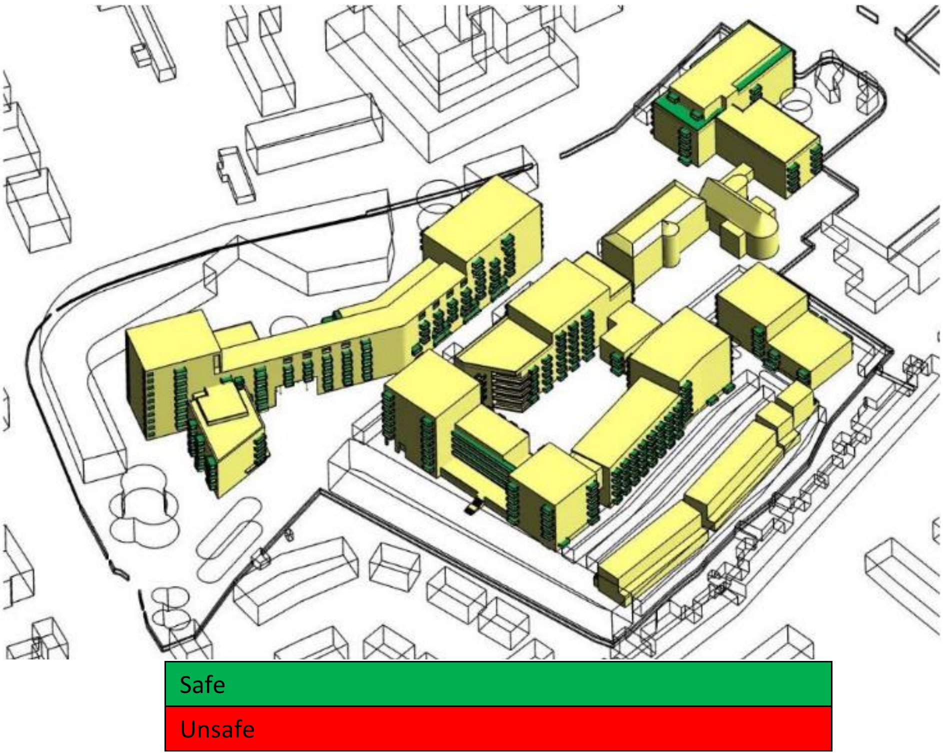


Figure 17.11: Pedestrian Wind Comfort Results – Private Balconies & Terraces (View 3)

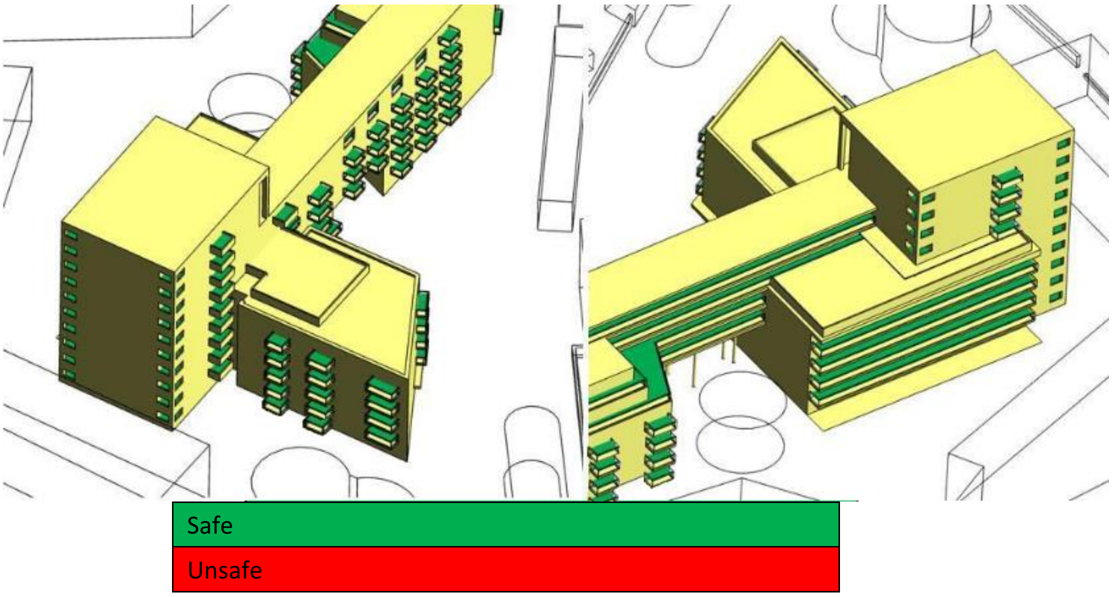
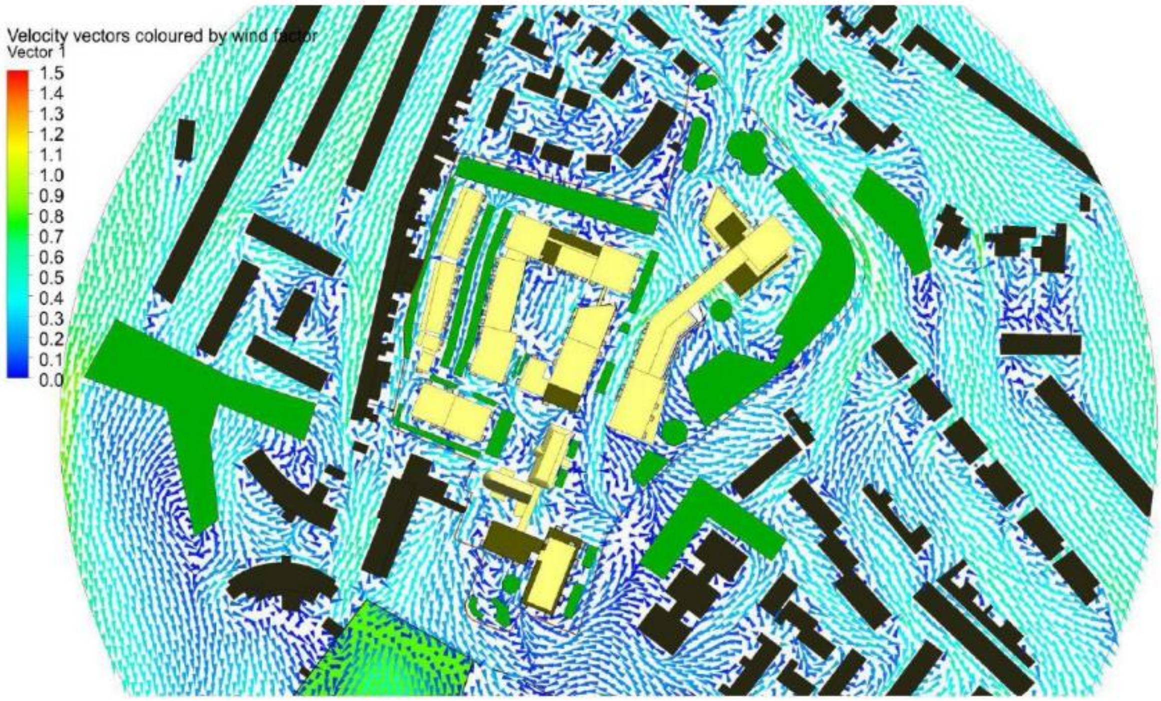


Figure 17.12: Pedestrian Wind Comfort Results – Private Balconies & Terraces (View 4 – Block A1)

17.4.2.4 CFD Wind Factor Results

The CFD wind factor (WF) velocity vectors and contours for each wind direction, which the Lawson results are based upon, are illustrated in this section. Refer to Section 17.2.4 on how to interpret the images. Note, the contours (bottom image) is a graphical representation of the velocity vectors (top image).



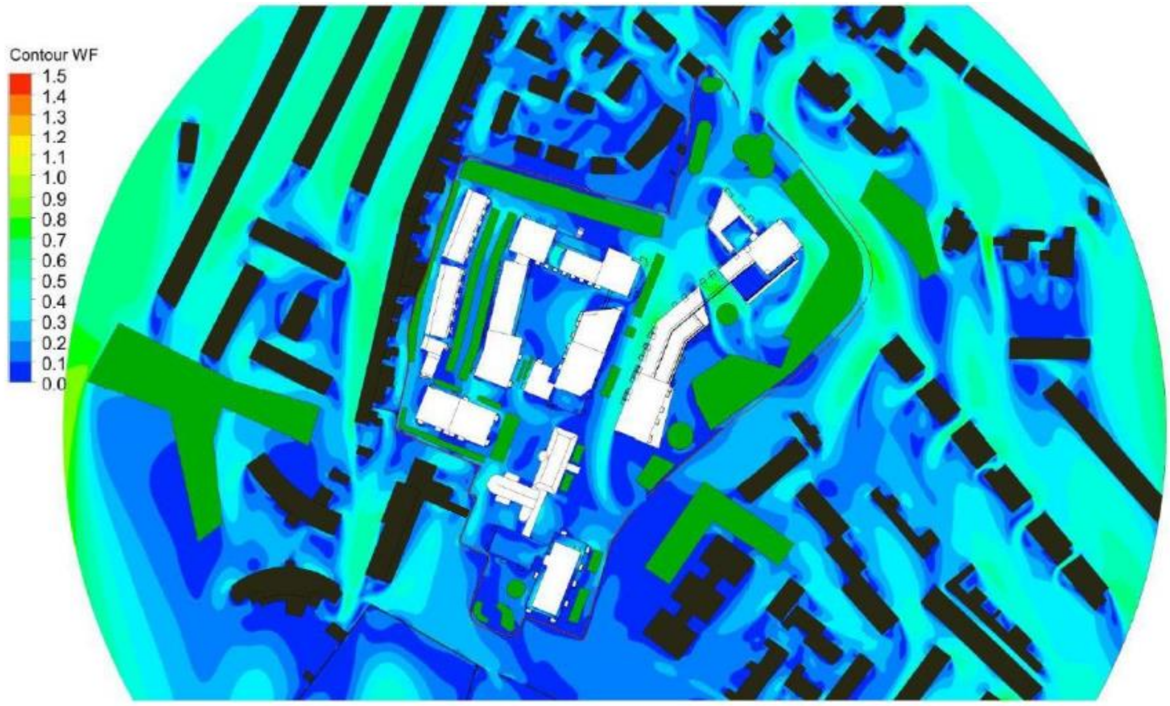


Figure 17.13: Wind Factor – 0 Degree (N) Wind Direction

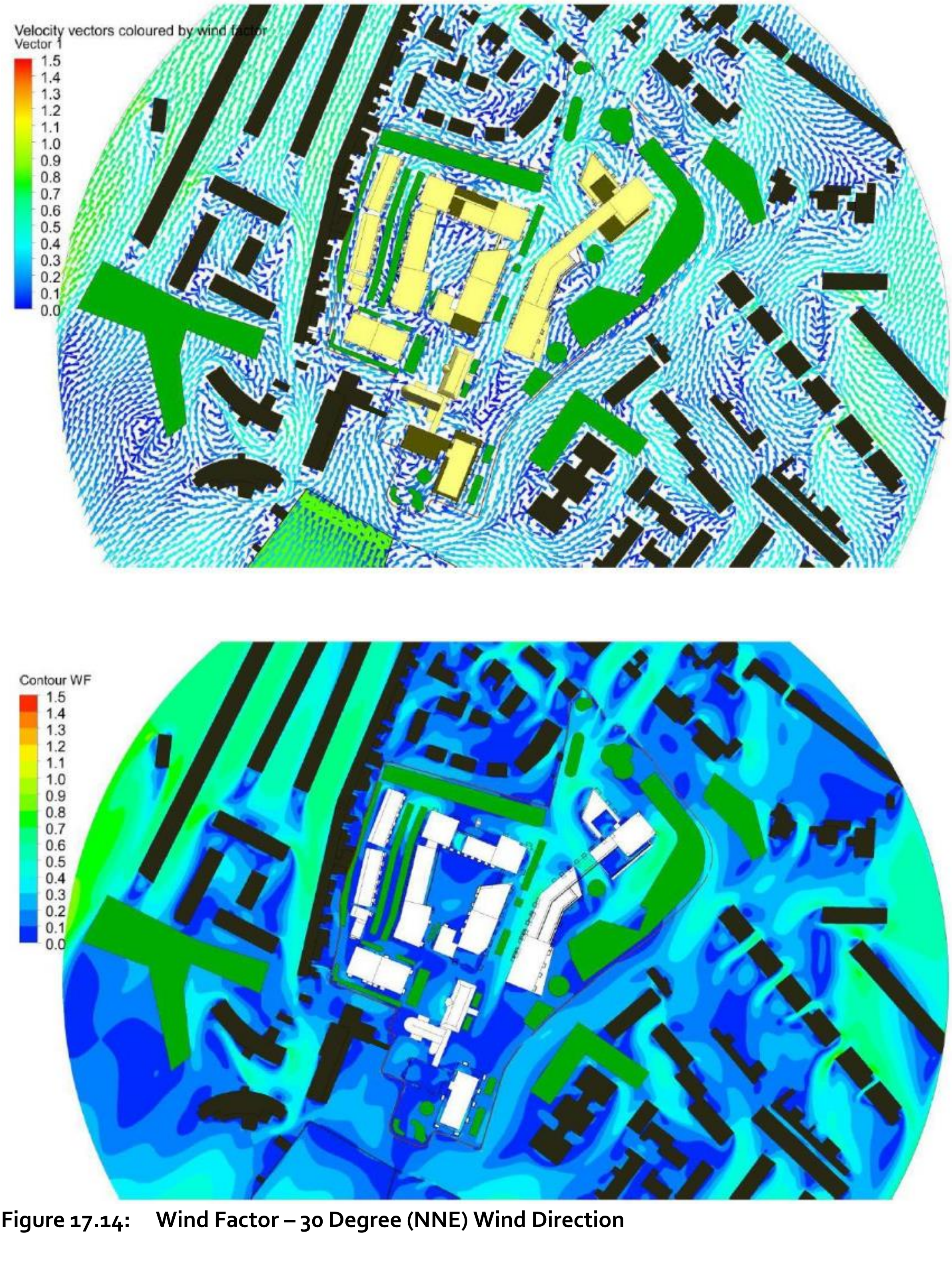


Figure 17.14: Wind Factor – 30 Degree (NNE) Wind Direction

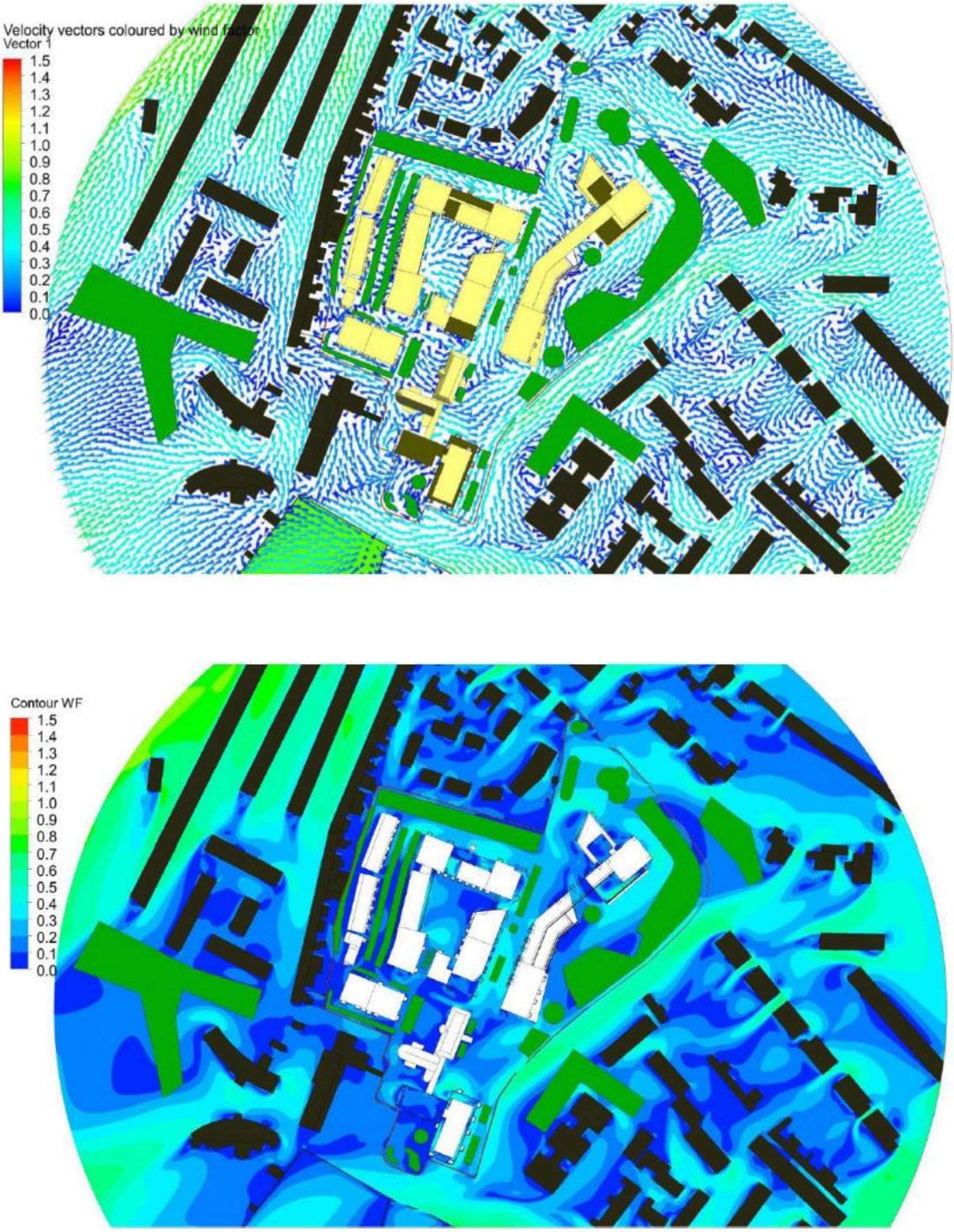
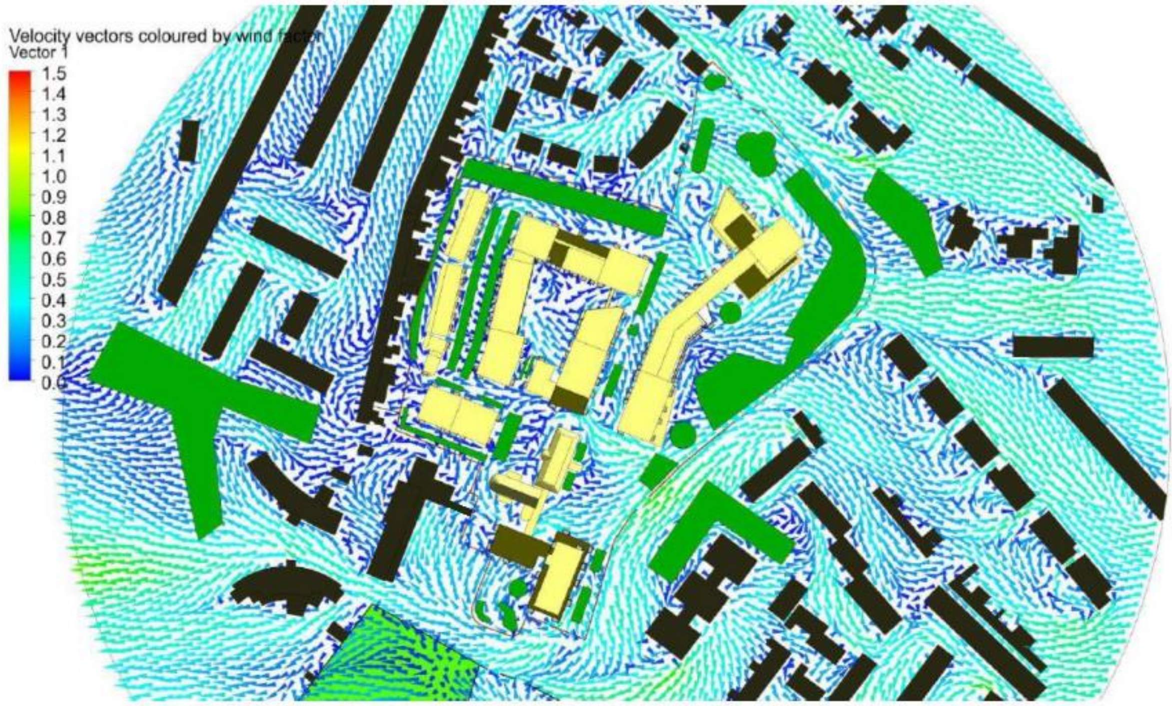


Figure 17.15: Wind Factor – 60 Degree (ENE) Wind Direction



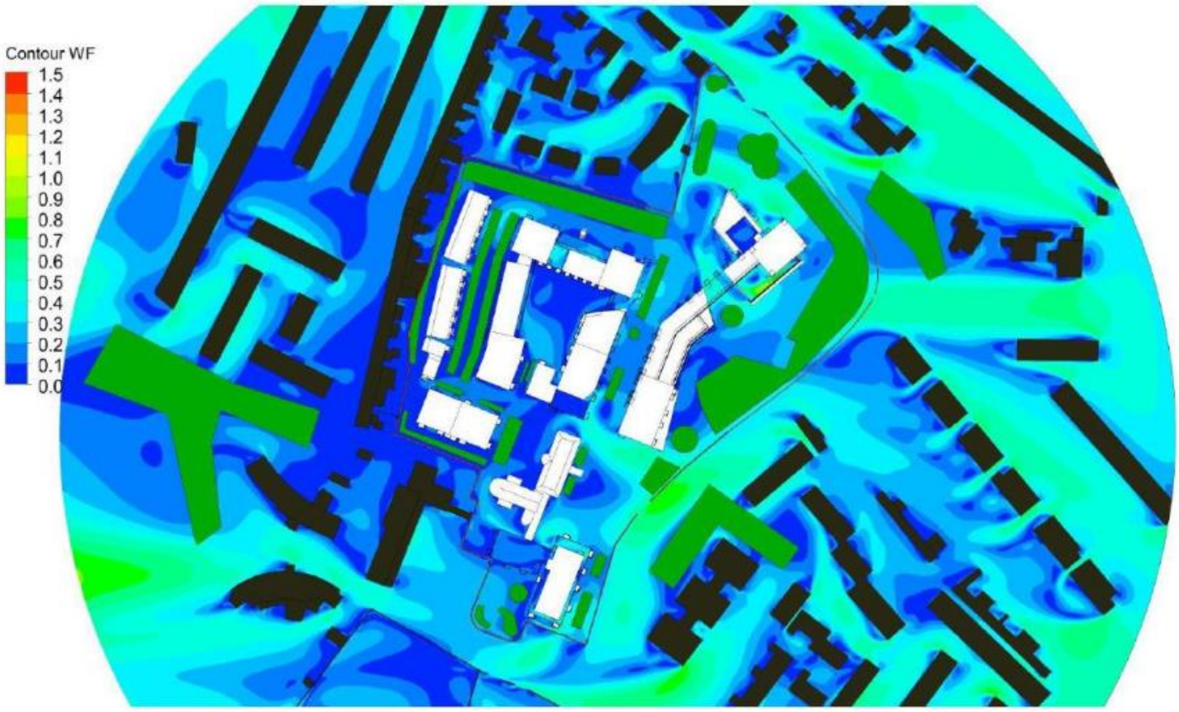


Figure 17.16: Wind Factor – 90 Degree (E) Wind Direction

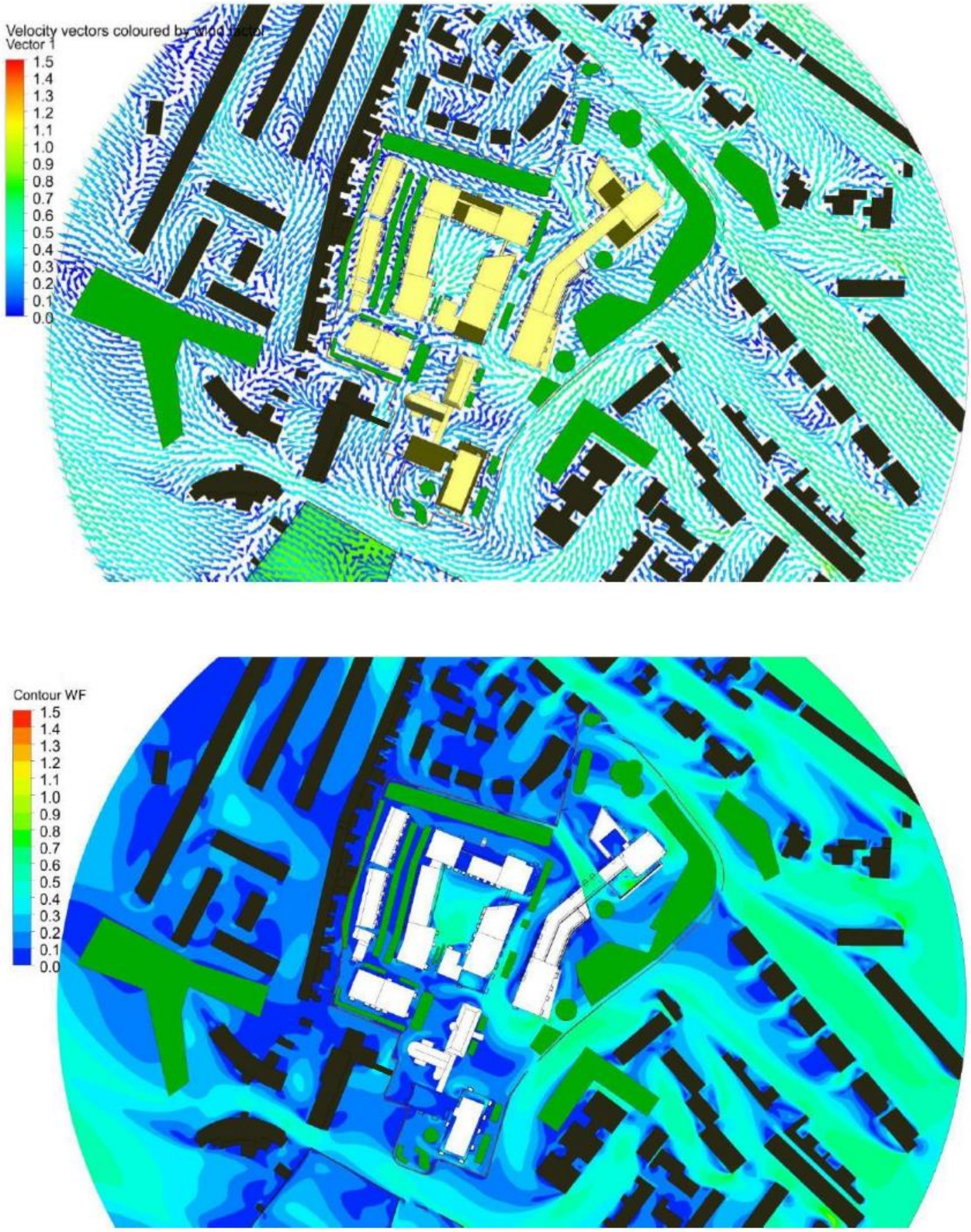


Figure 17.17: Wind Factor – 120 Degree (ESE) Wind Direction

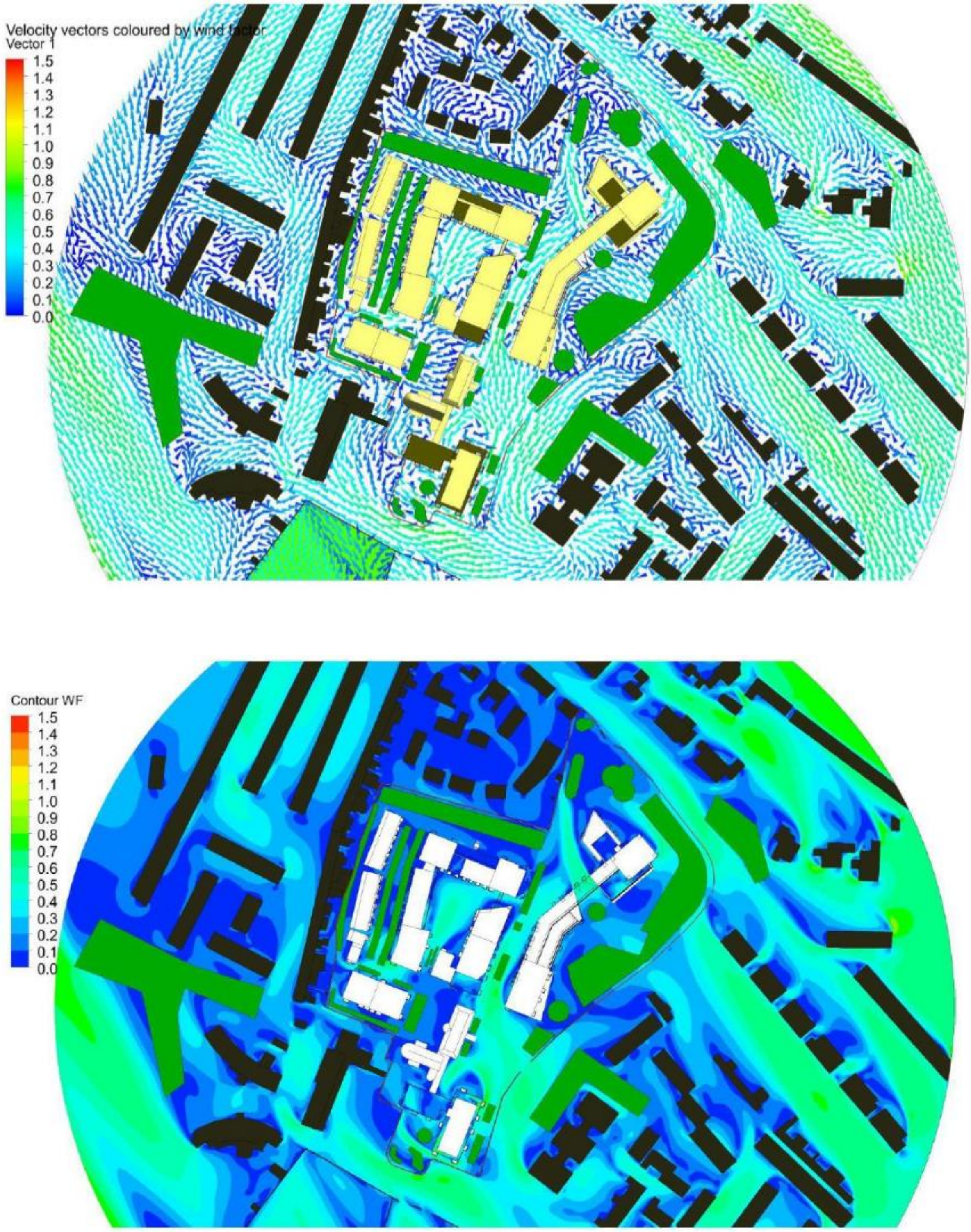


Figure 17.18: Wind Factor – 150 Degree (SSE) Wind Direction

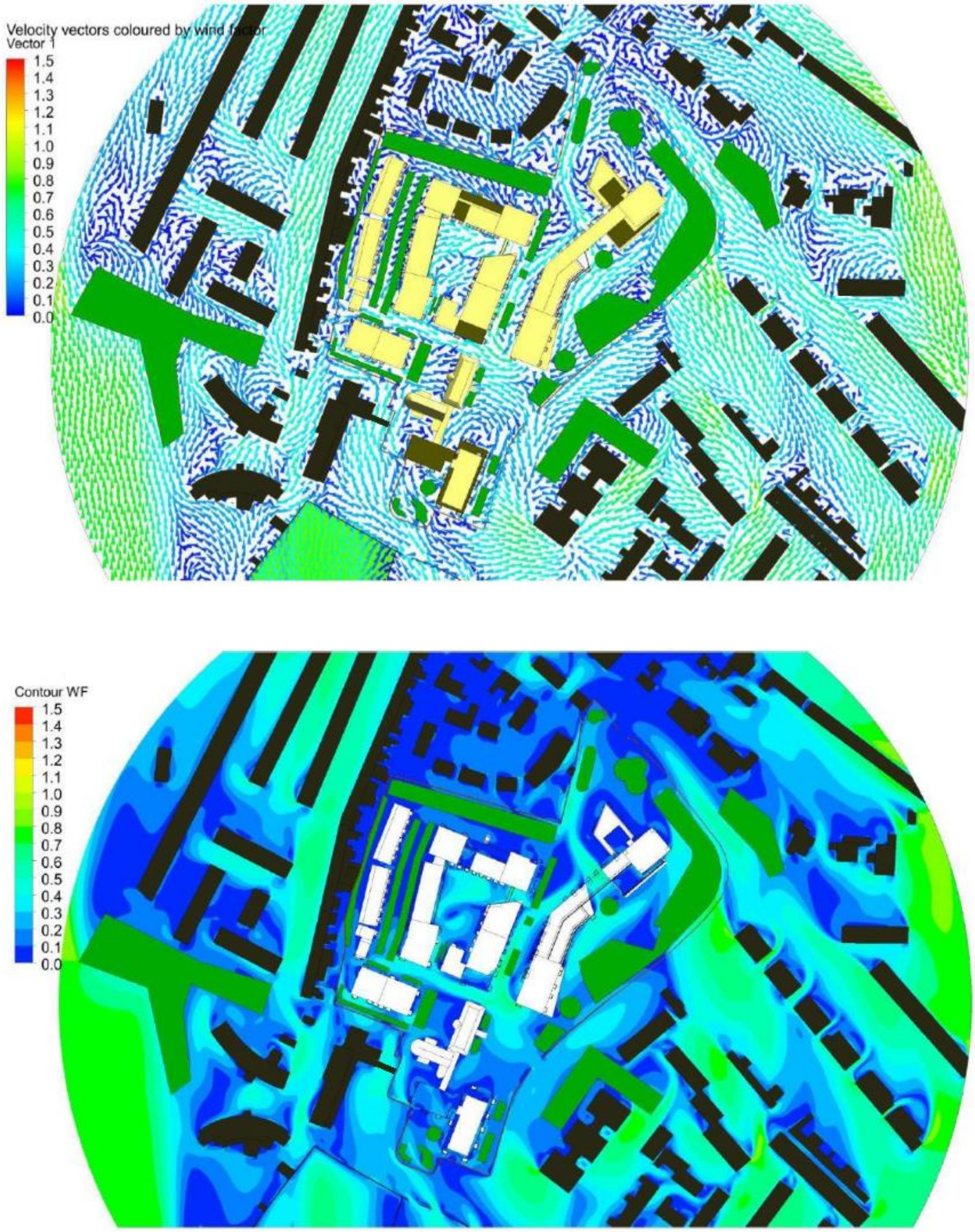


Figure 17.19: Wind Factor – 180 Degree (S) Wind Direction

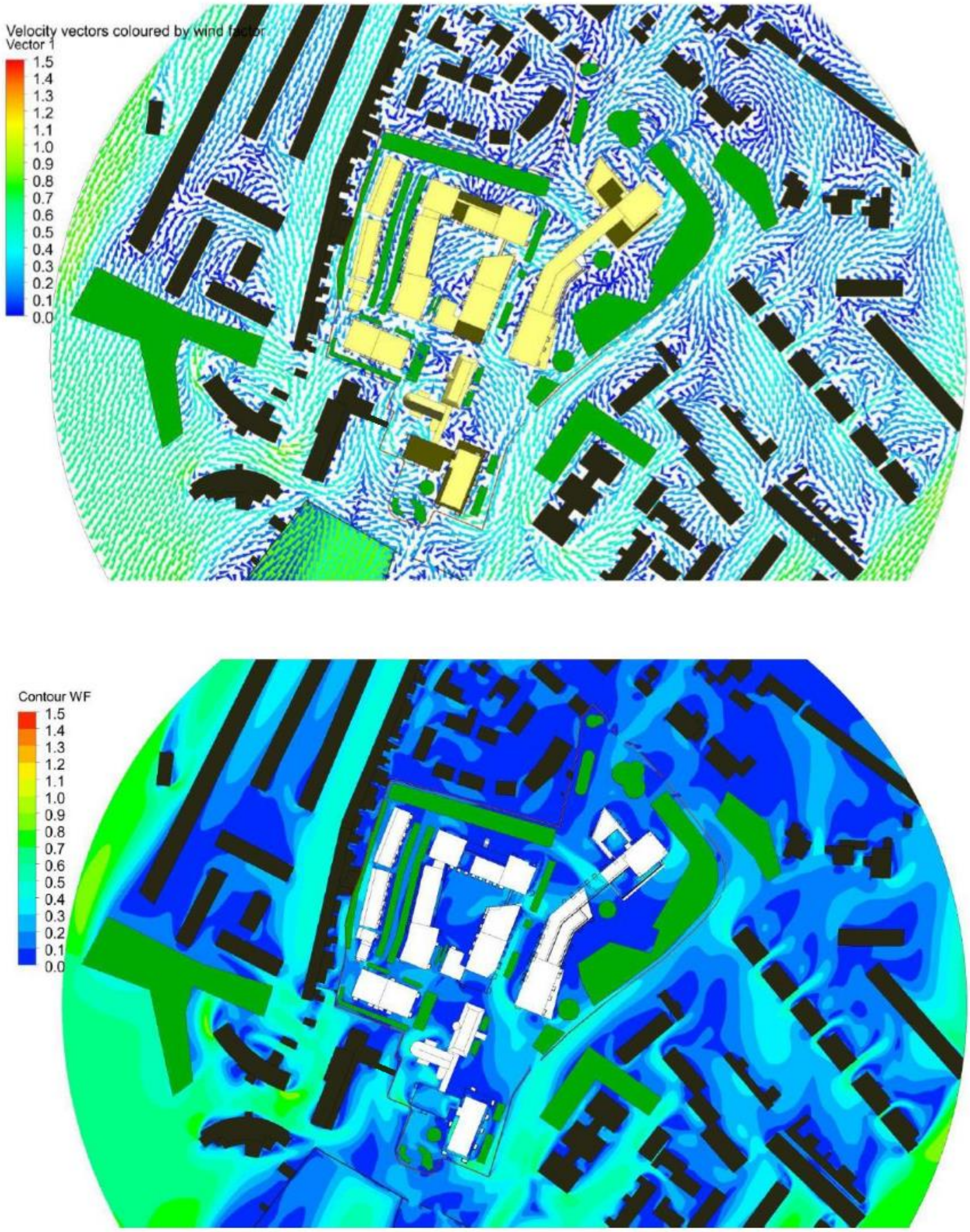


Figure 17.20: Wind Factor – 210 Degree (SSW) Wind Direction

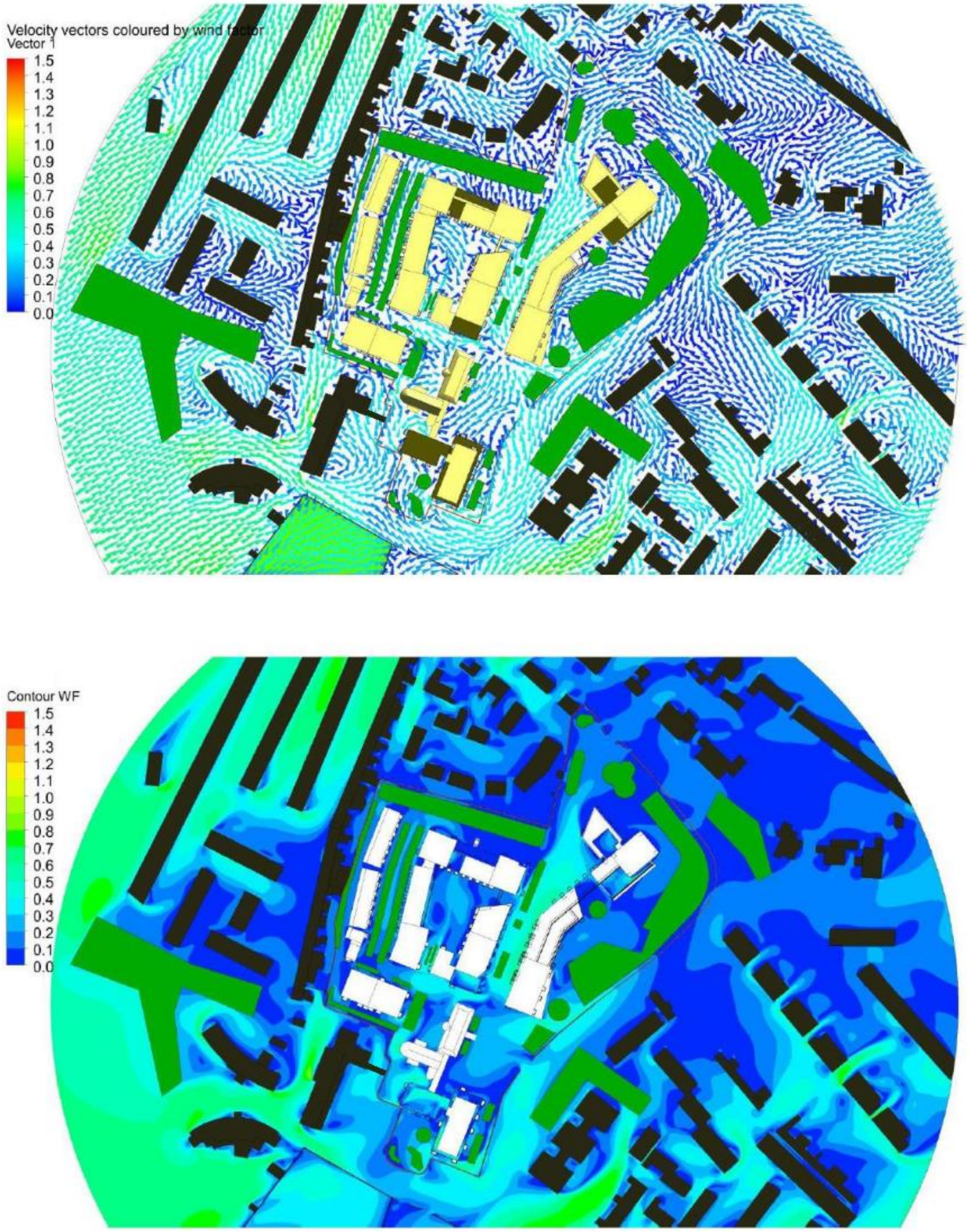


Figure 17.21: Wind Factor – 240 Degree (WSW) Wind Direction

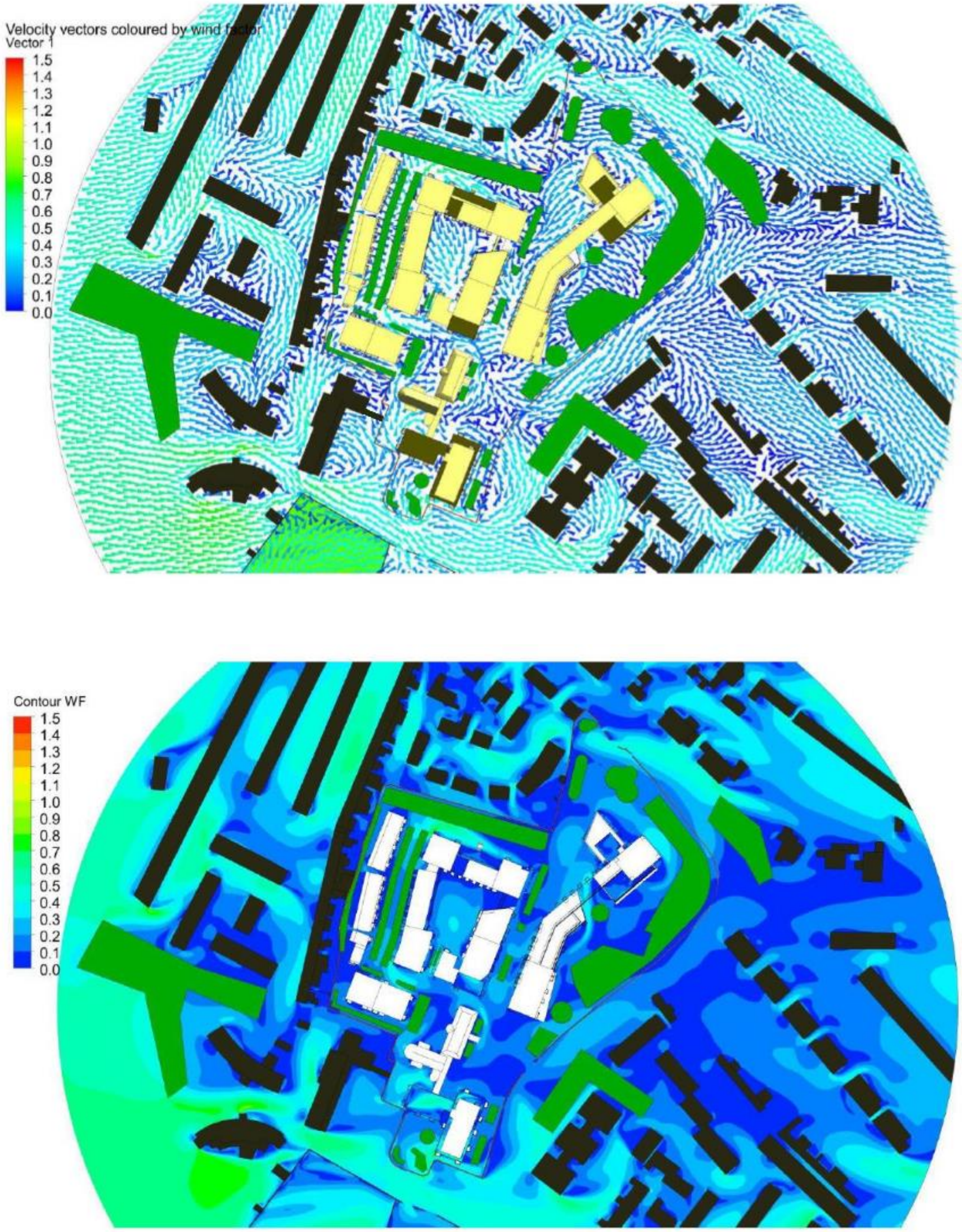


Figure 17.22: Wind Factor – 270 Degree (W) Wind Direction

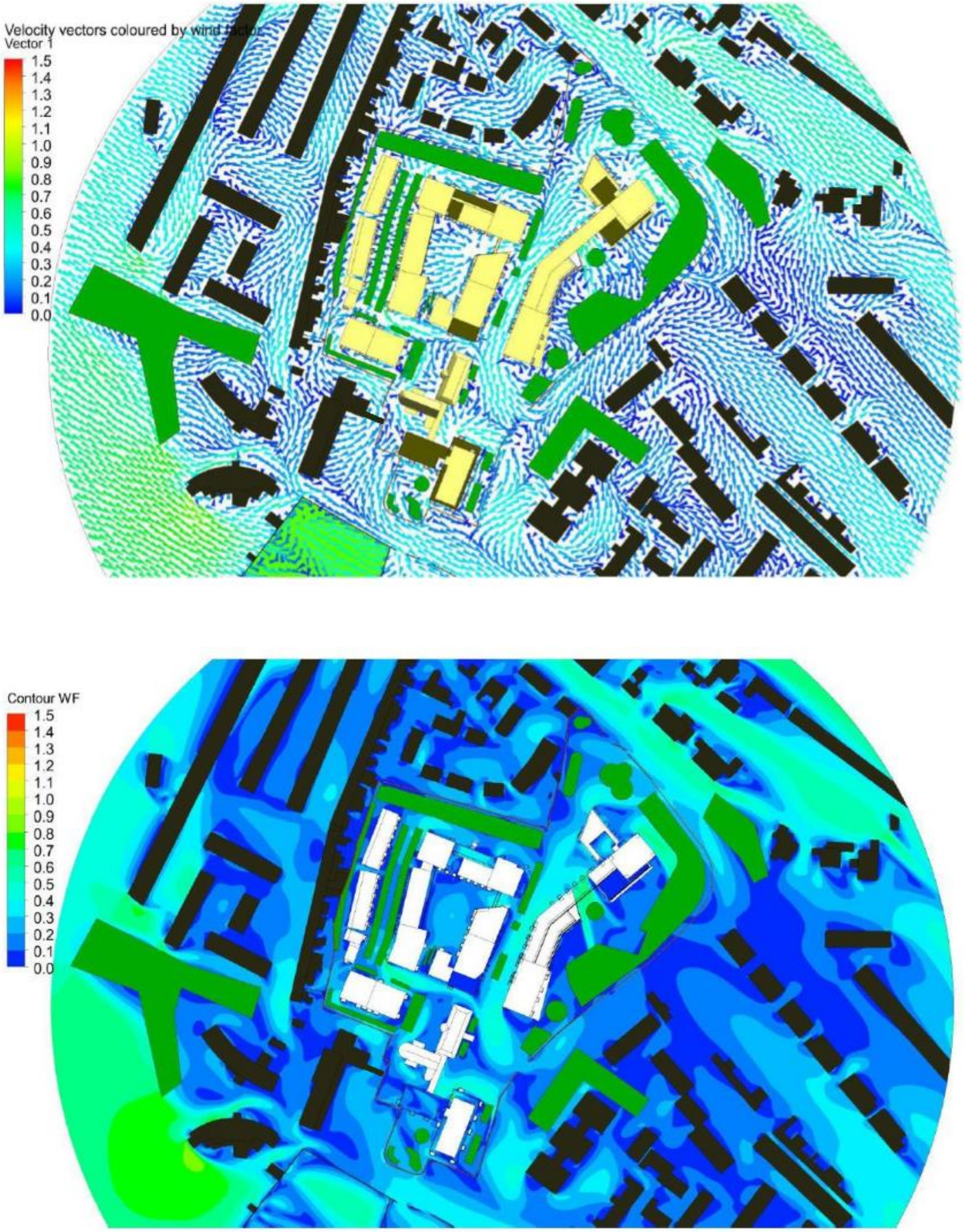


Figure 17.23: Wind Factor – 300 Degree (WNW) Wind Direction

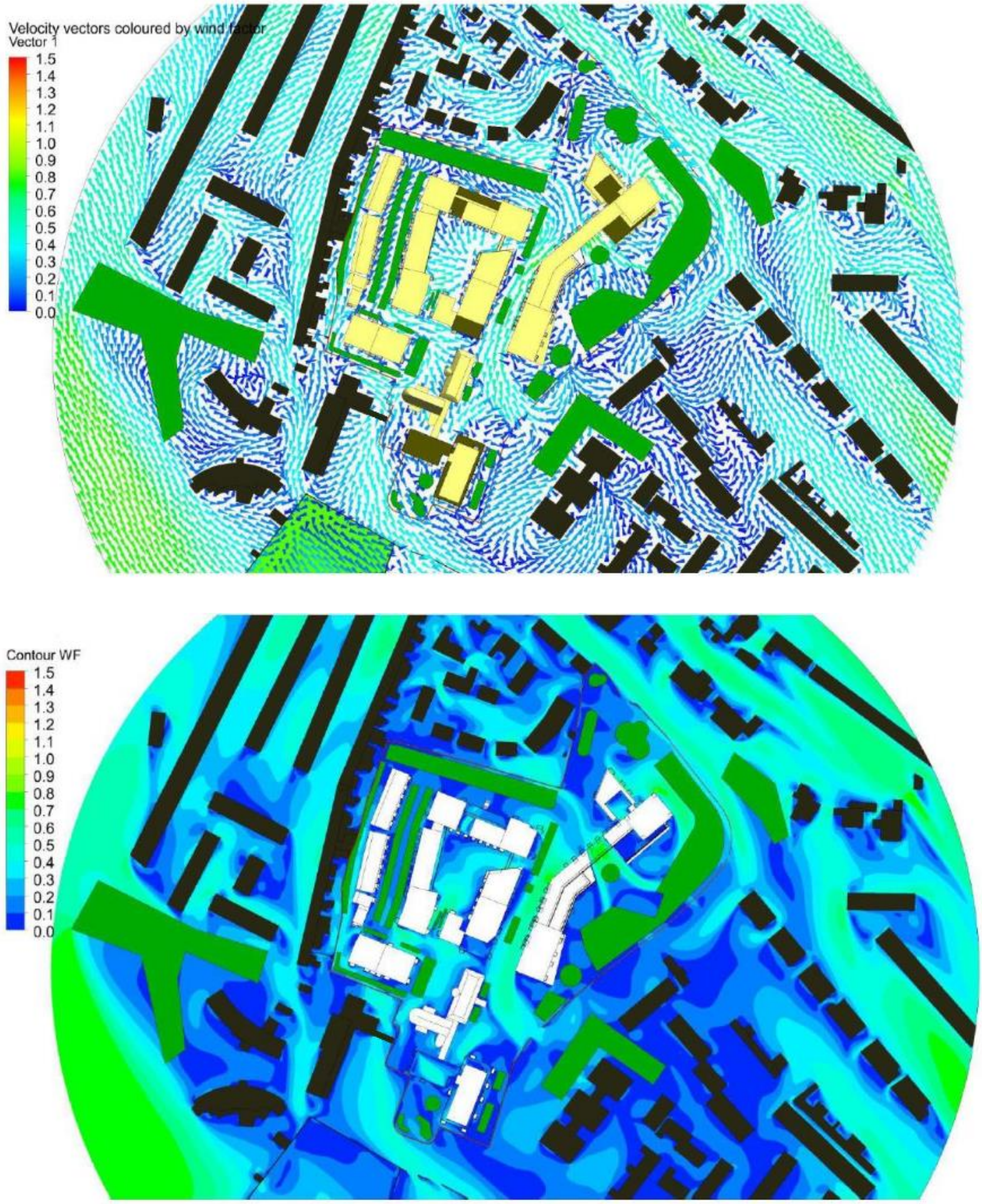


Figure 17.24: Wind Factor – 330 Degree (NNW) Wind Direction

17.4.3 Potential Cumulative Impacts

The CFD assessment has accounted for the cumulative impact associated with the existing site and the proposed development. The analysis has shown that even with the proposed development in place, the wind speeds will still be comfortable for pedestrians with no areas of concern highlighted.

A list of granted developments surrounding the proposed project has been provided by the Design Team. The below table outlines only those applications located in closest proximity to the proposed site. Due to the substantial distance from the proposed project and the extent of those granted applications, a neutral cumulative impact will be perceived.

Planning Reference	Development	Date Granted
ABP Reg. Ref. PL29S.307267	148-Unit Residential Development at Eglinton Road	**ABP Decision Date:** 31st August 2020
DCC Reg. Ref. 2179/20 **ABP Reg. Ref. PL29S.307375**	36-Unit Residential Development at Sandford Close	**Decision Date:** 11th March 2021 **ABP Grant:** 27th March 2020
DCC Reg. Ref. 3513/20 **ABP Reg. Ref. ABP-309720-21**	Mixed Use Development of 49 No. Build-to-Rent units and 231 sq m retail space at Nos. 25-27 Donnybrook Road and Nos. 1-3 The Crescent, Donnybrook	**Granted:** 24th February 2021 **Final Grant:** 26th May 2021 (Appeals Withdrawn)
DCC Reg. Ref. 2124/20	Single storey extension (c. 120 sq m) to the south of the existing school to provide additional canteen facilities at Muckross Park College	**Granted:** 20th March 2020 **Final Grant:** 29th June 2020
No. 1. DCC Reg. Ref. 2582/16 **No. 2. DCC Reg. Ref. 3312/20**	Demolition of existing sheds (c. 25 sq m) and construction of 4 No. detached houses at No. 91 Belmont Avenue Revised ground floor rear extension to include a single storey rear return for a utility room to No. 91 Belmont Avenue	**Granted:** 8th August 2016 **Final Grant:** 16th September 2016 **Granted:** 28th October 2020 **Final Grant:** 9th December 2020
DCC Reg. Ref. WEB1065/19 **ABP Reg. Ref. ABP-304727-19**	New 3g artificial turf pitch capable of accommodating full size rugby and football over the site on an existing natural grass pitch within the playing fields at Gonzaga College	**Granted:** 31st May 2019 **Final Grant:** 9th October 2019
DCC Reg. Ref. 2179/20 **ABP Reg. Ref. ABP-307375-20**	Demolition (c. 392 sq m) of Block 5 (1 storey) and Block 6 (1 storey) (total 4 No. units) and the construction of 36 No. residential units in the form of 2 No. three storey terraces at Sandford Lodge	**Granted:** 27th March 2020 **Final Grant:** 11th March 2021
DCC Reg. Ref. 3312/20	PROTECTED STRUCTURE at a site at Belmont Avenue; revised ground floor rear extension to include a single storey rear return for a utility room to No. 91 Belmont Avenue	**Granted:** 28th October 2020 **Final Grant:** 9th December 2020

Table 17.5: Granted Planning Applications in Closest Proximity to the Proposed Project

(Source: Thornton O'Connor Town Planning)

17.4.4 'Do Nothing' Impact

If the proposed development does not go ahead, based on the assessment carried out on the existing site and the statistical analysis of 30 years of climate data from the nearby Dublin airport, the existing site will remain well sheltered from the prevailing wind directions and will continue to be considered a comfortable environment for pedestrians.

17.5 Mitigation Measures

17.5.1 Construction Phase

The assessment of the wind microclimate during the construction phase has been based on professional judgement by reviewing the existing site conditions and the expected conditions once the development is in place via the CFD modelling.

It is expected the wind microclimate will gradually adjust from the existing conditions to the final modelled scenario as construction progress develops. However, the mitigation measures outlined in the following sections will need to be implemented before completion to ensure comfortable conditions once the proposed development becomes operational.

17.5.2 Operational Phase

The following specific mitigation measures have been incorporated into the proposed design to prevent excessive wind speeds during the operational phase of the development.

17.5.2.1 Apartment Block Arrangement

The arrangement of the apartment blocks has been carefully chosen to help mitigate increased wind speeds throughout the site. The central areas within the development are well protected from the predominant south-west wind direction via the buildings located to the south-west. Furthermore, an internal courtyard space has been incorporated within Block B and C which provides a sheltered area for pedestrians to utilise throughout the year.

Figure 17.25: Wind Mitigation Measure – Apartment Block Arrangement

17.5.2.2 Rooftop Amenity Canopy

A canopy has been integrated into the design of the building above the rooftop amenity space in Block A1. The canopy protects the amenity space from building downwash, deflecting the wind away and creating a comfortable environment for the occupants using the amenity space.

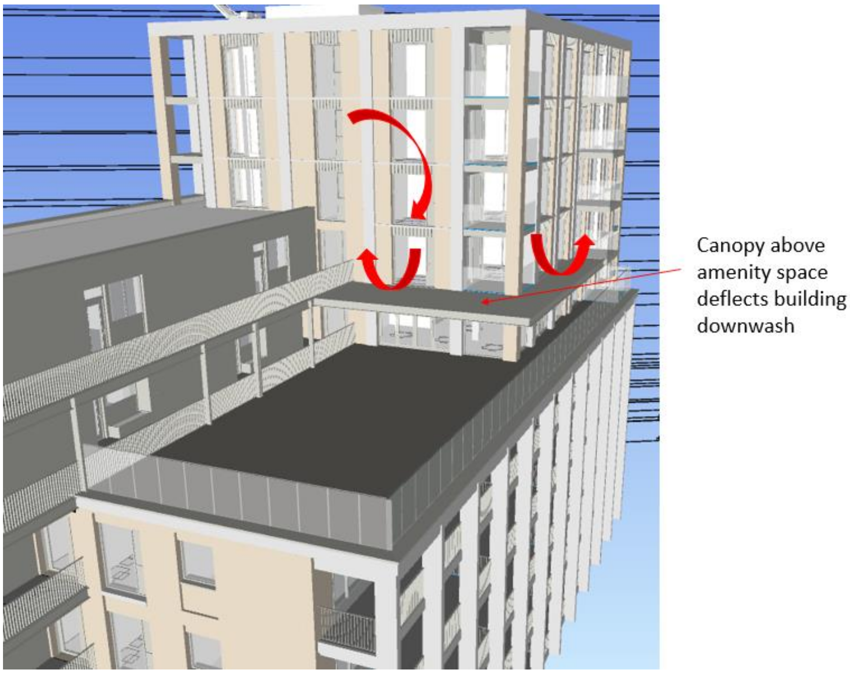


Figure 17.26: Wind Mitigation Measure – Rooftop Amenity Canopy

17.5.2.3 Inset Balconies

The Block A1 tower which is most exposed to the wind due to its height, predominantly incorporates inset balconies. Figure 17.27 illustrates a sample of these balconies which are highlighted in red. Inset balconies offer increased wind protection for people utilising the balcony spaces as they provide a natural shelter from the elements.

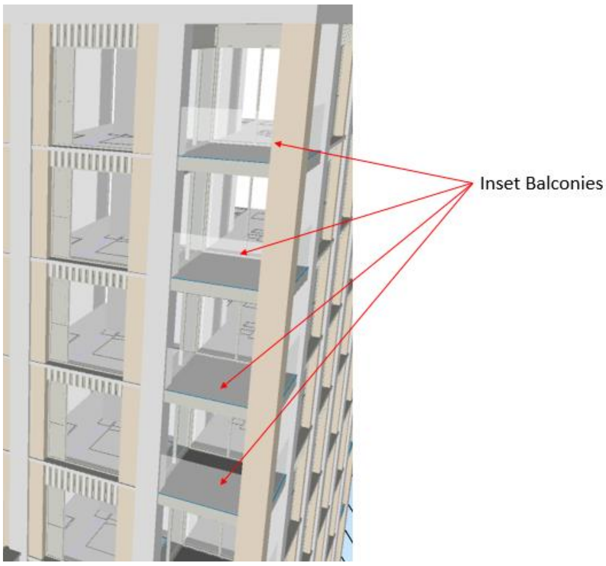


Figure 17.27: Wind Mitigation Measure – Block A1 Inset Balconies

17.5.2.4 Solid Balustrades

All private balconies on the tower element of Block A1 (floors 5 to 9) and the shared rooftop amenity areas will incorporate solid glazed balustrades. Figure 17.28 illustrates a sample of these balconies. Full length solid balustrades block wind directly entering the balcony space, dissipating the wind speed within the balcony area which creates a much more comfortable experience for occupants.

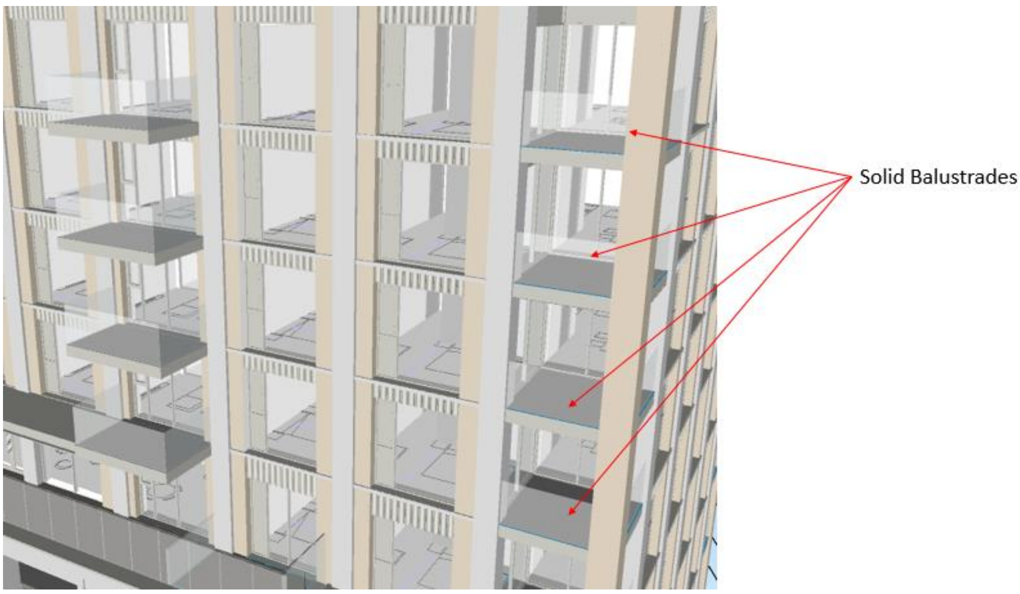


Figure 17.28: Wind Mitigation Measure – Block A1 Solid Balcony Balustrades

17.5.2.5 Landscaping

The landscaping has been strategically designed to mitigate increased wind speeds and to provide shelter for pedestrians at ground level, within the central courtyard spaces and on the rooftop amenity areas. The landscaping design incorporates trees, hedges and raised planters and sheltered seating pockets which all act as wind mitigation measures.

The proposed landscaping design for all levels is illustrated in Figure 17.29 with subsequent images illustrating the landscape design for each rooftop amenity area. Trees are to be planted close to primary entrance ways and along the streetscape, mitigating excessive wind speeds and providing shelter for pedestrians at street level. The use of trees and low-level shrubs all assist in the localised reduction of wind speed.

Figure 17.29: Wind Mitigation Measure – Landscaping Design (All Levels)

(Source: 3D Design Bureau)

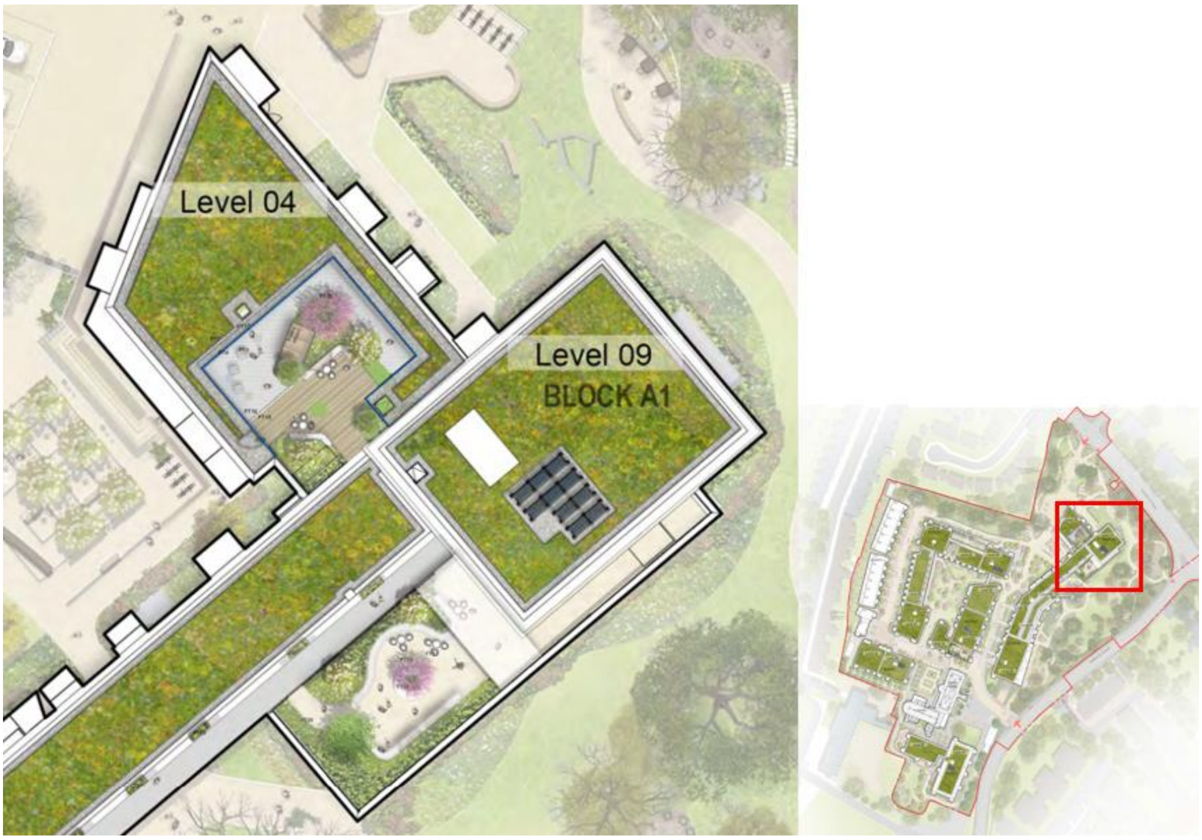


Figure 17.30: Wind Mitigation Measure – Landscaping Design (Block A1 Amenity Areas)

(Source: Cameo Landscape Design Statement)

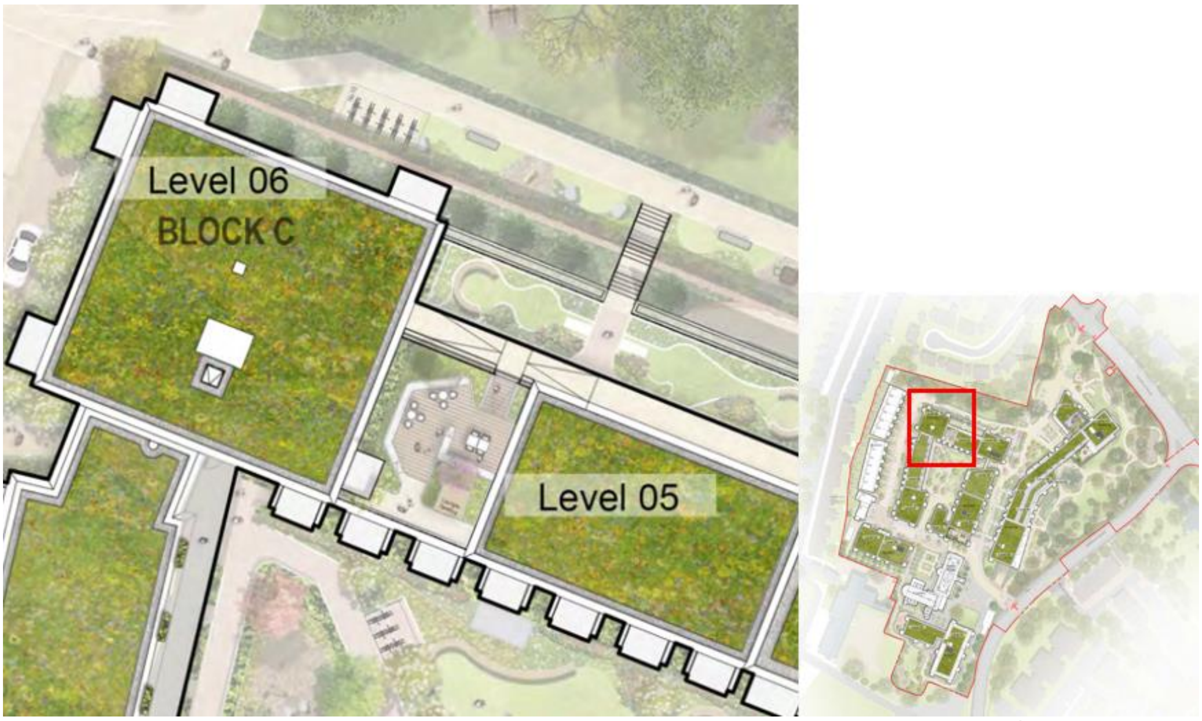


Figure 17.31: Wind Mitigation Measure – Landscaping Design (Block C 2nd Floor Amenity Area)

(Source: Cameo Landscape Design Statement)

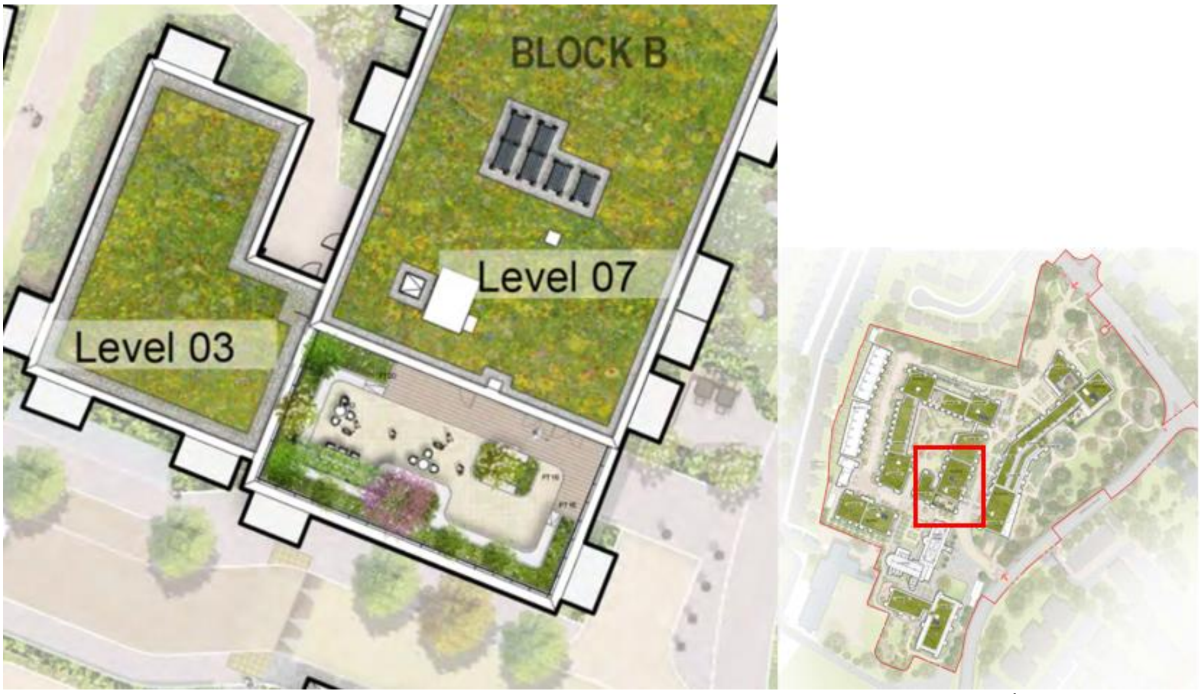


Figure 17.32: Wind Mitigation Measure – Landscaping Design (Block C 5th Floor Amenity Area)

(Source: Cameo Landscape Design Statement)

17.6 Residual Impacts

The trees and planting associated with the landscape design will continue to grow and develop after the proposed mitigation measures have been implemented, thus providing increased protection from the wind resulting in increased pedestrian comfort conditions in these areas which will be a positive impact.

17.7 Monitoring

17.7.1 Construction Phase

During the construction phase the wind conditions will gradually change from the conditions experienced in the existing environment to the conditions experienced during the operational phase. As wind comfort conditions are comfortable at both phases and no issues have been identified, no monitoring is required.

17.7.2 Operational Phase

The proposed development has been designed to have acceptable pedestrian wind comfort conditions during the operational phase, therefore no monitoring is required.

17.8 Reinstatement

17.8.1 Construction Phase

No reinstatement works are required during the construction phase.

17.8.2 Operational Phase

No reinstatement works are required during the operational phase.

17.9 Interactions

The interactions between the proposed development and its environs and human health have been evaluated within the assessment. The modelling has included the proposed design, the proposed landscaping strategy and the existing landscape which will remain, in conjunction with the existing buildings surrounding the development. The combination of all interactions has resulted in a comfortable environment for pedestrians within the proposed development.

17.10 Difficulties Encountered

There were no difficulties encountered during the course of the assessment.

17.11 References

- Lawson, T.V., 2001, 'Building Aerodynamics', Imperial College Press, London
- Met Eireann (https://www.met.ie/climate/available-data/historical-data)

18.0 Risk Management

18.1 Introduction

This Chapter of the EIAR sets out the assessment of the vulnerability of the proposed development at Milltown Park to risks of major accidents/ and or disasters. It assesses the expected effects of the project to risk of major accidents and disasters relevant to the project. It includes the methodology used for the assessment. The interactions and cumulative impact and Mitigation and Monitoring Measures are included in Chapters 20.0 and 21.0, respectively.

This chapter has been completed by Janet O'Shea of Enviroguide Consulting. Janet is a Technical Director with Enviroguide Consulting and holds a BSc. In Environmental Health and post graduate Diploma in Environmental Impact Assessments. Janet has 15 years' experience as an Environmental Professional and is a Chartered Waste Manager with the CIWM and a Chartered Environmentalist.

The proposed development ("the site") comprises of 671 residential dwelling (604 No. Build to Rent and 67 No. Build to Sell) on a c. 4.26 ha site (developable area). The development also includes a creche with outdoor play area and communal internal amenities (co-working space, lounges, libraries and multi-purpose hall).

This chapter has been prepared in accordance with the above requirements and by reference to the EIA Directive and implementing legislation, the Seveso III Directive, the Safety Health and Welfare at Work Act, 2005 and the Floods Directive (2007/ 60/EC).

18.2 Study Methodology

18.2.1 Scope and Context

The relevant legislation to which this Chapter applies is Statutory Instrument (SI). No. 296/2018 - European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 and in particular Schedule 6 – Information to be contained in EIAR. The following paragraphs of Schedule 6, Paragraph 2(e)(i)(IV), specifically refers "a description of the likely significant effects on the environment of the proposed development resulting from ... the risks to human health, cultural heritage or the environment (for example due to accidents or disasters),"

Paragraph 2(h) further expands with "a description of the expected significant adverse effects on the environment of the proposed development deriving from its vulnerability to risks of major accidents and/or disasters which are relevant to it. Relevant information available and obtained through risk assessments pursuant to European Union legislation such as the Seveso III Directive or the Nuclear Safety Directive or relevant assessments carried out pursuant to national legislation may be used for this purpose, provided that the requirements of the Environmental Impact Assessment Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for, and proposed response to, emergencies arising from such events."

18.2.2 Guidelines and Reference Material

This assessment, of major accidents and disasters is a relevantly new requirement in legislation and, as a result, national guidelines are not yet available. Cognisance has been taken of the Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA Draft, August 2017). Although this document predates the 2018 legislation it follows the requirements laid out in the Directive 2014/52/EU.

Specifically, the EPA Guidelines state that the EIAR must take account of "the vulnerability of the project to risk of major accidents and /or disasters relevant to the project concerned and that the EIAR therefore explicitly addresses this issue. The extent to which the effects of major accidents and / or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk)… The potential for a project to cause risks to human health, cultural heritage or the environment due to its vulnerability to external accidents or disasters is considered where such risks are significant, e.g. the potential effects of floods on sites with sensitive plants. Where such risks are significant then the specific assessment of those risks in the form of a Seveso Assessment (where relevant) or Flood Risk Assessment may be required. The EIAR should refer to those separate assessments while avoiding duplication of their contents."

Reference has also been made to the Department of Defence (DOD) Publication 'A National Risk Assessment for Ireland 2017'. A consolidated list of national hazards for Ireland identified in the DOD document are identified in Table 13-1.

Table 18.1 Consolidated List of National Hazards (Source: A National Risk Assessment for Ireland (2017) Department of Defence)

Hazard: Civil • Infections Disease • Terrorist Incident • Animal Disease • Foodborne Outbreaks • Crowd Safety • Civil Disorder • Loss of Critical Infrastructure	**Hazard: Natural** • Storm • Flooding • Snow • Low temperatures • High temperatures • Volcanic Ash • Drought • Tsunami • Space weather
Hazard: Transportation • Road • Rail • Air • Maritime • Transport Hub	**Hazard: Technological** • Industrial Incident • Hazmat • Fire • Nuclear Incident (Abroad) • Radiation Incident (Domestic) • Disruption to electricity/gas supply • Disruption to oil supply • Network and Information Security/ Cyber Incident

18.2.3 Risk Assessment Methodology

The risk assessment methodology has been supported by general risk assessment methods. Hazard analysis and risk assessment are accepted internationally as essential steps in the process of identifying the challenges that may have to be addressed by society, particularly in the context of emergency management. Mitigation as a risk treatment process involves reducing or eliminating the likelihood and/or the impact of an identified hazard.

Table 18.2 Classification of National Likelihood Criteria (Source: A National Risk Assessment for Ireland (2017) Department of Defence)

National Likelihood Criteria		
Rating	**Classification**	**Average Recurrence Interval**
1	Extremely Unlikely	500 or more years between occurrences
2	Very Unlikely	100-500 year between occurrences
3	Unlikely	10-100 years between occurrences
4	Likely	1-10 years between occurrences
5	Very Likely	Less than 1 year between occurrences

18.3 Predicted Impacts

The EIAR chapters within this report identify that the proposed development has been designed in accordance with best practice and that the proposed development can be safely undertaken without risk to health.

In order to understand the potential consequences and predicted impacts of any major accident or disaster due to the Proposed Development and the vulnerability of the project a desk study was undertaken. The assessment reviewed:

- The vulnerability of the project to major accidents or disasters.
- The potential for the project to cause risks to human health, cultural heritage and the environment, as a result of that identified vulnerability.

A methodology has been used including the following assessment:

- Identifying and screening the hazards
- Phase 2: Screening the hazards
- Identifying the impact
- Assessing the likelihood of the major accident or disaster occurring, and

- Assessing any risks that remain.

Phase 1 Assessment:

The DOD Consolidated List of National Hazards was used to identify a preliminary list of potential major accident and disasters. Receptors covered by legislation were not included within the assessment e.g. construction workers.

Phase 2 Screening:

The list was screened and major events, such as volcanoes were not included given the unlikely event of one occurring. Elements already addressed as a key part of the design e.g. risks of landslides are not repeated.

Phase 3: Mitigation and Evaluation

In the event that mitigation measures included did not mitigate against the risk, then, the potential impacts on receptors are identified in the relevant chapter.

Table 18.3 lists the major accidents and/or disasters reviewed

Major Accident or Disaster	Relevant for this Proposed Development?	Why relevant?	Potential Receptor	Covered within EIAR?
Civil				
Human disease/ Epidemic	Y	COVID-19 is a new illness that can affect your lungs and airways. It is caused by a virus called coronavirus. Coronavirus is spread in sneeze or cough droplets. The development poses no additional risk to COVID-19. There will be approximately 550 workers directly employed during the peak of the construction phase of the project. During the construction phase of this Proposed Development HSE guidelines will be adhered to in relation to social distancing, cough and sneeze etiquette and hand washing. Appropriate welfare facilities will be provided at the construction compound. Frequently touched objects and surfaces such as door handles, machine steering wheels andgear levers will be cleaned and disinfected frequently. The Governments 'Work Safely Protocol' and the Construction Industry Federation 'Back to Work Resource Pack ' will be adhered to. All construction staff will complete the relevant HSA Return to Work Safely Online Courses prior to commencing work on-site.	Employees	N/A

		There will be approximately 24 workers employed during the operational stage. The proposed creche will employ between c. 14 and c. 16 staff. Final staff numbers will be dependent on whether the creche will provide full time/part-time day-care service or sessional pre-school services. In addition, there will be approximately 8 people employed for grounds maintenance, building maintenance and concierge during a 24 hour period All workers employed during the operational phase of the Proposed Development will comply with the relevant Government protocols that will be in place at that point in time in relation to Covid-19.		
Terrorist Attack	N	Not considered vulnerable	N/A	N/A
Animal Disease	N	Not considered vulnerable	N/A	N/A
Foodborne Disease	N	Not considered vulnerable	N/A	N/A
Waterborne Disease	Y	Not considered vulnerable. Waterborne diseases can be caused by consuming contaminated drinking water. A potable water supply will be supplied to the Proposed Development via a connection to an existing Irish Water supply.	N/A	Refer to Chapter 11 Water and Hydrology for information on water supply.
Crowd Safety	N	Not considered vulnerable	N/A	N/A
Civil Disorder	N	Not considered vulnerable	N/A	N/A

Loss of Critical Infrastructure	N	Not considered vulnerable	N/A	N/A
Transportation				
Road Accidents	Y	Fuel spillage	Road users, land and soils, hydrology and water, aquatic environment	Chapters 10 (Land, Soils and Geology) and 11 (Water-Hydrology) assessed the potential for spillages during the project timeframe and proposed mitigation measures within thechapter including the requirement for spill kits, bunds for refuelling.
Rail accidents	N	Not considered vulnerable as the site of the Proposed Development is approximately 2.61KM from the closest train station at Sydney Parade, Sydney Parade Ave, Dublin. The site is located approximately c. 740 metres as the crow flies from Cowper LUAS stop, Ranelagh, Dublin and c. 720 metres as the crow flies from Beechwood LUAS stop.	N/A	N/A
Aircraft disasters	N	Not considered vulnerable as the proposed development is located approximately 11.53KM from Dublin airport and runways and approximately 13.13KM from Baldonnel Airport.	N/A	N/A
Maritime Disaster	N	Not considered vulnerable as the site is approximately 2.67KM from the coast.	N/A	N/A
Transport Hub	N	Not considered vulnerable	N/A	N/A
Natural				

Cultural, Archaeological and Architectural Heritage	N	There are no protected structures or conservation areas located within the Site of the Proposed Development. The subject site is located in close proximity to an Architectural Conservation Area at Belmont Avenue/ Mt. Eden Road and environs. Theclosest monument to the subject site is the site of a ringfort (DU022-089; Clonskeagh) located 325m to thesoutheast. Additional adjacent monuments are located 500-600m from the subject site. An archaeology assessment has been completed by Archer Heritage Planning Ltd.	N/A	Chapter 6 (Archaeology and Cultural Heritage) /Chapter 7 (Architectural Heritage) of this report identifies all protected structures, architectural conservation areas and monuments within proximity to the Proposed Development.
Avalanche and landslides	N	The potential for landslides was already considered within the design therefore no future assessment or potential required.	N/A	N/A
Sinkholes	N	Geology not prone to sinkholes, no karst mapped nearby.	N/A	N/A
Earthquakes	N	Area is not geologically active.	NA	NA
Floods	N	A flood hazard assessment has been undertaken. No flood events are noted in the immediate vicinity of the site.	Development	Chapter 11 of this EIAR identifies the vulnerability of the project to flooding.
Storm surge/tidal flooding	N	No risk of tidal flooding	Development	Chapter 11 of this EIAR identifies no risk of flooding.
Blizzards	N	Not relevant	N/A	N/A
Droughts	N	Not relevant	N/A	N/A

Severe weather such as Tornados, heatwaves	N	Not relevant	N/A	N/A
Air Quality events	Y	Vehicular emissions Dust emissions	Residents/ workers	Chapter 12 (Air Quality and Climate) of this EIAR identifies the impact of the construction and operation of the development on ambient air quality.
Wildfires	N	Not relevant. A landscape plan has been completed for the Proposed Development.	N/A	N/A
Dam, Bridge or Tunnel Failure	N	None present	N/A	N/A
Flood defence failure	N	This has been assessed in Chapter 11 Water & Hydrology. A flood hazard assessment has been undertaken. No flood events are noted in the immediate vicinity of the site and therefore no flood defence measures have been proposed. Flood defence failure does not need to be considered.	N/A	Refer t o Chapter 11 Water & Hydrology.
Other				
Fire	Y	The risk of fire inside the apartments might lead to loss of life.	Residents & nearby properties.	The design criteria of the buildings are in accordance with all relevant building and fire safety standards. Smoke ventilation, fire alarms and emergency lighting are fitted on all buildings and a sprinkler system is fitted on the apartment buildings.

Cyber Attacks	N	Not considered vulnerable	N/A	N/A
Utilities failure	Y	Water, electricity, wastewater, sewage. The risk is very small and localised.	Hydrology and Water	Chapter 10, 11 and 16 contains information on containment and operational systems.
Industrial accidents (defence, energy, oil and gas refinery, food industry, chemical industry, manufacturing, quarrying, mining)	N	There are no Upper Tier Seveso sites near the Proposed Development. The closest is in National Oil Reserves Agency Ltd., Shellybanks Road, Ringsend, Dublin 4, located approximately 2.50KM from the site. There is one Lower Tier Seveso site located approximately 4.06KM from the Proposed Development at Synergen Power Ltd t/a ESB Dublin Bay Power Pigeon House Road, Ringsend, Dublin 4 .	N/A	N/A
Disruption to electricity/gas supply	N	Not considered vulnerable	N/A	N/A
Invasive species	N	Not considered vulnerable.	N/A	IAPS (invasive alien plant species) Report has been prepared by Invasive Plant Solutions and is included in Appendix 7.1. No invasive species have been identified at the Site of the Proposed Development. A Management Plan in included in this report. The Preliminary Construction Management Plan prepared by DBFL Consulting Engineer (enclosed as a separate document as part of this

				planning application) and the Construction & Demolition Waste Management Plan prepared by AWN also address invasive species (included in Appendix 14.1).
Disruption to oil supply	N	Not considered vulnerable	NA	N/A
Nuclear accident	N	Not considered vulnerable	N/A	N/A
Road signs and masts failure	N	Designed to modern standards	Road users, population	NA
Utilities failure	Y	Water, electricity, wastewater, sewage	Employees	Chapters 10, 11 and 16.
Crime or civil unrest	N	Not considered vulnerable	NA	NA
Building Failure	N	This has been taken into consideration in the building design. All apartments have been designed to modern standards. No further assessment is required.	Residents	The design criteria of the buildings are in accordance with all relevant building design standards.

18.4 Management Plans

18.4.1 Fire Safety & Emergency Response

The design criteria of the buildings are in accordance with all relevant building and fire safety standards. Smoke ventilation, fire alarms and emergency lighting are fitted on all buildings and a sprinkler system is fitted on the apartment buildings. A fire evacuation strategy will be put in place in advance of dwelling occupancy.

18.5 Residual Impacts

Control measures observed for health and safety and environmental management as per relevant code of practices (Code of Practice for Inspecting and Certifying Buildings and Works) and relevant legislation including Building Control Act 1990 (No. 3 of 1990), as amended and Building Control Regulations 1997, as amended.The residual impacts will be negligible once all control, mitigation and monitoring measureshave been implemented.

18.6 Monitoring

There is no monitoring required with regards to risk management. All monitoring proposals for the interacting chapters have been detailed in the relevant technical chapters and are included in Chapter 20 Mitigation Measures and Monitoring.

18.7 Difficulties Encountered

No difficulties were encountered in completing this Risk Chapter.

18.8 Conclusion

The design has considered the potential for flooding, road accidents or fire within the design methodology. The vulnerability of the proposed development to major accidents and/or disasters is not considered significant.

19.0 INTERACTIONS AND CUMULATIVE IMPACTS

19.1 Introduction

This Chapter of the EIAR was prepared by Patricia Thornton (BSc. Surv) (MRUP), Director of Thornton O'Connor Town Planning. Patricia is a Director of Thornton O'Connor Town Planning, is a Corporate member of the Irish Planning Institute and has 18 No. years post-qualification experience. Patricia has experience in preparing and coordinating EIARs for a variety of projects and has also been involved in the coordination of a wide range of developments including residential and commercial developments.

This chapter collates the significant interactions between the different disciplines outlined throughout this EIAR. Table 19.1 (included at the end of this chapter) provides a matrix which summarises the significant interactions associated with the proposed development. the description of effects is in accordance with Table 3.3 of the *Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports 2017*. These Guidelines note that:

> '*The relevant terms listed in the table below can be used to consistently describe specific effects. <u>All categories of terms do not need to be used for every effect'</u>.*

Quality of Effects It is important to inform the non-specialist reader whether an effect is positive, negative or neutral	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative/adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
Describing the Significance of Effects ''Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful (also see Determining Significance below).	**Imperceptible** An effect capable of measurement but without significant consequences.
	Not significant An effect which causes noticeable changes in the character of the environment but without significant consequences.

	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
	Very Significant An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound Effects An effect which obliterates sensitive characteristics.
Describing the Extent and Context of Effects Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	**Extent** Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?).
Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur – so that the CA can take a view of the balance of risk over advantage when making a decision.	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented.
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.

Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	**Momentary Effects** Effects lasting from seconds to minutes.
	Brief Effects Effects lasting less than a day.
	Temporary Effects Effects lasting less than a year.
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years.
	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years.
	Reversible Effects Effects that can be undone, for example through remediation or restoration.
	Frequency of Effects Describe how often the effect will occur. (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually).

This chapter outlines and discusses the principal significant interactions, however many other slight or less significant interactions may occur which have been outlined throughout this EIAR.

Throughout the preparation of this EIAR, each of the specialist consultants liaised with each other on a continual basis and dealt with potential interactions between effects predicted as a result of the proposed development and ensured that all required mitigation measures were incorporated.

19.2 Description of Significant Interactions

19.2.1 Interactions between Population/Human Health and Air Quality/Climate

Interactions between population/human health and air quality/climate are discussed in Chapters 5 and 12. The main interactions are predicated to arise during construction stage as there will be dust emissions associated with the construction of the proposed development. Mitigation measures such as the implementation of a Dust Management Plan (outlined in Appendix 12.2) will minimise dust emissions during construction stage and ensure that no adverse impacts will occur on population and human health. The mitigation measures that will be put in place at the proposed development will ensure that the impact of the proposed development complies with all ambient air quality legislative limits and therefore the predicted impact is short-term, imperceptible and neutral with respect to population and human health during construction and long-term, imperceptible and neutral during operation phase.

19.2.2 Interactions between Population/Human Health and Transportation

The scheme will be developed in line with the Transportation Chapter (Chapter 15 of this EIAR) and the separately enclosed Preliminary Construction Management Plan (PCMP) to ensure any impacts on local traffic is minimised during the construction stage. Chapter 15 notes that a large proportion of the construction employees are anticipated to arrive in shared transport therefore reducing the potential for associated temporary negative impacts on the surrounding road network. Appropriate on-site parking and compounding will be provided on this large site to prevent overflow onto the local network. Deliveries will be actively controlled and subsequently arrive at a dispersed rate during the course of the working day. Provided that mitigation measures and management procedures detailed in Chapter 15 are implemented, the residual impact on the local receiving environment during the construction stage will be short-term, imperceptible and neutral.

As the development proposes some 671 No. residential units and associated (albeit) reduced car-parking, there will be additional traffic movements at the site and in the vicinity. The implementation of mitigation measures such as the implementation of the Mobility Management Plan will ensure that the residual effect on the local receiving environment is both managed and minimised. The promotion of sustainable modes of transport from the site, the large quantum of bicycle parking provided and the incorporation of permeable links through the site will contribute towards modal shift in travel patterns and increased physical activity, which will have a positive, significant and long-term effect on the area.

If the development does not proceed at the subject lands, there would be a potential negative impact for pedestrians and cyclists in the local area as the significantly enhanced pedestrian and cyclist permeability through the site would not be provided to shorten journeys to public transport, services and facilities.

19.2.3 Interactions between Air Quality and Climate, Transportation and Population/Human Health

Chapters 12 and 15 outline interactions between air quality and traffic/transportation respectively. Interactions between air quality and traffic can be significant. With increased traffic movements and reduced engine efficiency, i.e. due to congestion, the emissions of vehicles increase. The impacts of the proposed development on air quality are assessed by reviewing the change in annual average daily traffic on roads close to the site. Chapter 12 concludes that the impact of the interaction between traffic and air quality is considered to be long-term, imperceptible and neutral. As set out above in Sections 19.2.1 and 19.2.2, the interaction between air quality/climate and transportation with population and human health is not expected to generate any significant impacts.

19.2.4 Interactions between Population/Human Health and Noise/Vibration

Interactions between population/human health and noise/vibration are discussed in Chapters 5 and 13. The potential impacts on human beings in relation to the generation of noise and vibration during the construction phases are that high levels of noise and vibration could cause nuisance to people in nearby sensitive locations. Best practice noise and vibration control measures will be employed by the contractor during the construction phase in order to avoid significant impacts at the nearest sensitive buildings. Implementation of the mitigation measures set out and adherence to good practice noise reducing measures will ensure that the short-term, slight to significant, negative impacts on human health will be lessened.

Similarly, during the operational phase, plant selections designed to achieve the relevant noise criteria will result in a residual impact that is long-term, imperceptible and neutral to people in nearby noise sensitive locations. External noise sources have been assessed and mitigation to ensure internal noise levels achieve the relevant noise criteria have been provided.

19.2.5 Interactions between Population/Human Health, Landscape and Wind

Chapter 9 provides a Landscape and Visual Impact Assessment prepared by Modelworks. The chapter sets out that the proposed development would introduce a new, higher density residential neighbourhood to the townscape, making more sustainable use of the valuable urban land resource. The proposal includes a substantial area of communal and public open space, most notably a new public park (including a playground and a network of footpaths) inside the site boundaries along Sandford Road and Milltown Road. The park would be visible and accessible from the public realm around the site, representing a significant gain in public open space with long-term, positive and significant impacts on the health of the existing population and the new resident community.

The interactions between the proposed development and its environs and human health have been evaluated within the Wind Assessment. The modelling has included the proposed design, the proposed landscaping strategy and the existing landscape which will remain, in conjunction with the existing buildings surrounding the development. The combination of all interactions has resulted in a comfortable environment for pedestrians within the proposed development, and the interaction between population/human health, landscape and wind will be long-term, neutral and imperceptible.

19.2.6 Interactions between Population/Human Health and Waste Management

As set out in Chapter 14, the potential impacts on human beings in relation to the generation of waste during the demolition, construction and operational phases are the incorrect management of waste. This could result in littering which could cause a nuisance to the public and attract vermin. A carefully planned approach to waste management and adherence to the project specific Construction and Demolition Waste Management Plan and Operational Waste Management Plan, will ensure appropriate management of waste and avoid any negative impacts on the local population, and thus the interactions between population/human health and waste management will be long-term, imperceptible and neutral.

19.2.7 Interactions between Population/Human Health and Biodiversity

As set out in Chapter 8 (Biodiversity), the open space within the site will provide amenity areas, including play areas, fitness areas and benches. This will involve thinning of trees within the woodland which, without mitigation to protect the wildlife, could impact on wildlife in the area for which the woodland provides cover and foraging ground. Mitigation measures involve planting of native shrubs in the understory which will enhance the woodland structure and planting of 238 No. new trees/large shrubs across the site. These measures will provide habitat for wildlife to safely commute and nesting opportunity for birds.

Interaction with population and human health involves the provision of lighting to provide a safe outdoor realm for residents which, without mitigation, could impact on nocturnal species, such as bats. Mitigation measures include the provision of a dark corridor with restricted lighting and a lighting design minimising impact on bats and other nocturnal animal, providing suitable commuting and foraging habitat. With the implementation of the outlined mitigation measures, the interaction between population/human health and biodiversity will be long-term, not significant and neutral.

19.2.8 Interactions between Population/Human Health and Water-Hydrology

Potential impacts on human health have been considered in the Water-Hydrology chapter (Chapter 11). The chapter sets out that the implementation of the measures outlined within the chapter will ensure that the potential impacts do not occur on water and hydrology and ultimately there is anticipated to be no impact on population and human health in this regard.

As set out in Chapter 11, surface water drainage has been carried out in accordance with Greater Dublin Strategic Drainage Study (GDSDS) and SuDS methodologies will be implemented, therefore no predicted impacts on water and hydrology will arise during the operational stage. Therefore, the interaction between population/human health and water-hydrology are considered to be long-term, imperceptible and neutral.

19.2.9 Interactions between Biodiversity and Landscape

The retained open space within the site will provide amenity areas for residents, including play areas, fitness areas and benches. This will involve thinning of trees within the woodland which, without mitigation to protect the wildlife, could impact on wildlife in the area for which the woodland provides cover and foraging ground. Mitigation measures involve planting of native shrubs in the understory which will enhance the woodland structure and planting of 238 No. new trees/large shrubs across the site. These measures will provide habitat for wildlife to safely commute and nesting opportunity for birds.

It is also proposed as part of the development to plant 238 No. new trees and large shrubs. Given that these specimens would all be in better condition than the majority of the 283 No. trees to be removed, and that the 121 No. retained trees would be in better condition than they currently are (due to the thinning of the woodland and the maintenance of each retained specimen), there would be a similar quantity and a net improvement in the quality of shrub and tree cover on the site as a result of the development which will ensure the site's function to provide habitat for a range of species and providing a wildlife corridor at the site.

Therefore, the interactions between biodiversity and landscape is considered to be long-term, slight and neutral.

19.2.10 Interactions between Land, Soils and Geology, Biodiversity and Air Quality

The Air Quality and Climate Chapter (Chapter 12) notes that construction phase activities such as land clearing, excavations, stockpiling of materials etc. have the potential for interactions between air quality and land and soils in the form of dust emissions. With the appropriate mitigation measures to prevent fugitive dust emissions, it is predicted that there will be no significant interactions between air quality and land and soils. As set out in Chapter 10 (Land, Soils and Geology), dust generation can occur during extended dry weather periods as a result of construction traffic. Dust suppression measures (e.g. dampening down) will be implemented as necessary during dry periods and vehicle wheel washes will be installed for example.

The works involve stripping of topsoil and excavations, which will remove some vegetation such astrees and scrub. It will also generate dust and potentially impact on the air quality in the locality. However, the generation of dust will be temporary during construction phase and is not anticipated to have a significant impact on biodiversity.

The impact of the interactions between land, soils and geology, biodiversity and air quality are considered to be short-term, imperceptible and neutral.

19.2.11 Interactions between Archaeology and Land, Soils and Geology

It is set out in Chapter 6 of the EIAR (Archaeology and Cultural Heritage) and Chapter 10 (Land, Soils and Geology) that should archaeological material be recorded in the course of monitoring, this may necessitate areas being left open to the elements for a period in order to facilitate consultation with Department of Housing Local Government and Heritage (DHLGH), processing of licences and/or full excavation/preservation-by-record of archaeological features. Consequently, in this scenario, there will be interactions with land and soils, which are considered short-term, not significant and neutral.

19.2.12 Interactions between Archaeology and Architectural Heritage

The Archaeology and Cultural Heritage Chapter (Chapter 6) details that should earlier building footprints be recorded in the course of archaeological monitoring, the results of any subsequent archaeological works will contribute to our knowledge of the evolution of the Milltown Park complex (see Chapter 7 – Architectural Heritage), which is considered long-term, not significant and positive.

19.2.13 Interactions between Archaeology and Biodiversity

Interaction with archaeology relates to the construction phase where archaeological monitoring could record archaeological material adjacent to preserved mature trees. This has potential implications for arboriculture requirements. However, 238 No. of trees and large shrubs will be planted across the site and the potential impact on individual trees due to any archaeological findings is not anticipated to have a significant impact on the overall biodiversity on site. The impact of the interactions between archaeology and biodiversity is considered to be long-term, not significant and neutral.

19.2.13 Interactions between Architectural Heritage and Landscape

Chapter 9 of this EIAR (LVIA prepared by Modelworks) sets out that the proposed development would retain Tabor House and the Chapel, the two most valuable existing architectural features of the site, as part of the cluster of buildings. Their condition, and the character and condition of their setting would be improved by the development, with both buildings opened up to view from Milltown Road.

As a remnant of the Milltown Park demesne the woodland belt inside the Sandford Road and Milltown Road boundaries is also a cultural heritage feature. While the proposed development includes the removal of a number of trees from the woodland belt, the majority of specimens in good condition would be retained (and supplemented by new planting), so that the woodland belt remains as a distinct landscape feature of the site. The development will improve the character and condition of the setting of Tabor House and the Chapel with views provided towards the refurbished buildings from Milltown Road, and the proposed replacement/modification of the tall boundary wall with a low wall and railing will also allow greater public appreciation of the woodland as a landscape/cultural heritage feature. The impact of the interaction between architectural heritage and landscape is considered to be long-term, moderate and positive.

19.2.14 Interactions between Land, Soils and Geology, Transportation and Noise/Vibration

Delivery of materials to site (e.g. aggregates for road construction, concrete for foundations, delivery of construction plant to site) will lead to potential impact on the surrounding road network. There will be a level of construction related noise and vibration during the construction of the development on the lands.

However, mitigation works outlined in Chapter 10 (Land, Soils and Geology) such as the provision of vehicle wheel wash facilities will be installed in the vicinity of site entrances and road sweeping will be implemented as necessary in order to maintain the road network in the vicinity of the site.

Mitigation measures proposed will ensure that the potential impacts of the proposed development on land, soils and the geological environment do not occur during the construction phase and that any residual impacts will be short term, imperceptible and neutral. On completion of the construction phase no further mitigation measures are proposed as there will be no further impact on soils and the geological environment.

In relation to the interaction between transportation and noise/vibration, with the implementation of mitigation measures the interaction between construction noise and vibration and transportation will be short-term, slight to significant and neutral. In the operation stage, the interaction will be permanent, imperceptible and neutral.

19.2.15 Interactions between Land, Soils and Geology and Water-Hydrology

Stripping of topsoil will result in exposure of the underlying subsoil layers to the effects of weather and construction traffic and may result in subsoil erosion and generation of sediment laden surface water runoff. Due to relatively high level of groundwater encountered in some boreholes there may be a need to dewater excavations during construction. Chapter 10 (Land, Soils and Geology) sets out that the stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development. Topsoil stockpiles will be protected for the duration of the works and not located in areas where sediment laden runoff may enter existing surface water drains. Topsoil stockpiles will also be located so as not to necessitate double handling.

Mitigation measures proposed such as the above will ensure that the potential impacts of the proposed development on soils and the geological environment do not occur during the construction phase and that any residual impacts will be short term, imperceptible and neutral.

19.2.16 Interactions between Land, Soils and Geology and Waste Management

During the construction phase excavated soil, stone and made ground (between c.74,000m^3 and c. 80,000 m^3) will be generated from the excavations required to facilitate site levelling, construction of the basement and construction of new foundations. It is estimated that between c. 64,000m^3 and c. 70,000m^3 of excavated material will need to be removed offsite, however it is envisaged that c. 10,000m^3 material will be reused onsite.

Where material has to be taken off site it will be taken for reuse or recovery, where practical, with disposal as last resort. Oil, fuel etc. storage areas are to be decommissioned on completion of the construction phase. Any remaining liquids are to be removed from site and disposed of at an appropriate licenced facility.

The management of waste during the construction phase in accordance with the Construction and Demolition Waste Management Plan will meet the requirements of regional and national waste legislation and promote the management of waste in line with the priorities of the waste hierarchy. Adherence to the mitigation measures in Chapter 14 (Material Assets: Waste Management) such as on-site segregation of waste and contacting nearby sites to investigate reuse opportunities for clean and inert materials, and the requirements of the Construction and Demolition Waste Management Plan (Appendix 14.1), will ensure the effect is long-term, imperceptible and neutral.

19.2.17 Interactions between Land, Soils and Geology and Material Assets – Site Services

Trench excavations to facilitate site service installation will result in exposure of subsoils to potential erosion and subsequent sediment generation. Mitigation measures are outlined in Section 10.6 of Chapter 10 Land, Soils and Geology (i.e. service trenches to be backfilled as soon as practicable to minimise potential erosion of subsoils), and the impact of the interaction is considered to be short-term, imperceptible and neutral.

19.2.18 Interactions between Water-Hydrology and Transportation

Construction and operation stage traffic have the potential to impact water quality via hydrocarbon spills and leaks and via increased sediment / particle loading on trafficked surfaces. Measures to mitigate against impacts are detailed in Chapter 11 (Water-Hydrology), and the impact of the interaction is considered to be short-term, imperceptible and neutral.

19.2.19 Interactions between Transportation and Material Assets – Waste Management

Construction and operational stage traffic have the potential to be impacted by waste generation and resource management on site. Local traffic and transportation will be impacted by the additional vehicle movements generated by removal of waste from the site during the construction and operational phases of the development. The increase in vehicle movements as a result of waste generated during the construction phase will be temporary in duration. There will be an increase in vehicle movements in the area as a result of waste collections during the operational phase but these movement will be imperceptible in the context of the overall traffic and transportation increase and has been addressed in Chapter 15 (Material Assets: Transportation).

Provided the mitigation measures detailed in Chapter 15 (Material Assets: Transportation) and the requirements of the Operational Waste Management Plan (included as Appendix 14.2) are adhered to, the interaction should be short to long-term, imperceptible and neutral.

19.3 Cumulative Impacts

Any potential cumulative impacts have been considered in the preparation of this EIAR and are detailed where relevant in the various EIAR Chapters e.g. construction stage impacts, surface water drainage infrastructure, foul drainage, water supply, landscape and visual impact and traffic for example. We confirm that this EIAR has assessed environmental impacts from existing developments as part of the baseline assessments.

At the time of writing this Environmental Impact Assessment Report, we note the following relevant applications, some of which are in the administrative area of Dun Laoghaire-Rathdown County Council. This list of planning applications has been reviewed and considered by the authors of each EIAR Chapter and included in the cumulative assessment where deemed appropriate.

Granted:

	Planning Reference	Development and Location	Date Granted
1.	**ABP Reg. Ref. PL29S.307267**	148 No. Unit Residential Development Eglinton Road, Donnybrook, Dublin 4	**ABP Decision Date:** 31st August 2020
2.	**DCC Reg. Ref. 2189/20** **ABP Reg. Ref. PL29S.307375**	36 No. Unit Residential Development Sandford Lodge, Sandford Road, Dublin 6	**Decision Date:** 11th March 2021 **ABP Grant:** 27th March 2020
3.	**DCC Reg. Ref. 3301/20** ***Currently Under Appeal***	100 No. BTR Unit Shared Accommodation Nos. 22-24 Donnybrook Road,	**Granted:** 13th January 2021

	ABP Reg. Ref. ABP-309378-21	Kiely's Pub, Donnybrook, Dublin 4	**ABP Decision Due:** 10th June 2021 (Not yet made)
4.	**DCC Reg. Ref. 2115/19**	203 No. Bed Student Accommodation Alexandra College, Richmond Avenue South, Milltown, Dublin 6	**Granted:** 20th March 2019 **Final Grant:** 25th April 2019
5.	**DCC Reg. Ref. 3907/18**	Works at Alexandra College, Richmond Avenue South, Milltown, Dublin 6 (including construction on a new internal campus road, relocation of existing car and coach parking, provision of additional bicycle parking spaces and the provision of improvement works to the campus entrance on Milltown Road to include a set-back gateway)	**Granted:** 25th January 2019 **Final Grant:** 5th March 2019
6.	**DCC Reg. Ref. 3513/20** **ABP Reg. Ref. ABP-309720-21**	Mixed Use Development of 49 No. Build-to-Rent units and 231 sq m retail space Nos. 25-27 Donnybrook Road and Nos. 1-3 The Crescent, Donnybrook, Dublin 4	**Granted:** 24th February 2021 **Final Grant:** 26th May 2021 (Appeals Withdrawn)
7.	**DCC Reg. Ref. 2124/20**	Single storey extension (c. 120 sq m) to the south of the existing school to provide additional canteen facilities Muckross Park College, Marlborough Road, Dublin 4	**Granted:** 20th March 2020 **Final Grant:** 29th June 2020
8.	**No. 1. DCC Reg. Ref. 2582/16** **No. 2. DCC Reg. Ref. 3312/20**	Demolition of existing sheds (c. 25 sq m) and construction of 4 No. detached houses No. 91 Belmont Avenue, Donnybrook, Dublin 4	**Granted:** 8th August 2016 **Final Grant:** 16th September 2016

		Revised ground floor rear extension to include a single storey rear return for a utility room No. 91 Belmont Avenue, Donnybrook, Dublin 4	**Granted:** 28th October 2020 **Final Grant:** 9th December 2020
9.	**DCC Reg. Ref. WEB1065/19** **ABP Reg. Ref. ABP-304727-19**	New 3g artificial turf pitch capable of accommodating full size rugby and football over the site on an existing natural grass pitch within the playing fields Gonzaga College, Sandford Road, Ranelagh, Dublin 6	**Granted:** 31st May 2019 **Final Grant:** 9th October 2019
10.	**DCC Reg. Ref. 3159/17** **ABP Reg. Ref. ABP-300024-17**	Revision to DCC Reg. Ref. 2308/16 to increase the total apartment units from 96 No. to 116 No. Lands at the former Paper Mills site, bounded by the River Dodder to the East, Clonskeagh Road to the West, Clonskeagh Bridge to the South-West, Dublin 6	**Granted:** 27th September 2017 **Final Grant:** 4th July 2018
11.	**DCC Reg. Ref. 3144/18**	Demolition of the existing Anglesea Stand and Anglesea Terrace structure (c. 7,716 sq m), 'lean-to' open fronted shed bounding Simmonscourt Road (approx. 145 sq m) and removal of modern terrace (approx. 44sq m) area surrounding the clock tower (a protected structure). Provision of a new grandstand (7,332.2 sq m) over 3 levels, 21.3 m [26.8 m OD] in height (with associated floodlighting and acoustic public address within roof of new stand) with a connection (via a glazed bridge link at level 01) to the pocket building of (1,204.3 sq m GFA) comprising a 2 level (storey) 9.91 m [15.41 m OD] in height building with plant (89 sq m) at	**Granted:** 24th July 2018 **Final Grant:** 31st August 2018

		roof level (within a louvered cover - overall height 10.66 m 16.12 m OD)) to the east. Site within the overall RDS Lands, Ballsbridge, Dublin 4	
12.	**DCC Reg. Ref. 2189/20** **ABP Reg. Ref. ABP-307375-20**	Demolition (c. 392 sq m) of Block 5 (1 storey) and Block 6 (1 storey) (total 4 No. units) and the construction of 36 No. residential units in the form of 2 No. three storey terraces Lands at Sandford Lodge, Sandford Close, Sandford Road, Dublin 6	**Granted:** 27th March 2020 **Final Grant:** 11th March 2021
13.	**DCC Reg. Ref. 2244/21** *Currently on Appeal under:* **ABP Reg. Ref. ABP-310204-21**	Demolition of structures on site and construction of a 12 No. storey development including 84 apartments with retail and café/restaurant (570 sq m) Junction of Donnybrook Road and Brookvale Road, Donnybrook, Dublin 4, D04 K3T8	**Refused:** Refused by DCC on 14th April 2021 **ABP Decision Due Date:** 13th September 2021
14.	**DCC Reg. Ref. 3939/19** **ABP Reg. Ref. ABP-306755-20**	The demolition of the existing Rectory and the construction of 9 No. dwellings The Rectory, Purser Gardens, Rathmines, Dublin 6, D06 E0Y5	**Granted:** 19th February 2020 **ABP Grant:** 9th September 2020
15.	**DCC Reg. Ref. 4011/18** **ABP Reg. Ref. ABP-304085-19**	The demolition of all buildings on the former commercial site to the rear and the construction of a new residential development comprising 20 No. residential houses No. 1 Annesley Park, Dublin 6	**Granted:** 4th March 2019 **ABP Grant:** 4th November 2019
16.	**DCC Reg. Ref. 2812/20**	Demolition of existing single storey structures to the side and rear. - Construction of single storey rear extension to the side and rear of the existing dwelling	**Granted:** 29th July 2020 **Final Grant:** 9th September 2020

		No. 23 Bushfield Terrace, Donnybrook, Dublin 4, D04 V2RO	
17.	**DCC Reg. Ref. 2412/19** **ABP Reg. Ref. ABP-305475-19**	The construction of a residential scheme arranged in 3 No. new three-four storey blocks with habitable attic accommodation at a site at The former Donnybrook Laundry at The Crescent, Donnybrook, Dublin 4, D04 R856 and No. 17 The Crescent, Donnybrook Road, Dublin 4 D04 A6Y7	**Granted:** 22nd August 2019 **ABP Grant:** 29th January 2020
18.	**DCC Reg. Ref. 2731/21 (alterations to DCC Reg. Ref. 3890/14 extended by DCC Reg Ref. 3890/14/X1-4 No. bedroom dwelling)**	Development comprising provision of a pedestrian entrance gate off Eglinton Road; (ii) provision of a temporary construction access off Eglinton Road; and (iii) all ancillary works necessary No. 1 Eglinton Square, Donnybrook, Dublin 4, D04 E2W2	**DCC Decision:** Split decision 29th June 2021 – Grant proposed pedestrian entrance gate and refuse proposed temporary construction entrance.
19.	**(SHD) ABP Reg. Ref. ABP-310138-21 (www.msmshd.ie)**	Demolition of existing buildings on site and part of the granite wall along Dundrum Road, excluding Small Hall and the construction of 231 No. apartments and a childcare facility Mount Saint Mary's and Saint Joseph's, Dundrum Road, Dundrum, Dublin 14	**ABP Decision Date:** 25th August 2021

Pending:

	Planning Reference	Development	Date Granted
1.	**DCC Reg. Ref. 2843/21**	Construction of Donnybrook Primary Care Centre comprising 4 No. storeys over basement level accommodating HSE medical	**DCC Decision:** Further Information Received 25th August 2021

		diagnostics, consulting and treatment rooms plus ancillary offices The Royal Hospital Donnybrook, Morehampton Road, Donnybrook, Dublin 4, D04 HX40	Decision due 21st September 2021
2.	**DCC Reg. Ref. 2477/21**	The demolition of a single storey rear return and provision of 2 No. residential units; and the provision of a new part 2 to part 4 No. storey structure to the rear of the site accommodating 10 No. residential units No. 47 Ranelagh Road, Ranelagh, Dublin 6	**DCC Decision:** (Further Information Requested 20th May 2021)
3.	**DCC Reg. Ref. 2762/21**	Construction of an additional storey consisting of an additional 2-bedroom apartment at third floor level, with private balconies. There will be an increase in units from 6 to 7 No. apartments Nos. 47-48 Chelmsford Road, Ranelagh, Dublin 6	**Refused:** 5th July 2021 **Appealed to ABP:** Decision due 2nd December 2021
4.	**DCC Reg. Ref. 2704/21**	Construction of 64 No. Build-to-Rent apartment units comprising 19 No. studio apartments, 41 No. one bedroom apartments and 4 No. two bedroom apartments St. Mary's Home, Pembroke Park and No. 28A Clyde Lane, Dublin 4	**DCC Decision:** (Further Information Requested 24th June 2021)

Therefore, it is clear that the potential for any cumulative impacts to occur have been comprehensively considered in the preparation of this EIAR, as detailed where relevant throughout the various chapters.

Interactions	Population and Human Health	Archaeological and Cultural Heritage	Architectural Heritage	Biodiversity	Landscape and Visual Impact	Land, Soils and Geology	Water-Hydrology	Air Quality and Climate	Noise and Vibration	Material Assets - Waste Management	Transportation	Material Assets - Site Services	Material Assets – Daylight and Sunlight	Microclimate – Wind
Population and Human Health				✓	✓		✓	✓	✓	✓	✓			✓
Archaeology			✓	✓		✓								
Architectural Heritage					✓									
Biodiversity					✓	✓		✓						
Landscape and Visual Impact														✓
Land, Soils and Geology							✓	✓	✓	✓	✓	✓		
Water-Hydrology											✓			
Air Quality and Climate											✓			
Noise and Vibration											✓			
Material Assets - Waste Management											✓			
Transportation														
Material Assets - Site Services														
Material Assets – Daylight and Sunlight														
Microclimate – Wind														

Table 19.1 Matrix of Significant Interactions Discussed Throughout Chapter 19

20.0 MITIGATION MEASURES AND MONITORIING

This chapter of the EIAR was prepared by Patricia Thornton (BSc. Surv) (MRUP), Director of Thornton O'Connor Town Planning. Patricia is a Corporate member of the Irish Planning Institute and has 18 No. years post-qualification experience. Patricia has experience in preparing and coordinating EIARs for a variety of projects and has also been involved in the coordination of a wide range of developments including residential and commercial developments.

This chapter summarises the mitigation measures proposed in the various chapters throughout this Environmental Impact Assessment Report.

The *Draft EPA Guidelines (2017)* describe mitigation measures as follows:

> *'measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements.'*

Full details of mitigation measures are included within each individual chapter of this EIAR.

20.1 Population and Human Health

The mitigation measures incorporated in Chapter 5 of the EIAR have been broken down under the following headings:

Population Profile and Trends

The development will have a long-term positive impact on population due to the provision of a wide range of dwelling unit types which includes provision for Part V units and will cater for a wide cohort of persons. As noted, during the construction phase the local population may be temporarily impacted due to the influx of construction traffic, noise and dust.

However, we note that these impacts are short-term and mitigation measures will be put in place to minimise such impacts which are discussed in other sections of this EIAR including the implementation of a Dust Management Plan, a Mobility Management Plan and Parking Strategy. Please see further details in Chapter 12 (Air Quality and Climate) (and Section 20.8 of this Chapter 20) and Chapter 15 (Transportation) (and Section 20.11 of this Chapter 20).

Housing

It is considered that the proposed development of 671 No. units will be a positive addition to the availability of housing in the area by providing a wide choice in tenure for a range of persons. The short-term impacts associated with the construction stage are associated with any new development and will not be significant once mitigation measures which have been outlined extensively in other sections of this EIAR such as the Noise and Vibration Chapter (Chapter 13) and the Transportation Chapter (Chapter 15) of the EIAR in addition to the implementation of the Preliminary Construction Management Plan and Outline Construction and Environmental Management Plan submitted as separate documents. Additional mitigation measures include the implementation of a Dust Management Plan, Mobility Management Plan and Parking Strategy.

Employment/Economy

The proposed development will have a significant positive impact on the economy and employment of the area due to the influx of jobs that will be created at construction and operation stages. We also note that during construction, local businesses will benefit from workers utilising their services and during the operational stage there will be an increased population at the subject lands which will support the local economy. New jobs will also be created at the subject lands during construction and operational stage. It is considered that the impact that will occur on employment and the local economy will be positive and long-term therefore no specific mitigation measures are proposed.

Local Services and Amenities

The proposed development will benefit the local economy as local shops and other amenities will benefit economically from the construction stage and operational stage. In addition, the significant quantum of public open space and permeable connections proposed will be an attractive addition to the area and represents a key planning gain for the wider neighbourhood.

The Childcare Demand Assessment enclosed as a separate document prepared by KPMG Future Analytics concludes that there is capacity in the existing childcare facilities in the area to cater for the proposed development. Although it has been concluded that sufficient capacity exists in the area, the Applicant has incorporated a crèche into the scheme, which as well as benefiting the future residents of the development, it will also cater for the immediate existing residents of the area, and thus enhancing the amenity of the area.

The Social Infrastructure Audit also prepared by KPMG Future Analytics noted that there is capacity for c. 162-163 No. pupils in primary schools in the area with the proposed development generating a demand for c. 66 No. pupils. The Assessment also notes that the development will generate a demand for c. 29 No. post-primary school places. The Audit concludes that there is capacity within 2 km of the proposed development for 35 No. pupils in existing post-primary schools. In addition, Marian College confirmed available capacity for male and female pupils but were unable to quantify exact numbers at the time of writing. The response rate for post-primary schools is a modest 50% owing to the time of year that the consultations took place and so it is reasonable to conclude that additional capacity for post primary students is available within the study area and is capable of accommodating additional demand generated by the proposed development.

Therefore, the existing schools in the area can absorb the limited demand predicted to arise from the subject development. The provision of a crèche will ultimately increase the capacity of childcare facilities for the area and the significant quantum of public open space and permeable connections proposed will be an attractive and positive addition to the area, particularly as there has never been such provision for public open space or permeable connections at the lands as the public have never enjoyed any right of access to these privately owned lands. In the event that permission is granted, access will be opened up to the public to the 14,848 sq m of public open space to be provided as part of the development.

Health and Safety

Mitigation measures will be put in place to minimise any potential impacts on health and safety. The Contractor shall be responsible for overall management of the site for the duration of the proposed works and must progress their works with reasonable skill, care, diligence and to proactively manage the works in a manner most likely to ensure the safety and welfare of those carrying out construction works. The Contractor shall comply with all relevant Statutory requirements such as the 2005 Safety Health and Welfare at Work Act, The Construction Regulations (SI 291 of 2013), the General Application Regulations (SI 299 of 2007), etc. (and any amendments thereof). In addition, the Contractor shall comply with all the reasonable safety requirements of the Client, the Project Supervisor for the Design Process and the Project Supervisor for the Construction Stage. Measures that would be taken under these Statutory requirements include:

- Appointment of a competent project supervisor for the design process, and a competent project supervisor for the construction stage.
- Contractor to ensure that all staff have received site-specific safety induction instruction.
- Appointment of a safety officer.
- Safe means of access to and egress from site are provided and maintained.

To negate any potential impacts during construction stage, a dust management plan will be implemented. In addition, the site will be securely fenced off from adjacent properties, public footpaths and roads.

As set out in Chapter 15 of this EIAR 'Transportation':

> *'An Outline Construction and Environmental Management Plan (CEMP) has been prepared as part of the planning application with an associated Preliminary Construction Management Plan (PCMP). The PCMP includes an Outline Traffic Management Plan as well as incorporating a range of integrated control measures and associated management activities with the objective of minimising the potential impacts of construction activities associated with the development. The following initiatives will be implemented to avoid, minimise and/or mitigate against the anticipated construction period impacts:*
>
> - *During the pre-construction phase, the site will be securely fenced off/hoarded off from adjacent properties, public footpaths and roads;*
> - *Appropriate on-site parking (temporary parking for the duration of construction works) and compound area will be provided to prevent overflow onto the local network;*
> - *A large proportion of construction workers are anticipated to arrive in shared transport. It is likely that some numbers of the construction team will be brought to/from the site in vans/minibuses, which will serve to reduce the trip generation potential;*
> - *Delivery vehicles to and from the site will be spread across the course of the working day, therefore, the number of HGVs travelling during the peak hours will be relatively low;*

- *Truck wheel washes will be installed at construction entrances;*

- *Any specific recommendations with regard to construction traffic management made by Dublin City Council will be adhered to;*

- *Potential localised traffic disruptions during the construction phase will be mitigated through the implementation of industry standard traffic management measures such as the use of traffic signage. These traffic management measures shall be designed and implemented in accordance with the Department of Transport's Traffic Signs Manual "Chapter 8 Temporary Traffic Measures and Signs for Roadworks" and "Guidance for the Control and Management of Traffic at Roads Works – 2nd Edition" (2010);*

- *Site entrance point/s from the public road will be constructed with a bound, durable surface capable of withstanding heavy loads and with a sealed joint between the access and public highway. This durable bound surface will be constructed for a distance of 10m from the public road;*

- *Material storage zones will be established in the compound area and will include material recycling areas and facilities;*

- *'Way finding' signage will be provided to route staff / deliveries into the site and to designated compound / construction areas;*

- *Dedicated construction haul routes will be identified and agreed with Dublin City Council prior to commencement of activities on-site; and*

- *On completion of the works, all construction materials, debris, temporary hardstands etc. from the site compound will be removed off-site and the site compound area reinstated in full on completion of the works*.'

The mitigation measures proposed during the operational stage include the implementation of the Parking Management Strategy, Mobility Management Plan, provision of ample cycle parking, junction enhancements and promotion of car sharing which will encourage the use of sustainable transport modes which will ultimately negate any potential impacts on the health and safety of the population in relation to traffic safety. The scheme is fully in accordance with the *Design Manual for Urban Roads and Streets*.

Furthermore, a Daylight/Sunlight Report has been prepared by 3D Design Bureau which concludes that the design approach taken has ensured that no significant adverse impacts will occur on daylight/sunlight infiltration to neighbouring properties and that levels of daylight and sunlight within the scheme will provide a high-quality level of amenity for future residents. Please see Appendix 5.1 for the Review of the BRE Sunlight and Daylight Assessment prepared by 3D Design Bureau, which accompanies this EIAR. A full Daylight and Sunlight Assessment Report prepared by 3D Design Bureau is also enclosed separately.

A Risk Management Chapter has been competed by Enviroguide Consulting and is included as Chapter 18 which notes that the design has considered the potential for flooding, road accidents or fire within the design methodology. The vulnerability of the proposed development to major accidents and/or disasters is not considered significant. The residual impacts will be negligible once all control, mitigation and monitoring measures have been implemented.

Traffic/Commuter Patterns

The scheme will be developed in line with the Transportation Chapter (Chapter 15 of this EIAR), the separately enclosed Preliminary Construction Management Plan (PCMP) and Outline Construction and Environmental Management Plan (CEMP) to ensure any impacts on local traffic is minimised during the construction stage. Chapter 15 notes that a large proportion of construction workers are anticipated to arrive in shared transport, therefore the encouragement of car sharing will reduce the quantum of vehicles arriving at the site during construction, which will therefore minimise any potential impacts on the surrounding road network during construction.

As discussed, the promotion of sustainable modes of transport from the site during the operational stage will significantly mitigate against any potential impacts that may arise on traffic in the area. Please see Chapter 15 (Transportation) which details the proposed development further in relation to potential traffic impacts and mitigation measures which include the implementation of a Parking Management Strategy, Mobility Management Plan, provision of ample cycle parking, junction enhancements and promotion of car sharing. We note that the scheme has been designed in line with the *Design Manual for Urban Roads and Streets*.

20.2 Archaeological and Cultural Heritage

20.2.1 Mitigation Measures

There are currently no archaeological remains identified within the site. However, it has been established as an area of moderate archaeological potential. In particular, the discovery of human remains adjacent to the site in an adjoining property is significant. The recommendations below are made subject to the approval of the Department of Housing Local Government and Heritage (DHLGH). As the statutory body responsible for the protection of Ireland's archaeological and cultural heritage resource, they may issue alternative or additional recommendations.

Pre-Construction Phase

Pre-construction assessments (desktop study, walkover survey, geophysical survey and test trench assessment) have been undertaken at the site. No further pre-construction assessment is proposed at this stage.

Recommended Mitigation Measure

All ground disturbance works across the development site will be monitored by a suitably qualified archaeologist. In the event that archaeological material is recorded during monitoring, further discussion/consultation with the DHLGH will be sought in order to ascertain the appropriate treatment (i.e. preservation by record/preservation in situ) of any additional archaeological remains. Should the DHLGH recommend preservation by record/full archaeological excavation, this work will be undertaken under the appropriate licence. The DHLGH may recommend preservation in situ, should avoidance of any newly discovered archaeological remains be possible.

20.2.2 Monitoring

Construction groundworks will be monitored by a suitably qualified archaeologist. Any future licensed archaeological works will require an application process including approval of proposed methodologies by the National Monuments Service of DHLGH in consultation with the National Museum of Ireland and notification of works.

20.3 Architectural Heritage

20.3.1 Mitigation Measures

Chapter 7 of this EIAR outlines various mitigation measures as follows:

- It is recommended that all the building range's exteriors, interiors and settings be thoroughly recorded. All records will be of a quality meriting inclusion in the Irish Architectural Archives.

- The careful management of the demolition process in the designed temporary protection of extant structures prior to the commencement of their permanent works will ensure that retained buildings are protected from damage, with no direct impacts envisaged. As described in Chapter 6, archaeological investigations will record evidence of earlier embedded structures, if found to exist beneath extant upstanding fabric. New interventions consequential to the loss of physical connections to buildings, which are proposed to be demolished, will be measured and sympathetic to existing architecture.

- Flanking sections will be protected during the removal stage and consolidated to ensure their long-term co-existence with new perforations. Any proposed interventions will be executed using high-quality materials, in a palette to complement the muted tones of the existing wall. The sylvan nature of the existing site will be protected in so far as possible and enhanced by further planting. Flanking sections of retained, early masonry, will be protected during demolitions and consolidated to ensure their continuance as a characterful boundary onto Milltown Road. Modifications to the boundary wall adjoining the entrance will be the sympathetic to the existing entrance in terms of scale and materiality to minimise the visual impact on the established streetscape.

- Potential impacts associated with the construction phase of the development will be considered by way of introducing a range of mitigating measures to protect existing site boundaries and mature trees. On completion of the development, the sylvan screening that presently defines the architectural setting of protected structure in the vicinity of the subject site will be supplemented to overcome possible environmental changes arising from the construction phase of the development. The Sandford Road entrance will be retained to minimise the visual impact on the southward views from the Architectural Conservation Area.

The chapter considers potential impacts to Protected Structures in the vicinity and outlines whether mitigation measures are envisaged. For the majority of the Protected Structures, no mitigations are envisaged given their considerable distance. In relation to Nos. 132-138 Sandford Road, the following mitigation is proposed:

> *'The proposal to retain sections of original boundary wall, together with introducing new sections with permeability through the site where its sylvan character will be safeguarded, will lessen visible change from the enclosing urban realm in one sense, whilst enhancing it in revealing the proposed parkland as an extension to the public realm'.*

In relation to No. 1 Saint James's Terrace to No. 12 Saint James's Terrace, the following mitigation is proposed:

> *'The protection of mature trees and supplementary planting will reduce the visual impact of the new development. Contemporary interventions to the boundary wall will be undertaken using high quality self-finished materials, and selection of a muted colour palette sympathetic to the existing historic context to reduce impact on the streetscape'.*

Chapter 7 also states the following in relation to the redevelopment of the site:

> *'Development of the existing site is inevitable. The existing building range has evolved in direct response to its religious institutional function and is inseparable architecturally from that function. Its function has now become obsolete and the buildings vacated. An uncertain future for the building range was determined when their original function was permanently lost. In the absence of a corresponding compatible function, their wholescale re-use is architecturally and economically unviable. None of the buildings within the grouping are protected structures, and not being afforded statutory protection are subject to the same rigours of statutory compliance as new build structures.*
>
> *As a consequence, the removal of certain buildings to generate a viable residential scheme is not unexpected. Their removal is mitigated in the selected retention and careful presentation of the groupings most significant pair of historic buildings, as has been described in previous sections and in the attached Appendix 7.3. Further mitigations are proposed in the execution of a detailed building inventory, supported with accurately documented survey drawings.*
>
> *The retention of two buildings for purposeful re-use within the vast building range presents an inherently positive impact for the legibility of the original function of the site.*
>
> *The proposed development has emerged in direct response to the positioning, orientation and setting of the retained pair of buildings. The presented integrated approach to this unique site's redevelopment absorbs the challenges of cohesive urbanism to a greater extent than would be possible if it were developed piecemeal.*
>
> *The scale and positioning of the site affords it special consideration in its capacity to offer a unique urban contribution. In response, the design of the proposed replacement building grouping has evolved in efforts to merge with its established, historic and characterful urban environment.'*

20.3.2 Monitoring

Archaeological monitoring and recording will follow the demolition of structures and the excavation of the site. The main contractor for the scheme will monitor works in the vicinity of retained historic buildings and enclosing boundary walls on a daily basis, to ensure that protection measures are observed at all times.

20.4 Biodiversity

20.4.1 Mitigation Measures

Construction Phase

Dodder Valley pNHA

The woodland on the proposed development site will be planted with native shrubs as groundcover and native tree species will be incorporated into the planting regime. This will secure the sites function as a connecting wildlife corridor with River Dodder and the Dodder Valley pNHA. Details on measures in place to strengthen the biodiversity on the site are provided in the section below.

Habitats

Mixed broadleaved/conifer woodland / treelines / scrub / grassland

During removal of vegetation and construction works, trees to be retained will be protected by the erection of protective fencing under supervision of Site Arborist prior to construction and no works are to be undertaken within the tree root protection zone, as specified in the Arborist Report (CMK Horticulture & Arboriculture Ltd, 2021). The Site Arborist shall monitor the tree protection during construction. Further, the regeneration of young trees needs to be safe guarded and young/early mature trees of high quality will be retained.

Planting of new vegetation will take place during construction in tandem with the construction of buildings. To compensate for the removal of 283 No. trees there will be 238 No. new large multi-stem trees and large shrubs planted across the site. Native species of scrub will be planted in the mixed broadleaved/conifer woodland and have been specifically selected to provide nesting habitat for birds and safe cover for mammals. This will enhance the field layer in the woodland as it is currently dominated by non-native species. Species to be planted include: Hawthorn *Crataegus monogyna*, Dogwood *Cornus sanguinea*, Elder, Holly and Guelder Rose *Viburnum opulus*.

The proposed tree planting includes native and non-native (ornamental) species. The native species have been chosen primarily based on species currently present on the site. Native tree species to be planted include: Holly, Wild Cherry, Downy Birch *Betula pubescens*, Pedunculate Oak *Quercus robur*, Rowan *Sorbus aucuparia* and Hazel.

There are six elm trees present on site (five English Elm *Ulmus Procera* and one Wych Elm *Ulmus glabra*). One English Elm (Arborist Tag No. 220) and the Wych Elm (Arborist Tag No. 214) will be retained on the site. Elms have a limited long-term potential due to Dutch Elm disease. Therefore, the Elms to be removed will be replaced with tree species with better long-term prospects, as specified above.

The grassland west of Tabor House, which at present is used for foraging by bats, will be planted with wildflower meadow from native wildflower seed mix and an orchard (*Malus* spp.) which will provide valuable resource for pollinators and thus continue to provide foraging resource for bats. Insect hotels will be installed in this area and in the green space east of the northern entrance of the site which has a mix of heritage lawn and wildflower planting. The insect hotels will be placed in a sunny location facing south, south-east. These will provide nesting habitat for solitary bees.

All the above are incorporated into the Landscape Design Statement (Sandford DAS) accompanying this application. Planting of new vegetation will take place during construction in tandem with the construction of buildings. Planting of native scrub will enhance the woodland habitat and strengthen it as a connecting habitat for wildlife in the wider area. The incorporation of native tree species in the planting scheme will further provide for green connecting corridors within the site.

Green roofs are proposed on the new buildings (refer to Landscape Masterplan) which will compensate for the loss of grassland habitat and enhance biodiversity of the developed site and further connecting the green corridors within the site. Native species (e.g. those associated with native dry grasslands) will be planted on the roofs. Suitably planted green roofs can also provide important foraging habitats for birds and bats.

Terrestrial Mammals

General avoidance measures that will be incorporated to minimise disturbance to mammals during construction:

- The hours of working will be limited to daylight hours where possible, to limit disturbance to nocturnal and crepuscular animals;

- Contractors must ensure that no harm comes to wildlife by maintaining the site efficiently and clearing away materials which are not in use, such as wire or bags in which animals can become entangled;

- Any pipes should be capped when not in use (especially at night) to prevent animals becoming trapped. Any excavations should be covered overnight to prevent animals from falling and getting trapped. If that is not possible, a strategically placed plank should be placed to allow animals to escape; and

- During vegetation removal, caution is needed in case of nesting Hedgehogs within the woodland. The site will be visually checked by an Ecological Clerk of Works (ECoW) prior to bringing in any machinery and be cleared on a rotational basis with scrubby patches left to provide nesting habitat and cover for Hedgehog. In addition, piles of dead wood and brash piles shall be created in undisturbed areas of the site during construction.

The woodland in the north and east part of the site will be retained and enhanced by planting of groundcover with native scrub thus securing habitat for mammals habiting the site. There will be removal of low quality trees and scrub. However, high quality trees (mature and young) and Ivy will be retained. Planting of native species of trees and scrub will strengthen the woodland as a connecting habitat and will compensate for loss of foraging and commuting habitat.

Bats

Lighting

Lighting will be switched off during non-working hours where possible and directional lighting will be used during the construction phase. This will minimise spill to any other area forming part of the bats commute. The specification and colour temperature of light treatments is chosen based on their tolerability by bats. LED luminaires are ideal due to their sharp cut-off, lower intensity, and dimming capability. A warm white spectrum (2700 K – 3000 K) will be used to reduce the blue light component.

Vegetation removal

Three trees on site were identified to have bat roost potential. One of these trees (Arboricultural Tag Number 311) is destined for removal. The following tree felling procedure will be adhered to when felling trees identified as suitable to provide potential bat roosts:

All bats, and any trees that are identified as bat roosts, are legally protected by the Wildlife Acts and the EU Habitats Directive.

The tree with Arboricultural Tag Number 311, which is destined for removal, will be re-examined by an experienced bat specialist before tree felling starts. The examination will be carried out at height under derogation licence using torch and/or endoscope. If features are confirmed as not being suitable for use as roosts, then work can continue. If bats/evidence of bats/or suspected roosts are found, then these will be legally protected, and an application for a derogation licence will be made before moving forward with the works with appropriate mitigation in place, involving soft felling, lowering sections to the ground and then leaving in place overnight (to allow any bats to make their way out).

Demolition of buildings

A pre-construction bat survey of the roof space of Milltown Park House will be conducted prior to any demolition works in case conditions change over the timeframe of the planning application until construction starts. The survey will be conducted by a suitably qualified and licensed bat ecologist. If bats are present, demolition will have to be postponed and a derogation licence will be required before carrying out any works. Prior to works commencing, bats must have safely left the roost which can be done by an exclusion procedure involving installation of one-way valves over access points for bats following instructions from a bat ecologist. The majority of roosts are only used seasonally and demolition works should be adapted to this.

Enhancement measures

Three bat boxes will be installed on mature trees present within the woodland. The following trees have been identified as suitable, referring to Arboricultural Tag Number: 297, 352 and 324. These trees are selected due to being mature and in suitable location for bat boxes.

Before the bat boxes are installed, Ivy will be removed from the area surrounding the placement of each Bat box (1m radius). Large multi chambered bat boxes will be used (e.g. https://www.nhbs.com/large-multi-chamber-woodstone-bat-box or similar) as they are likely to benefit species identified on site, including Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus*, Leisler's Bat *Nyctalus leisleri* and potentially some Myotis Bat species.

Birds

Seasonality

Any clearance of trees and scrub will be conducted outside of the bird nesting season (March to September inclusive).

Demolition or reroofing of buildings must take place outside of the bird nesting season (March to September included) as Jackdaw and Herring Gull are nesting in the chimneys. If works are to take place in 2022, or years thereafter, it should take place outside of the bird nesting season or the chimneys should be bird proofed by a specialist contractor prior to nest building/egg laying and a new breeding bird survey by a qualified ecologist should take place before any demolition works start.

Enhancement measures

Some 4 No. bird boxes will be installed in the woodland along the eastern boundary. Trees identified to install the bird boxes on have the Arboricultural Tag Numbers 11, 175, 191 and 269.

Planting

Planting of native species of trees and scrub will compensate for loss of foraging, commuting and nesting habitat. The planting of native shrubs in the ground layer of woodland will provide cover and nesting opportunities for birds and the mixed planting of wildflowers, heritage lawn, fruit trees and green roofs will attract insects which is a food resource for many bird species.

Biosecurity

Invasive Plant Solutions have carried out an invasive alien plant species survey and prepared a report including a management plan for the construction phase of the development (provided in Appendix 8.4). The management plan includes a management programme for Three-cornered Garlic and Spanish Bluebell, and ongoing monitoring of the site to screen for the future risk of the introduction of Invasive Non-Native Species onto the lands from outside the property and biosecurity measures. The management plan includes a multi annual herbicide control programme with a targeted application of a glyphosate based herbicide (Roundup Biactive XL in solution, at a dilution rate of 1:40, or similar).

Prior to clearance of vegetation and works commence in the area, Winter Heliotrope should be removed and appropriately disposed to avoid further dispersal of the species. Removal of Winter Heliotrope can be done by either physical control or chemical control. Due to an extensive rhizome network, physical removal is only practical on a limited scale. The Winter

Heliotrope is extensive on the present site and as such chemical control is the preferred option.

Grey Squirrel is widespread across the Dublin suburban landscape and any management would have to be at a county level and not dealt with locally. Mitigation measures are not proposed for this species.

Operation Phase

Bats

Lighting

A dark corridor will be maintained around the boundary of the site to provide commuting and foraging habitat for bats. The key bat habitats include the woodland surrounding the site in the north and east which was identified as bat commuting habitat during the activity surveys and it connects the site to adjacent gardens and potential commuting routes outside of the site.

The second key bat habitat which is located to the west of Tabor House was identified as an important foraging area for bats during the activity surveys. This area will be planted with a wildflower meadow and fruit trees to attract insects and provide foraging opportunities for bats. The Holly treeline in the centre of the site was also identified as a commuting route for bats, however this will be removed as part of the new development. The key bat habitats including the woodland along the north and eastern boundary will not be lit by artificial lighting and the key bat foraging area of wildflower meadow west of Tabor house will have restricted lighting with light turned off at curfew time 22:30 during the summer months May to September inclusive. The open public space will act as supporting habitat providing a buffer zone around the key habitat and connecting the woodland with the wildflower meadow. The lighting in the buffer zone will be restricted, details are provided in the section below.

The dark corridor will maintain the sites connectivity with the surrounding area, providing connectivity with the wider urban landscape.

The following design mitigation is incorporated into the Lighting Report and Drawings prepared by Pritchard Themis which will alleviate the risk of light disturbance to bats.

- Hours of illumination:

  Feature lighting of trees and on the west side facades of Tabor House and the Chapel will be turned off at curfew 22:30 all year round. Lighting in the formal garden area (wildflower meadow) west of Tabor House and the Chapel is set to turn off at this curfew during summer months May to September inclusive.

- Light levels and type:

  The specification and colour temperature of light treatments is chosen based on their tolerability by bats. UV free LED luminaires will be used as they are ideal due to their sharp cut-off, lower intensity, and dimming capability. A warm white spectrum (no higher than 3000K) will be used to reduce the blue light component. The LED luminaires will also feature peak wavelengths higher than 550nm to avoid the component of light most disturbing to the Bats.

Bollards that sit within the buffer zone of the dark corridor will have a light output set to a down-rated driver to ensure a lower lux level.

Street lighting in the area behind Building F is within the buffer zone of the dark corridor and will be set to average at a maintained average of 5 lux.

- Column heights of lamp posts and direction of light:

  As bats most likely forage and commute in the unlit areas surrounding the site, the following measures are in place to reduce the amount of light spillage where it is not needed:

  - The height of lamp columns will be 6m or less.
  - Lighting will also be directed away from retained vegetation, i.e. the woodland.
  - The use of uplighting will be restricted to the central route between the proposed buildings. Any uplighters will be fitted with louvres to control light spill. Downlighting will be used in locations close to the woodland and retained vegetation. Uplighting of trees and west side facades of Tabor House and the Chapel will be turned off at 22:30 during summer months.
  - Bollards with a height of 800mm will be used on tertiary pedestrian routes, including the footpath along the woodland. The bollards along the woodland will have a spacing of 9-13m apart. The footpath surface will be of a natural material which does not create a reflection, minimising any potential upward reflection of the light.

Although it is deemed unlikely that light emitted from buildings will significantly impact on potential foraging and commuting areas for bats as these will largely lie along the extremities of the Site, particularly along the north and eastern Site boundary; night-time light spill from the interiors of the proposed buildings via windows/entrances; and the levels of spill/glare from outdoor lighting in place on the building exterior and throughout the site; will be minimised through selective lighting measures (such as fittings set back into the room) utilised for units facing towards the buffer zone.

Loss of habitat

The grassland to the western side of the Chapel and Tabor House was frequently used by foraging bats during the surveys. This area will be planted with wildflower meadow from native wildflower seed mix and an orchard (*Malus* spp.) which will provide valuable resource for pollinators and thus continue to provide foraging resource for bats. Green roofs planted with suitable species that support invertebrates can offer additional foraging habitat for bats.

The restricted lighting in the buffer zone (supporting habitat) will ensure that bats can commute between the woodland and foraging area west of the Chapel and Tabor House.

Enhancement measures

Bat boxes will be installed on mature trees present within the woodland (Arboricultural Tag Number: 297, 352 and 324). Ivy will have to be removed from the area surrounding the placement of each Bat box (1m radius). It is recommended that large multi chambered bat boxes are used (e.g. https://www.nhbs.com/large-multi-chamber-woodstone-bat-box or similar) as it is likely to benefit species identified on site, including Common Pipistrelle, Soprano Pipistrelle, Leisler's Bat and potentially some Myotis Bat species. Green roofs planted with suitable species that support invertebrates can offer additional foraging habitat for bats.

20.4.2 Monitoring

Following guidelines (NPWS, 2016) bat use of the site will be monitored for one year post construction to evaluate implemented measures to provide foraging and commuting habitat and roosting sites for bats. The monitoring should be carried out by a qualified Ecologist and take place in the summer months May – September in the form of activity surveys including transects and automatic static detectors.

20.5 Landscape and Visual Impact

20.5.1 Mitigation Measures

Construction Phase

Apart from (a) the measures incorporated in the proposed design at operation stage, (b) the measures for tree protection (as recommended in the Tree Protection Strategy prepared by CMK Horticulture & Arboriculture Ltd) and biodiversity protection (as recommended in Chapter 8), and (c) standard best practice construction site management (e.g. erection and maintenance of site hoarding, orderly storage of materials and vehicles, etc.), no additional mitigation measures are proposed for townscape and visual effects.

Operational Phase

The proposal has been subject to detailed environmental impact assessment, including of potential townscape and visual effects, throughout the design and pre-planning process. Informed by this assessment, the proposal has been designed to avoid causing any significant negative townscape and visual effects.

Important mitigation measures built into the proposal from the outset include:

- The retention of the tree/ woodland belt inside the north and east boundaries as part of the scheme's main public open space (not all of the trees, but most of the better quality trees – a sufficient volume to retain the tree belt as a key feature of the landscape), with the buildings (Block A and C) set back well behind the trees. This would (a) retain the site's 'parkland' character in views from Sandford Road and Milltown Park, (b) provide screening of the buildings, and (c) lend maturity, identity/ character, landscape and visual amenity tothe new neighbourhood.

- The retention of Tabor House and the Chapel on the site. The dual intention was to (a) preserve these assets in the interest of cultural/ architectural heritage conservation, and (b) to lend maturity, identity/ character, landscape and visual amenity to the new neighbourhood.

- Retention of trees, setting back of the buildings (Block C) and modulation of building height along the north (Norwood Park) boundary. Block C is set back from the boundary behind a linear open space incorporating the retained trees, to function as a landscape/ visual buffer between the building and the nearest houses of Norwood Park. The northern range of Block C is also broken into four distinct volumes, of two, four, six and eight storeys. The intention of this articulated form is to reduce the perception of massing/height in the views from Norwood Park.

- Positioning of lower buildings (Block E and the lower volume of Block D) inside the west (Cherryfield Avenue) boundary. The proposed Block E terraces are three storeys and are positioned against the west boundary in a back-to-back arrangement with the Cherryfield Avenue houses. This is a typical lower density suburban arrangement. The Block D apartment building steps down from five to three storeys towards the west boundary, with the same intention of minimising the intrusion of the building in views from Cherryfield Avenue.

- High quality design and materials. The proposed scheme is conceived as a higher density neighbourhood of the highest architectural and landscape quality, commensurate with the qualities of the urban context. Therefore, even when visiblefrom the surroundings (as a higher density development in a traditionally low density area unavoidably would be), the buildings and landscape would be attractive. The townscape character and views would change, but their quality would be maintained.

In addition to these decisions taken at the start of the design process, an important mitigation measure was the reduction in scale of Block A1. This element of the proposal is deliberately tall in order to achieve place-making and townscape legibility gains. However, at 13 No. storeys (as originally proposed), the step up in height from the surrounding built form could have been consideredexcessive and the building excessively intrusive in views. In recognition of this Block A1 was reduced to 10 No. storeys and set back several metres further from the Sandford Road boundary (the setting back was also to improve the open space inside the north boundary). The result is that the building would be visible and recognisable from the surrounding area (i.e. it would function as a landmark) without dominating or otherwise harming its townscape context.

20.5.2 Monitoring

The retention of existing trees on site is an important element of the proposal. Any unplanned loss of trees beyond that considered and designed for in the subject application could result in negative townscape and visual impacts.

The planning application is accompanied by a Tree Protection Strategy prepared by CMK Horticulture & Arboriculture Ltd., which includes the requirement for (a) a Site Arborist tobe appointed for the project, (b) the monitoring of tree protection measures by the Site

Arborist throughout construction, (c) supervision by the Site Arborist of all works in the vicinity of trees, and (d) the specification by the Site Arborist of remedial works in the event of any damage to trees. The strategy also requires a re-survey of the retained trees post construction to ensure their survival in optimum condition.

20.6 Land, Soils and Geology

20.6.1 Ameliorative, Remedial or Reductive Measures

Construction Phase

Stripping of Topsoil

Stripping of topsoil will be carried out in a controlled and carefully managed way and coordinated with the proposed staging for the development. As noted previously, approximately 40% of stripped topsoil will be reused on site (incorporated into landscaping) with remaining topsoil reused on another site as a by-product in accordance with Article 27 of the EC (Waste Directive) Regulations (2011) or disposed of at a licenced waste receiving facility (subject to the approval of the facility operator in accordance with their facility permit or licence).

At any given time, the extent of topsoil strip (and consequent exposure of subsoil) will be limited to the immediate vicinity of active work areas.

Topsoil stockpiles will be protected for the duration of the works and not located in areas where sediment laden runoff may enter existing surface water drains.

Topsoil stockpiles will also be located so as not to necessitate double handling.

Excavation of Subsoil Layers

The need to excavate existing subsoil layers has been minimised as the proposed ground floor levels and external pavement levels have been designed to follow the natural topography of the site. The basement excavation has also been minimized in as far as the structural and functional constraints will allow.

Disturbed subsoil layers will be stabilized as soon as practicable (e.g. backfill of service trenches, construction of road capping layers, concrete blinding of the basement excavation, construction of building foundations and completion of landscaping). The duration that subsoil layers are exposed is to be minimised in order to mitigate against weather effects.

Similar to comments regarding stripped topsoil, stockpiles of excavated subsoil material will be protected for the duration of the works. Stockpiles of subsoil material will be located separately from topsoil stockpiles.

Measures will be implemented to capture and treat sediment laden surface water runoff (e.g. surface water inlet protection and earth bunding adjacent to open drainage ditches).

Imported Fill

Importation of fill to site will be required. Materials imported to site for use as fill will be natural stones sourced from locally available quarries or materials that have been approved as by-products by the EPA in accordance with the EPA's criteria for determining a material is a by-product, per the provisions of article 27(1) of the European Communities (Waste Directive) Regulations, 2011.

No large or long-term stockpiles of fill material will be held on the site. At any time, the extent of fill material held on site will be limited to that needed in the immediate vicinity of the active work area.

Smaller stockpiles of fill, where required, will be suitably protected to ensure no sediment laden runoff enters existing surface water drains. Such stockpiles are to be located in order to avoid double handling.

Construction Traffic

Earthworks plant and vehicles delivering construction materials to site will be confined to predetermined haul routes around the site and designated delivery areas. This mitigates the risk of rutting and deterioration of the topsoil layer and any exposed subsoil layers.

Vehicle wheel wash facilities will be installed in the vicinity of any site entrances and road sweeping implemented as necessary in order to maintain the road network in the immediate vicinity of the site.

Dust suppression measures (e.g. dampening down) will be implemented as necessary during dry weather periods.

Accidental Spills and Leaks

In order to mitigate against spillages contaminating underlying soils, all oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area.

Refueling and servicing of construction machinery will take place in a designated hardstand area (when not possible to carry out such activities off site).

A response procedure will be put in place to deal with any accidental pollution events and spillage kits will be available and construction staff will be familiar with the emergency procedures and use of the equipment. Concrete batching will take place off site when possible to minimise the risk of ground contamination on site during the concrete batching process.

Geological Environment

No mitigation measures are proposed in relation to the geological environment.

Risks to Human Health

- Contractor / Project Supervisor Construction Stage (PSCS) to implement safe systems of construction including but not limited to battering the sides of trench excavations and installation of excavation shoring systems.

- Full precautions to be taken when working in vicinity of boundary structures for protection of same. Method and sequence of construction to be agreed with design team prior to commencement of work. Contractor's Temporary Works Designer to prepare Method Statement and Temporary Works Cert to ensure stability of excavations and adjacent structures.

- Contractor to obtain utility company network plans and arrange observation as required.

- Contractor to locate and record all services on site prior to commencement of excavations.

- Contractor to prepare and implement a Construction Traffic Management Plan that will be agreed with the Design Team and local authority and which will ensure the safety of the public during construction (note, an outline Traffic Management Plan is included in the Preliminary Construction Management Plan).

- Contractor must supervise vehicle movements to and from the site during construction in order to ensure that this traffic management plan is fully implemented. Plan to include deliveries to the site, staff parking, works outside the defined site such as utility connections.

- Public pedestrian routes to be established at site entrance as required.

- All personnel using machinery/plant to have undergone training on the use of said machinery/plant. Ongoing site supervision to be undertaken to ensure all use of machinery/plant is in accordance with the training undertaken.

- Contractor's employees to be provided with all required PPE in accordance with Safety, Health and Welfare at Work Act, 2005.

- Contractor to prepare a Dust Management Plan with reference to the mitigation measures outlined in Chapter 12.0 (Air Quality and Climate).

Operational Phase

On completion of the construction phase, no further mitigation measures are proposed as there will be no further impact on soils and the geological environment.

20.6.2 Monitoring

Proposed monitoring during the construction phase in relation to the soil and geological environment are as follows:

- Adherence to Construction Management Plan (note, a Preliminary Construction Management Plan is enclosed separately which must be adhered to) and Outline Construction and Environment Management Plan.

- Construction monitoring of the works (e.g. inspection of existing ground conditions on completion of cut to road formation level in advance of placing capping material, stability of excavations etc.).

- Inspection of fuel / oil storage areas.

- Monitoring cleanliness of adjacent road network, implementation of dust suppression and provision of vehicle wheel wash facilities.

- Monitoring of contractor's stockpile management (e.g. protection of excavated material to be reused as fill, protection of soils for removal from site from contamination).

No ongoing monitoring is proposed on completion of the construction phase.

20.7 Water-Hydrology

20.7.1 Ameliorative, Remedial or Reductive Measures

Construction Phase

The following measures are proposed during the construction phase to mitigate against risks to the surrounding hydrological environment:

- A Preliminary Construction Management Plan has been prepared as part of this application and is to be implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the Preliminary Construction Management Plan. An Outline Construction and Environmental Management Plan (CEMP) has been prepared as part of the planning application and will be implemented during the construction phase.

- Weather conditions and typical seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations with an objective of minimizing soil erosion.

- In order to mitigate against spillages contaminating the surrounding surface water and hydrogeological environments, all oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area. Refuelling and servicing of construction machinery will take place in a designated hardstand area (where not possible to carry out such activities off site).

- Concrete batching (for use in in situ concrete pours) will take place off site and wash down and wash out of concrete trucks will take place off site (at authorized concrete batching plant in full compliance with relevant planning and environmental consents).

- The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply. Foul drainage discharge from the construction compound will be tankered off site to a licensed facility until a connection to the public foul drainage network has been established.

- The construction compound's potable water supply shall be protected from contamination by any construction activities or materials. The contractor shall obtain a temporary connection from the existing water supply network along Milltown Road / Sandford Road in accordance with Irish water requirements for same.

Operational Phase

The design of proposed site levels (roads, FFL etc.) has been carried out to ensure the proposed development is elevated and set in such a way as to avoid concentrating additional surface water flow in any particular location.

Following the Site Specific Flood Risk Assessment, it has been determined that the proposed development is located in Flood Zone C as defined by the Guidelines i.e. proposed development is considered to have the required level of flood protection up to and including the 1% AEP flood event.

Proposed mitigation measures to address residual flood risks are summarised below;

- Proposed drainage system to be maintained on a regular basis to reduce the risk of a blockage.

- Overland flow routes, directed towards open space areas, are identified / established in the event of storms exceeding the 1% AEP design capacity of the attenuation system

The development's basement shall not have an adverse effect on the existing ground water regime as the basement extends into the low porosity boulder clays (refer to DBFL's Basement Impact Assessment for the proposed development).

Surface water runoff from the site will be attenuated to the greenfield runoff rate as outlined in the Greater Dublin Strategic Drainage Study (GDSDS). Surface water discharge rates will be controlled by a Hydrobrake type vortex control device in conjunction with below ground attenuation storage.

The following methodologies are being implemented as part of a SuDS surface water treatment train approach:

- Permeable paving in driveway areas.

- Surface water runoff from duplex roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved driveways.

- Surface water runoff from apartment roofs will be captured by green roofs (sedum blanket) prior to being routed to the piped surface water drainage network.

- Surface water runoff from the majority of site's internal street network will be directed to the proposed pipe network via tree pits or other SUDS features (with overflows to conventional road gullies). Part of the site's internal street network (adjacent to Block E) drains via 3 No. bio-retention areas. In limited instances, surface water runoff from paved areas will be directed to the proposed pipe network via conventional road gullies.

- A drainage reservoir (drainage board) is to be provided on the podium slab over basement. The podium will have a mix of soft landscaping and permeable hard landscaping (over a drainage board which would serve as a reservoir).

- Attenuation of the 30 and 100-year return period storms (refer to DBFL Report 190226-rep-002, Infrastructure Design Report).

- Installation of a Hydrobrake (limiting surface water discharge from the site to 2.0 l/sec/ha).

- Surface water discharge will also pass via a fuel / oil separator (sized in accordance with permitted discharge from the site).

A contract will be entered into with a suitably qualified contractor for maintenance of the attenuation system, Hydrobrake and full retention fuel / oil separator noted above.

No specific mitigation measures are proposed in relation to foul drainage however, all new foul drainage lines will be pressure tested and be subject to a CCTV survey in order to identify any possible defects prior to being made operational (in accordance with Irish water's QA Field Inspection Requirement Manual).

No specific mitigation measures are proposed in relation to water supply, however, water conservation measures such as dual flush water cisterns and low flow taps will be included in the design.

The potential impact of climate change has been allowed for as follows;

- Pluvial flood risk - attenuation storage design allows for a 20% increase in rainfall intensities.

- Pluvial flood risk - drainage system design allows for a 20% increase in flows.

- Provision of min. freeboard (500mm) from 1% AEP as required by GDSDS (mitigation against impact of climate change).

It is also noted that AWN's Hydrological Risk Assessment concludes that '*During operation the potential for an impact to ground or storm water is negligible and there are measures incorporated within the proposed development to manage stormwater run-off quality. These specific measures will provide further protection to the receiving soil and water environments*'.

20.7.2 Monitoring

Proposed monitoring during the construction phase in relation to the water and hydrogeological environment are as follows:

- Implementation of measures included in the Preliminary Construction Management Plan and outline Construction and Environment Management Plan included in application documents).

- Inspection of fuel / oil storage areas.

- Monitoring cleanliness of adjacent road network, implementation of dust suppression and vehicle wheel wash facilities.

During the operational phase an inspection and maintenance contract are to be implemented in relation to the proposed drainage network, Class 1 full retention fuel / oil separator, hydrobrakes and attenuation devices).

20.8 Air Quality and Climate

20.8.1 Avoidance, Remedial and Mitigation Measures

Construction Phase

Air Quality

The pro-active control of fugitive dust will ensure the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of the Dust Management Plan. The key aspects of controlling dust are listed below. Full details of the Dust Management Plan can be found in Appendix 12.2. These measures will be incorporated into the Construction Environmental Management Plan (CEMP) prepared for the site. An outline CEMP has been prepared by Thornton O'Connor Town Planning and is enclosed separately.

The Dust Management Plan notes the following measures in summary:

- Prior to demolition blocks will be soft stripped inside buildings (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).

- During the demolition process, water suppression will be used, preferably with a hand-held spray. Only the use of cutting, grinding or sawing equipment fitted or used in conjunction with a suitable dust suppression technique such as water sprays/local extraction will be used.

- Drop heights from conveyors, loading shovels, hoppers and other loading equipment will be minimised, if necessary fine water sprays should be employed.

In addition, a Preliminary Construction Management plan has been prepared by DBFL Consulting Engineers and is enclosed. In summary, the measures which will be implementedwill include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.

- Any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.

- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly (on any un-surfaced site road, this will be 20 kph and on hard surfaced roads as site management dictates).

- Vehicles delivering material with dust potential (soil, aggregates etc.) will be enclosed or covered with tarpaulin at all times to restrict the escape of dust.

- Public roads outside the site will be inspected on a daily basis for cleanliness and cleaned as necessary.

- Debris, sediment, grit etc. captured by road sweeping vehicles is to be disposed off-site at a licensed facility.

- Vehicles exiting the site shall make use of a wheel wash facility where appropriate prior to entering onto public roads.

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.

- During movement of materials both on and off-site, trucks will be stringently covered with tarpaulin at all times. Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate

Construction stage traffic and embodied energy of construction materials are expected to be the dominant source of greenhouse gas emissions as a result of the construction phase of the development. Construction vehicles, generators etc., may give rise to some CO_2 and N_2Oemissions. However, due to short-term nature of these works, the impact on climate will notbe significant.

Nevertheless, some site-specific mitigation measures will be implemented during the construction phase of the proposed development to ensure emissions are reduced further. In particular, the prevention of on-site or delivery vehicles from leaving engines idling, even over short periods, and minimising the waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.

Operational Phase

The impact of the proposed development on air quality and climate is predicted to be imperceptible with respect to the operational phase in the long term. Therefore, no site specific mitigation measures are required.

The proposed development has been designed to minimise the impact to climate where possible during operation. Details of the measures to be incorporated into the design of thedevelopment are outlined below and further within the Energy & Sustainability Report prepared in support of this planning application.

- UV free-LED fittings and timer controls are considerations being undertaken to improve the impact lighting may have on climate.
- A central building management system (BMS) will be used to check metering to monitor and optimise substantive energy use.
- A number of private and visitor bicycle spaces will be provided along with lower car parking ratios of 0.50 per unit to encourage sustainable modes of transport to residents.

20.8.2 Monitoring

Construction Phase

Monitoring of construction dust deposition at nearby sensitive receptors during the construction phase of the proposed development is recommended to ensure mitigation measures are working satisfactorily. This can be carried out using the Bergerhoff method in accordance with the requirements of the German Standard VDI 2119. The Bergerhoff Gauge consists of a collecting vessel and a stand with a protecting gauge. The collecting vessel is secured to the stand with the opening of the collecting vessel located approximately 2m above ground level. The TA Luft limit value is 350 mg/(m2*day) during the monitoring period between 28 - 32 days.

Operational Phase

There is no monitoring recommended for the operational phase of the development as impacts to air quality and climate are predicted to be imperceptible.

20.9 Noise and Vibration

20.9.1 Mitigation Measures

Construction Stage

With regard to construction activities, best practice control measures for noise and vibration from construction sites are found within BS 5228 (2009 +A1 2014) Code of Practice for Noise and Vibration Control on Construction and Open Sites Parts 1 and 2. Whilst construction noise and vibration impacts are expected to vary during the construction phase depending on the distance between the activities and noise sensitive buildings, the contractor will ensure that all best practice noise and vibration control methods will be used, as necessary in order to ensure impacts at off-site Noise Sensitive Locations are minimised.

The best practice measures set out in BS 5228-1 and BS 5228-2 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;
- noise control at source;
- screening; and,
- liaison with the public.

Construction activities will vary depending on the phase of construction. The following matrix identifies which mitigation measures are applicable to the various phases.

Construction Phase		**Mitigation Measure**			
		Selection of quiet plant	**Noise control at source**	**Piling**	**Screening**
Site Preparation		X	X		X
Demolition		X	X		X
Foundations	Option A	X	X		X
	Option B	X	X	X	X
	Option C	X	X		X
General Construction		X	X		X
Landscaping		X	X		X
		Liaison with Public	**Project Programme**	**Monitoring**	**General Measures**
Site Preparation		X	X	X	X
Demolition		X	X	X	X
Foundations	Option A	X	X	X	X
	Option B	X	X	X	X
	Option C	X	X	X	X
General Construction		X	X	X	X
Landscaping		X	X		X

<u>Selection of Quiet Plant</u>

The potential for any item of plant to generate noise should be assessed prior to the item being brought onto the site. The least noisy item will 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.

<u>Noise Control at Source</u>

If replacing a noisy item of plant is not a viable or practical option, 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 in consultation with the supplier. For example, resonance effects in panel work or cover plates will 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.

Referring to the potential noise generating sources for the works under consideration, the following best practice migration measures will be considered:

- The lifting of bulky items, dropping and loading of materials will be restricted to normal working hours.
- Mobile plant should be switched off when not in use and not left idling.
- For piling plant, noise reduction can be achieved by enclosing the driving system in an acoustic shroud.
- For concrete mixers, control measures will be employed during cleaning to ensure no impulsive hammering is undertaken at the mixer drum.
- For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant will 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.

Piling is the construction activity which is most likely to cause disturbance. General guidance in relation to piling is outlined in the following paragraphs.

Piling programmes will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. If piling works are in progress on a site at the same time as other works of construction or demolition that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

Prior to construction the planner, developer, architect and engineer, as well as the local authority, will be made aware of the proposed method of working of the piling contractor. The piling contractor will in turn have evaluated any practicable and more acceptable alternatives that would economically achieve, in the given ground conditions, equivalent structural results.

On typical piling sites the major sources of noise are essentially mobile and the noise received at any control points will therefore vary from day to day as work proceeds. The duration of piling works is typically relatively short in relation to the length of construction work as a whole, and the amount of time spent working near to noise sensitive areas can represent only a part of the piling period.

Noise reduction can be achieved by enclosing the driving system in an acoustic shroud. For steady continuous noise, such as that generated by diesel engines, it may be possible to reduce the noise emitted by fitting a more effective exhaust silencer system or utilising an acoustic canopy to replace the normal engine cover. Impact noise when piling is being driven can be reduced by introducing a non-metallic dolly between the hammer and the driving helmet.

Screening by barriers and hoardings is less effective than total enclosure but can be a useful adjunct to other noise control measures. For maximum benefit, screens should be close either to the source of noise (as with stationary plant) or to the listener. Removal of a direct line of sight between source and listener can be advantageous both physically and psychologically. In certain types of piling works there will be ancillary mechanical plant and equipment that may be stationary, in which case, care should be taken in location, having due regard also for access routes. When appropriate, screens or enclosures should be provided for such equipment.

Screening

Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. It is understood that the existing concrete perimeter wall will remain during the construction process and provide a degree of screening.

In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

Liaison with the Public

A designated environmental liaison officer will be appointed to site during construction works. Any noise complaints will be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

Project Programme

The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation/ piling or other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

Operational Phase

Mechanical Plant Noise

As part of the detailed design of the development, plant items with appropriate noise ratings and, where necessary, appropriately selected remedial measures (e.g. enclosures, silencers etc.) will be specified in order that the adopted plant noise criteria is achieved at the façades of noise sensitive properties, including those within the development itself.

Chapter 13 has specified cumulative plant noise limits at the nearest noise sensitive properties that must be achieved in order to ensure the impact is acceptable. To achieve these noise limits consideration will be given, at the detailed design stage, to a variety of mitigation measures and forms of noise control techniques. Some examples of these measures are as follows:

- Reduced/quiet modes;
- Duct mounted attenuators on the atmosphere side of air moving plant;
- Splitter attenuators or acoustic louvres providing free ventilation to internal plant areas;
- Solid barriers screening any external plant; and
- Anti-vibration mounts on reciprocating plant.

In addition to the above, it is proposed that the following practices are adopted to minimise potential noise disturbance for neighbours.

- All mechanical plant items e.g. motors, pumps etc. shall be regularly maintained to ensure that excessive noise generated any worn or rattling components is minimised.
- Any new or replacement mechanical plant items, including plant located inside new or existing buildings, shall be designed so that all noise emissions from site do not exceed the noise limits outlined in Chapter 13.

Entertainment Noise

The amenity spaces that have entertainment noise associated will be designed at a later stage however to ensure no negative impact associated with these spaces, the following acoustic measures will be incorporated where necessary.

Measure	Description
Appropriate Linings	Proposed constructions (e.g. external walls) should be reviewed in order to determine whether additional measures are required in order to control noise emissions from the highlighted areas. These measures would typically consist of independent wall linings where appropriate.

Glazing	Where glazing is proposed in the design the installed elements should offer an appropriate sound insulation performance in order to minimise noise break out.
Doors	Access to noisy internal areas from external locations may require acoustic lobbies with double doors separated by an appropriate distance.
Ventilation	Ventilation should be supplied by suitably attenuated mechanical means. Once details of the proposed building services installation are known, consideration should be given to the potential for entertainment noise breakout to atmosphere via ductwork; the potential for services noise transfer to both external and internal areas.
Audio System	The audio systems should feature a distributed array of loudspeakers arranged such that the coverage zones are tightly controlled and all patrons are within the "near field" of one or more loudspeakers. This will limit the amount of sound energy incident upon the external walls and in turn help to control the amount of noise transfer and break-out.
Noise Level	Once the measures outlined above are implemented it would be recommended that a maximum permissible noise level be set for each venue (i.e. a noise level that should not be exceeded in order to ensure that noise emissions are kept to an acceptable level).

Inward Noise Impact – Acoustic Design Statement Part 2

Chapter 13 identified some facades that will be provided with glazing and ventilation that achieves minimum sound insultation performances (such as the north and east of Block A and east of Block F). Other facades in the development have no minimum requirement for sound insulation.

The assessment has demonstrated that the recommended internal noise criteria will be achieved through consideration of the proposed façade elements at the design stage. The calculated glazing and ventilation specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage. Consequently, these may be subject to change as the project progresses. There is no acoustic requirement relating to the creche façade. Appropriate internal noise levels are predicted to be achieved with standard double glazing and ventilators.

20.9.2 Monitoring

Construction Phase

The contractor will be required to ensure construction activities operate within the noise and vibration limits set out within this assessment. The contractor will be required to undertake regular noise and vibration monitoring at locations representative of the closest sensitive locations to ensure the relevant criteria are not exceeded.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

Vibration monitoring should be conducted in accordance with BS 6472:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting (human disturbance) and BS ISO 4866:2010 Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures (building damage).

Operational Phase

Noise or vibration monitoring is not required once the development is operational.

20.10 Material Assets - Waste Management

20.10.1 Avoidance, Remedial and Mitigation Measures

Construction Stage

A project specific Construction & Demolition Waste Management Plan (C&D WMP) has been prepared in line with the requirements of the requirements of the guidance document issued by the Department of Environment Heritage, Local Government (DoEHLG) and is included as Appendix 14.1. Adherence to the high-level strategy presented in this C&D WMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the demolition, excavation and construction phases of the proposed development. Prior to commencement, the contractor(s) will be required to refine/update the C&D WMP or submit an addendum to C&D WMP to DCC to detail specific measures to minimise waste generation and resource consumption and provide details of the proposed waste contractors and destinations of each waste stream.

A quantity of soil, stone and made ground which will need to be excavated to facilitate the proposed development. Project Engineers have estimated that between c. 64,000m^3 and c. 70,000m^3 of excavated material will need to be removed offsite, however it is envisaged that c. 10,000m^3 excavated material will be reused onsite. Correct classification and segregation of the excavated material 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.

In addition, the following mitigation measures will be implemented:

- Building materials will be chosen with an aim to 'design out waste';

- On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery – it is anticipated that the following waste types, at a minimum, will be segregated:

    - Concrete rubble (including ceramics, tiles and bricks);
    - Plasterboard;
    - Metals;
    - Glass; and
    - Timber.

- Left over materials (e.g. timber off-cuts, broken concrete blocks/bricks) and any suitable construction materials shall be re-used on-site, where possible;

- All waste materials will be stored in skips or other suitable receptacles in designated areas of the site;
- Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) willalso be segregated and will be stored in appropriate receptacles (in suitably bundedareas, where required);
- A waste manager will be appointed by the main contractor(s) to ensure effective management of waste during the excavation and construction works;
- All construction staff will be provided with training regarding the waste management procedures;
- All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal;
- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licenced facilities; and
- All waste leaving the site will be recorded and copies of relevant documentation maintained.

Nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, if required. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with Article 27 of the EC (Waste Directive) Regulations (2011). EPA approval will be obtained prior to moving material as a by-product.

These mitigation measures will ensure that the waste arising from the construction phase of the development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations and the Litter Pollution Act 1997, the EMR Waste Management Plan (2015-2021). It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will encourage sustainable consumption of resources.

Operational Stage

A project specific Operational Waste Management Plan (OWMP) has been prepared and is included as Appendix 14.2. Implementation of this OWMP will ensure a high level of recycling, reuse and recovery at the development. All recyclable materials will be segregated at source to reduce waste contractor costs and ensure maximum diversion of materials from landfill, thus achieving the targets set out in the EMR Waste Management Plan 2015 – 2021 and abiding by the DCC waste bye-laws.

In addition, the following mitigation measures will be implemented:

- On-site segregation of all waste materials into appropriate categories including (but not limited to):
    - Organic waste;
    - Dry Mixed Recyclables;
    - Mixed Non-Recyclable Waste;
    - Glass;
    - Waste electrical and electronic equipment (WEEE);
    - Batteries (non-hazardous and hazardous);
    - Cooking oil;
    - Light bulbs;
    - Cleaning chemicals (pesticides, paints, adhesives, resins, detergents, etc.);
    - Furniture (and from time to time other bulky waste); and
    - Abandoned bicycles.

- All waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly identified with the approved waste type to ensure there is no cross contamination of waste materials;

- All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are currently not available; and

- All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities.

These mitigation measures will ensure the waste arising from the development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations, the Litter Pollution Act 1997, the EMR Waste Management Plan (2015 - 2021) and the DCC waste bye-laws. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.

20.10.2 Monitoring

Construction Stage

The management of waste during the construction phase should be monitored to ensure compliance with relevant local authority requirements, and effective implementation of the Construction and Demolition Waste Management Plan including maintenance of waste documentation.

Operation Stage

The management of waste during the operational phase should be monitored to ensure effective implementation of the Operational Waste Management Plan by the building management company and the nominated waste contractor(s).

20.11 Material Assets - Transportation

20.11.1 Mitigation Measures

Construction Stage

An Outline Construction and Environmental Management Plan (CEMP) has been prepared as part of the planning application with an associated Preliminary Construction Management Plan (PCMP). The PCMP includes an Outline Traffic Management Plan as well as incorporating a range of integrated control measures and associated management activities with the objective of minimising the potential impacts of construction activities associated with the development. The following initiatives will be implemented to avoid, minimise and/or mitigate against the anticipated construction period impacts:

- During the pre-construction phase, the site will be securely fenced off/hoarded off from adjacent properties, public footpaths and roads;

- Appropriate on-site parking (temporary parking for the duration of construction works) and compound area will be provided to prevent overflow onto the local network;

- A large proportion of construction workers are anticipated to arrive in shared transport. It is likely that some numbers of the construction team will be brought to/from the site in vans/minibuses, which will serve to reduce the trip generation potential;

- Delivery vehicles to and from the site will be spread across the course of the working day, therefore, the number of HGVs travelling during the peak hours will be relatively low;

- Truck wheel washes will be installed at construction entrances;

- Any specific recommendations with regard to construction traffic management made by Dublin City Council will be adhered to;

- Potential localised traffic disruptions during the construction phase will be mitigated through the implementation of industry standard traffic management measures such as the use of traffic signage. These traffic management measures shall be designed and implemented in accordance with the Department of Transport's Traffic Signs Manual "*Chapter 8 Temporary Traffic Measures and Signs for Roadworks"* and "*Guidance for the Control and Management of Traffic at Roads Works – 2nd Edition*" (2010);

- Site entrance point/s from the public road will be constructed with a bound, durable surface capable of withstanding heavy loads and with a sealed joint between the access and public highway. This durable bound surface will be constructed for a distance of 10m from the public road;

- Material storage zones will be established in the compound area and will include material recycling areas and facilities;

- 'Way finding' signage will be provided to route staff / deliveries into the site and to designated compound / construction areas;
- Dedicated construction haul routes will be identified and agreed with Dublin City Council prior to commencement of activities on-site; and
- On completion of the works, all construction materials, debris, temporary hardstands etc. from the site compound will be removed off-site and the site compound area reinstated in full on completion of the works.

Operation Stage

A package of integrated mitigation measures has been identified to off-set the additional local demand that the proposed residential development at the subject site could potentially generate as a result of the forecast increase in vehicle movements by residents of the scheme. The identified measures and associated timescale for their implementation are summarised below.

- Implementation of Parking Management Strategy - A management regime has been set out (and accompanies this planning application) which will be implemented by the development's management company to control access to the on-site car parking spaces thereby actively managing the availability of on-site car parking for residents and visitors to the development. This provision equates to a car parking ratio of approximately 0.50 car parking spaces per residential unit. The signing of a rental agreement or purchase of one of the proposed residential apartments will not include access to a designated on-site parking space. All potential residents (prior to signing rental agreement) will be notified that the proposed scheme is a 'low car allocation' development with no access (or guarantee thereof) to the limited on-site residents car parking provision. Nevertheless, all residents of the proposed residential apartment scheme will have the opportunity to apply to the on-site management company for a resident's car parking permit (updated weekly, fortnightly, monthly, quarterly or annually) and subsequently access to a dedicated (assigned) on-site basement car parking space. A charge will be applied to obtain a permit with the objective of covering the associated management costs and discouraging long term usage of the car parking space.
- Implementation of the Mobility Management Plan. A preliminary Mobility Management (MMP) has been compiled (Appendix 15.2) with the aim of guiding the delivery and management of co-ordinated initiatives by the scheme promotor to be implemented upon occupation of the site. The MMP will ultimately seek to encourage sustainable travel practices for all journeys to and from the proposed development.
- Infrastructure measures identified to reduce reliance of private vehicles include the provision of ample secure cycle parking on site, meeting the minimum guidance (*Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities, 2020, DHPLG*), and ensuring a design which promotes permeability for pedestrians and cyclists to, through and from the development. The lower level of car parking provision for the development will also act as a powerful

mobility management measure, ensuring against an overprovision of parking and a resultant over reliance on the private vehicle.

- Junction enhancements have been identified and proposed at the R117 Sandford Road site access junction, including an upgrade to the existing controlled pedestrian crossing to a toucan crossing, with the objective of creating a highly permeable environment for pedestrians and cyclists and the tightening of corner radii on the Belmont Avenue arm, with dropped kerbs and tactile paving providing a safer informal crossing than the existing scenario. A signalised toucan crossing is also proposed at the R117 Milltown Road, adjacent to the site access location, facilitating safe connections for pedestrians and cyclists.

- The provision of 10 No. dedicated car share (GoCar and development-owned) spaces at surface and basement level for the use of the scheme's residents and staff. The availability of these on-site provide a viable alternative to residents needing to own a private vehicle whilst still having access to a car as and when required.

20.11.2 Monitoring

Construction Phase

During the construction stage, the following monitoring exercises are proposed:

- Compliance with construction vehicle routing practices;
- Compliance with construction vehicle parking practices;
- Internal and external road conditions; and
- Timing of construction activities.

Operation Phase

As part of the Mobility Management Plan (MMP) process, bi-annual post occupancy surveys are to be carried out in order to determine the success of the measures and initiatives as set out in the proposed MMP document. The information obtained from the monitoring surveys will be used to identify ways in which the MMP measures and initiatives should be taken forward in order to maintain and further encourage sustainable travel characteristics.

20.12 Material Assets – Site Services

20.12.1 Ameliorative, Remedial or Reductive Measures

Construction Phase

- Contractor to prepare Method Statement detailing proposals for works in the vicinity of existing utilities including detail of process to minimise potential for interruption to power, gas and telecoms infrastructure. Contractor's method statement to be agreed with PSDP (Project Supervisor for the Design Process).

- Contractor to locate and record all services on site prior to commencement of excavations.

- A GPR utility survey has been carried out along Sandford Road, Milltown Road and Eglinton Road to confirm the location of power, gas and telecommunications infrastructure. This survey is to be supplemented with slit trench investigation as required by the contractor in advance of commencing works along Sandford Road, Milltown Road and Eglington Road.

- Contractor to obtain utility company network plans and arrange observation as required.

- Connections to the existing power, gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.

- Contractor to comply with HSA Code of Practice for Avoiding Danger from Underground Services (refer to Appendix 16.3).

- Contractor to prepare and implement a Construction Traffic Management Plan that will be agreed with the Design Team and Local Authority and which will ensure the safety of the public during construction (note, an outline Traffic Management Plan is included in the Preliminary Construction Management Plan).

- All personnel using machinery/plant to have undergone training on the use of said machinery/plant. Ongoing site supervision to be undertaken to ensure all use of machinery/plant is in accordance with the training undertaken.

Operational Phase

On completion of the construction phase there will be no further impact on electrical, gas or telecommunications supplies. No mitigation measures are proposed in relation to the site services described in this chapter.

20.12.2 Monitoring

No specific monitoring is proposed in relation to electrical, gas and telecommunications infrastructure.

20.13 Microclimate – Wind

20.13.1 Mitigation Measures

Construction Phase

The assessment of the wind microclimate during the construction phase has been based on professional judgement by reviewing the existing site conditions and the expected conditions once the development is in place via the Computational Fluid Dynamics (CFD) modelling.

It is expected the wind microclimate will gradually adjust from the existing conditions to the final modelled scenario as construction progress develops. However, the mitigation measures outlined in the following sections will need to be implemented before completion to ensure comfortable conditions once the proposed development becomes operational.

Operational Phase

Chapter 18 outlines specific mitigation measures that have been incorporated into the proposed design to prevent excessive wind speeds during the operational phase of the development. The proposed development has been designed to have acceptable pedestrian wind comfort conditions during the operational phase.

The trees and planting associated with the landscape design will continue to grow and develop after the proposed mitigation measures have been implemented, thus providing increased protection from the wind resulting in increased pedestrian comfort conditions in these areas which will be a positive impact.

The following specific mitigation measures have been incorporated for the operational phase of the development:

Apartment Block Arrangement

The arrangement of the apartment blocks has been carefully chosen to help mitigate increased wind speeds throughout the site. The central areas within the development are well protected from the predominant south-west wind direction via the buildings located to the south-west. Furthermore, an internal courtyard space has been incorporated within Block B and C which provides a sheltered area for pedestrians to utilise throughout the year.

Rooftop Amenity Canopy

A canopy has been integrated into the design of the building above the rooftop amenity space in Block A1. The canopy protects the amenity space from building downwash, deflecting the wind away and creating a comfortable environment for the occupants using the amenity space.

Inset Balconies

The Block A1 tower which is most exposed to the wind due to its height, predominantly incorporates inset balconies. Inset balconies offer increased wind protection for people utilising the balcony spaces as they provide a natural shelter from the elements.

Solid Balustrades

All private balconies on the tower element of Block A1 (floors 5 to 9) and the shared rooftop amenity areas will incorporate solid glazed balustrades. Full length solid balustrades block wind directly entering the balcony space, dissipating the wind speed within the balcony area which creates a much more comfortable experience for occupants.

Landscaping

The landscaping has been strategically designed to mitigate increased wind speeds and to provide shelter for pedestrians at ground level, within the central courtyard spaces and on the rooftop amenity areas. The landscaping design incorporates trees, hedges and raised planters and sheltered seating pockets which all act as wind mitigation measures.

Trees are to be planted close to primary entrance ways and along the streetscape, mitigating excessive wind speeds and providing shelter for pedestrians at street level. The use of trees and low-level shrubs all assist in the localised reduction of wind speed.

Chapter 18 sets out that the modelling has included the proposed design, the proposed landscaping strategy and the existing landscape which will remain, in conjunction with the existing buildings surrounding the development. The combination of all interactions has resulted in a comfortable environment for pedestrians within the proposed development.

20.13.2 Monitoring

Construction Phase

During the construction phase the wind conditions will gradually change from the conditions experienced in the existing environment to the conditions experienced during the operational phase. As wind comfort conditions are comfortable at both phases and no issues have been identified, no monitoring is required.

Operational Phase

The proposed development has been designed to have acceptable pedestrian wind comfort conditions during the operational phase, therefore no monitoring is required.

20.15 Risk Management

20.15.1 Mitigation Measures

Chapter 18 of this EIAR sets out that control measures observed for health and safety and environmental management as per relevant code of practices (Code of Practice for Inspecting and Certifying Buildings and Works) and relevant legislation including Building Control Act 1990 (No. 3 of 1990), as amended and Building Control Regulations 1997, as amended. The residual impacts will be negligible once all control, mitigation and monitoring measures have been implemented. The design has considered the potential for flooding, road accidents or fire within the design methodology. The vulnerability of the proposed development to major accidents and/or disasters is not considered significant.

20.15.2 Monitoring

There is no monitoring required with regards to risk management. All monitoring proposals for the interacting chapters have been detailed in the relevant technical chapters and are included in Chapter 20 Mitigation Measures and Monitoring.

20.16 Cumulative Impacts

Any potential cumulative impacts have been considered in the preparation of this EIAR and are detailed where relevant in the various EIAR Chapters e.g. construction stage impacts, surface water drainage infrastructure, foul drainage, water supply, landscape and visual impact and traffic for example. Therefore, it is clear that the potential for any cumulative impacts to occur have been comprehensively considered in the preparation of this EIAR, as detailed throughout the various chapters. A full list of proposed and pending applications was considered by the EIAR Team as set out in Chapter 3.0 (Section 3.5) and where relevant were included in the cumulative impacts assessment of the relevant chapter. As a result, it is not proposed to include any specific measures for monitoring or mitigation to be undertaken in relation to cumulative impacts.

21.0 DIFFICULTIES ENCOUNTERED

There have been no significant difficulties encountered during the preparation and compilation of the majority of this Environmental Impact Assessment Report.

Chapter 5 'Population and Human Health' prepared by Thornton O'Connor Town Planning notes the following difficulty:

> *'There were no significant difficulties encountered in the preparation of this chapter. However, we note some references to 2019 or early 2020 data were utilised in the chapter as the Covid-19 pandemic has had an impact on the economy and employment figures. However, we consider it important to assess the positive trends that were emerging before the pandemic impacted the country'.*

Chapter 7 'Architectural Heritage' prepared by Molloy and Associates Conservation Architects notes the following difficulty:

> *'Due to restrictions since March 2020 due to Covid-19, research of the site in public archives has not been possible. Access however has been provided to extensive, privately held archives in the Jesuit Community. The limitations presented for / prohibiting of research in public archives, whilst atypical for architectural heritage assessment in normal times, are not on balance of all findings, site and archival, believed to alternatively influence the final architectural heritage opinion on significance of structures within the grouping'.*

Chapter 14 'Material Assets-Waste Management' prepared by AWN Consulting notes the following difficulty:

> *'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.*
>
> *There is a number of licensed, permitted and registered waste facilities in the Fingal region and in the surrounding counties. However, these sites may not be available for use when required or may be limited by the waste contractor selected to service the development in the appropriate phase. In addition, there is potential for more suitably placed waste facilities or recovery facilities to become operational in the future which may be more beneficial from an environmental perspective.*
>
> *The ultimate selection of waste contractors and waste facilities would be subject to appropriate selection criteria proximity, competency, capacity, serviceability, and cost.'*

Appendix 5.1 'Review of BRE Sunlight & Daylight Assessment' prepared by 3D Design Bureau notes the following difficulty:

> *'It was neither possible nor practical for the Design Team to gain unfettered access to every parcel of private property within the study area surrounding the application site in order to carry out measured building survey. Therefore, while 3DDB has confidence that the three dimensional model used in the assessment of the impact of the proposed*

development on sunlight & daylight access achieves a high degree of accuracy, it should be noted that some level of assumption was necessary in completing the model'.

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