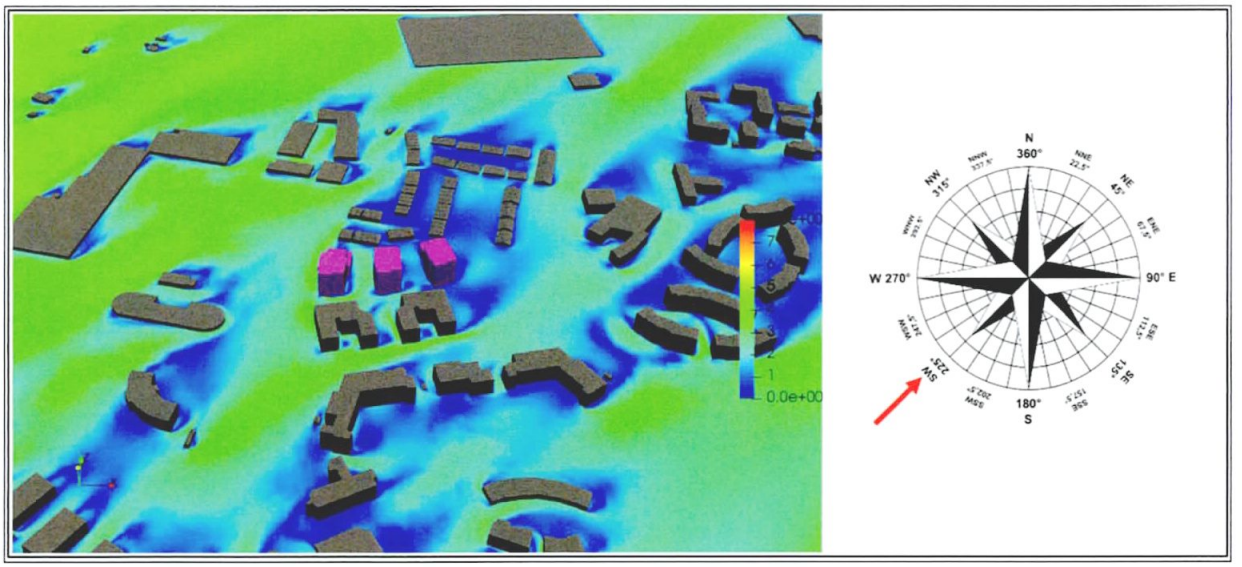

Figure 11-51 Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 225°

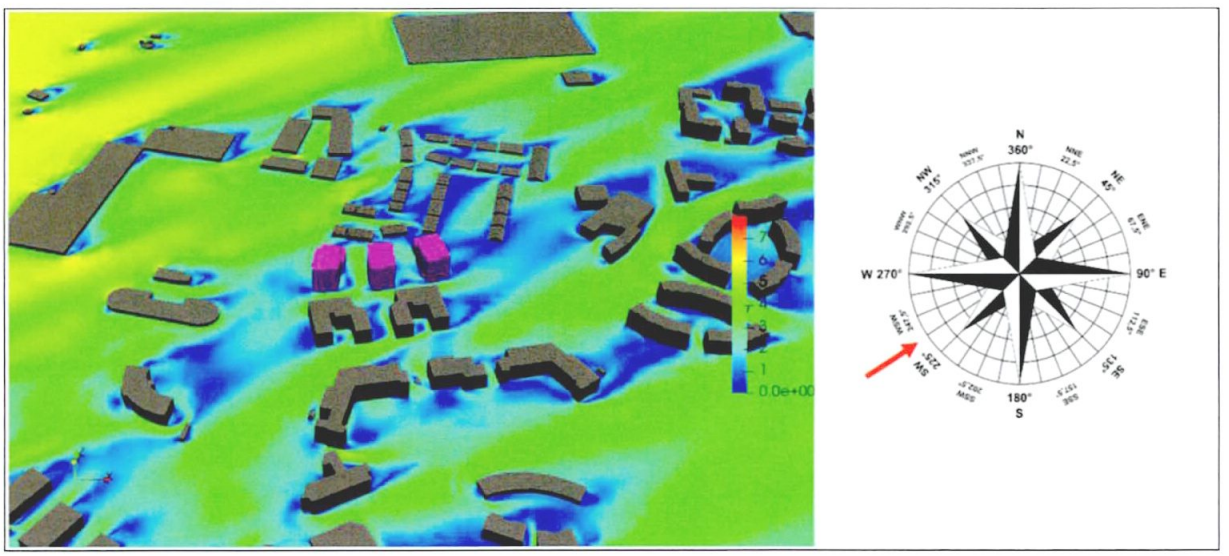

Figure 11-52 Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 236°

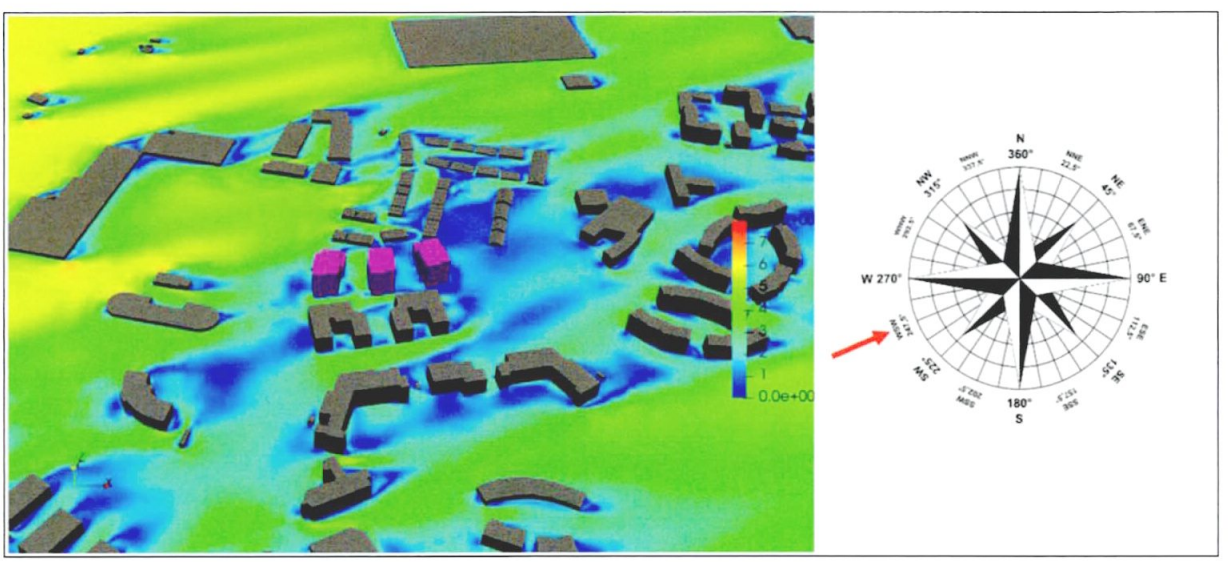

Figure 11-53: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 247°

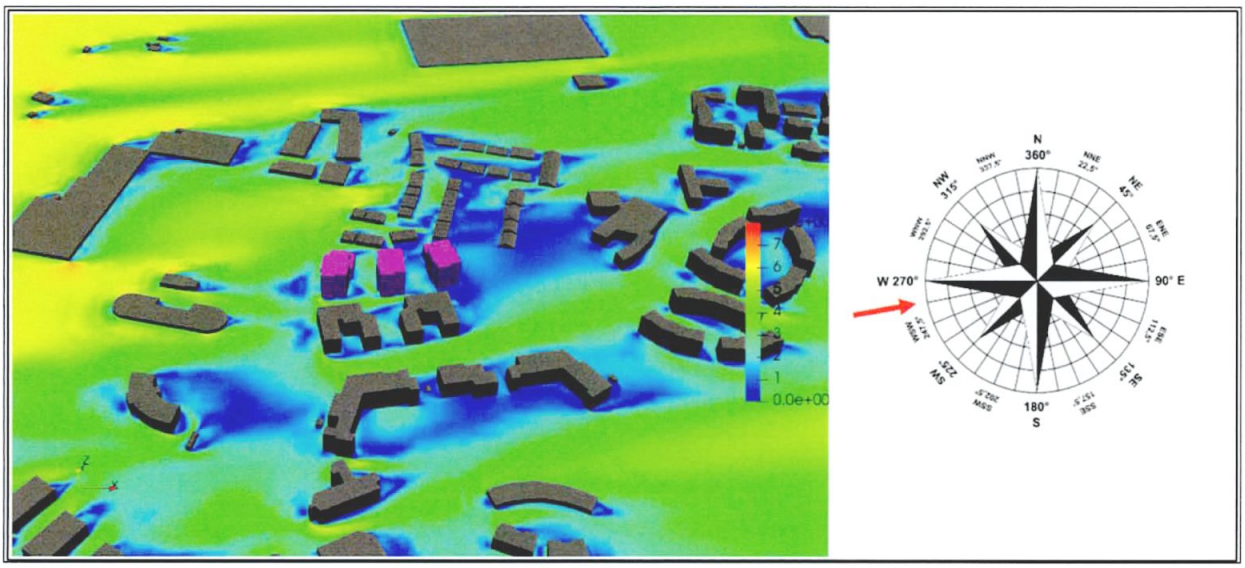

Figure 11-54: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 258°

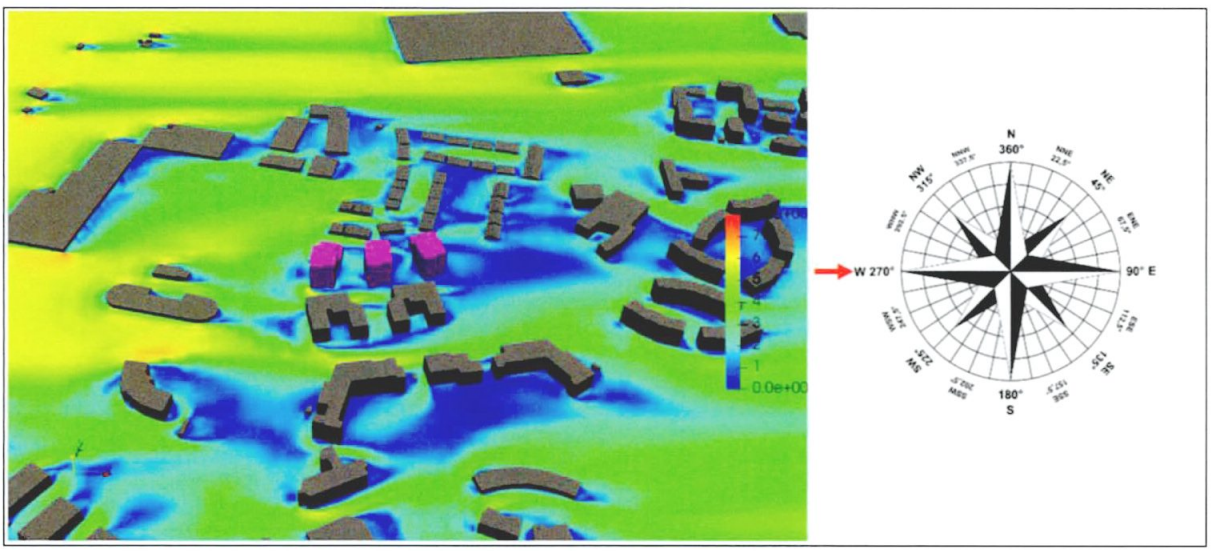

Figure 11-55: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 270°

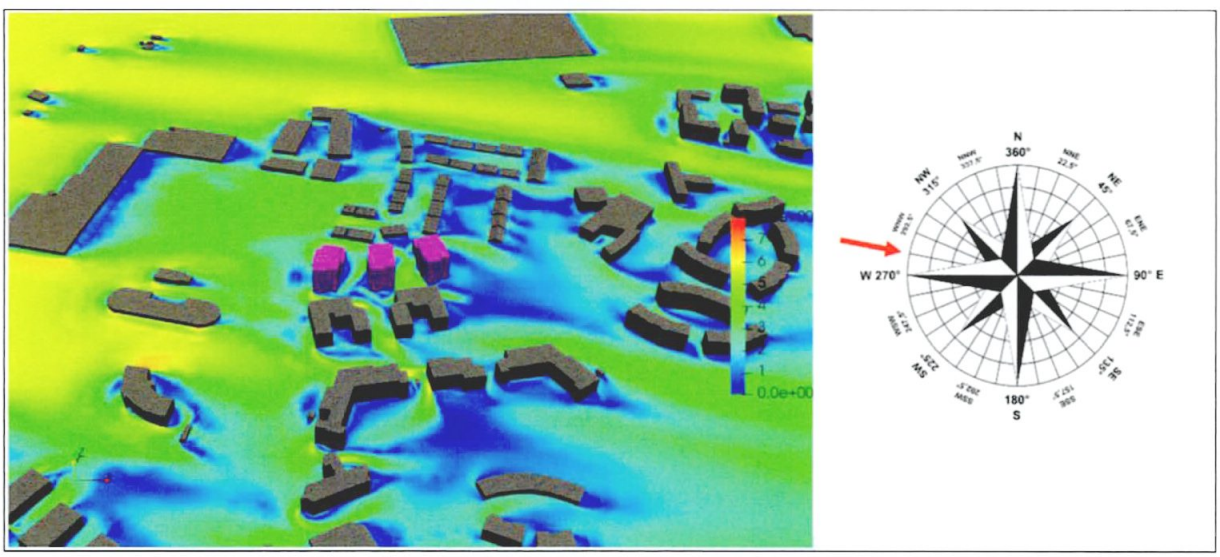

Figure 11-56: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 281°

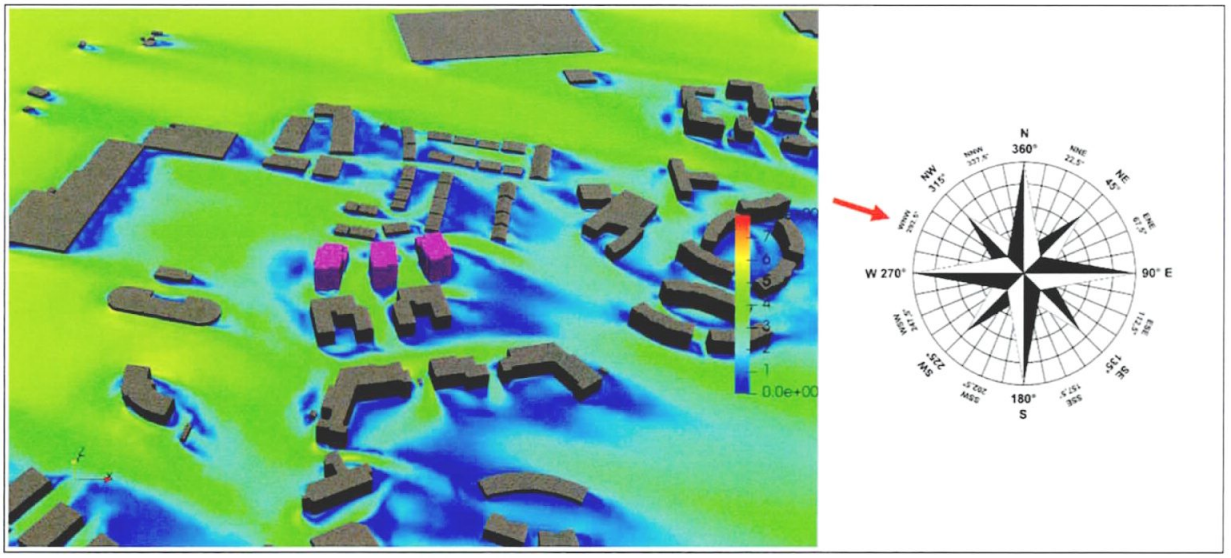

Figure 11-57 Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 292°

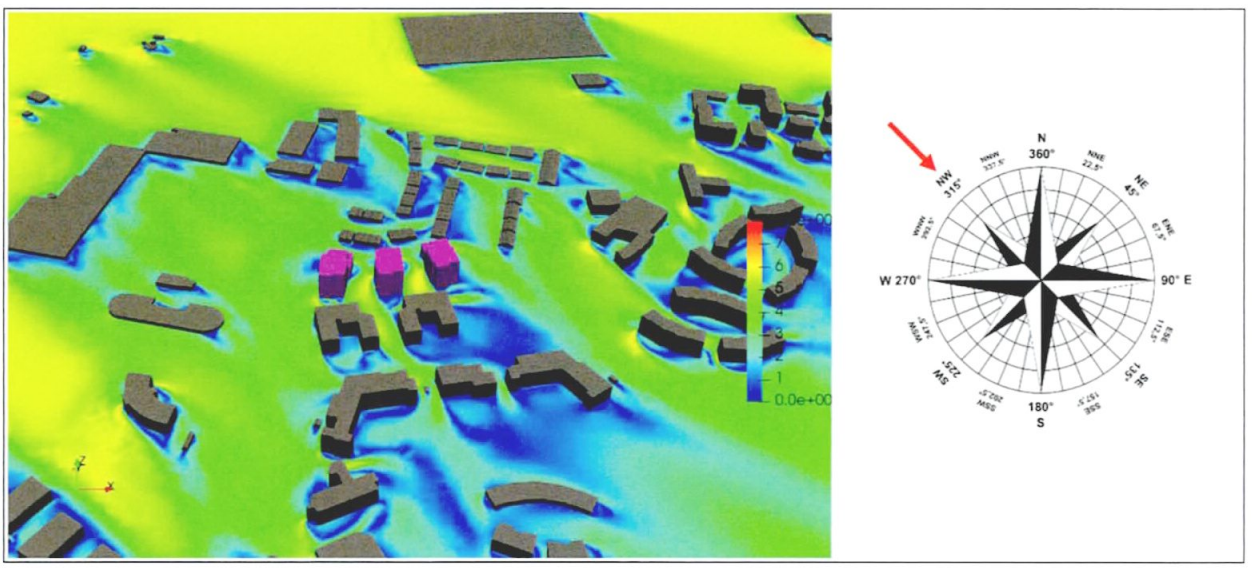

Figure 11-58: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 315°

11.4.5 Impact on Pedestrian Comfort and Distress

The wind flow results obtained simulating the different directions and wind speeds are combined with wind frequencies of occurrence to obtain comfort ratings at pedestrian level in all areas included within the model. The comparison of comfort ratings with intended pedestrian activities is shown in the Lawson Comfort and Distress Map that follows and the impact of the proposed development is classified on the potential receptors in line with the significance criteria cited in **Section 11.2.2** and detailed in the summary tables provided at the end of this section. The comfort/distress conditions are presented using a colour-coded diagram below formulated following the Lawson Criteria.

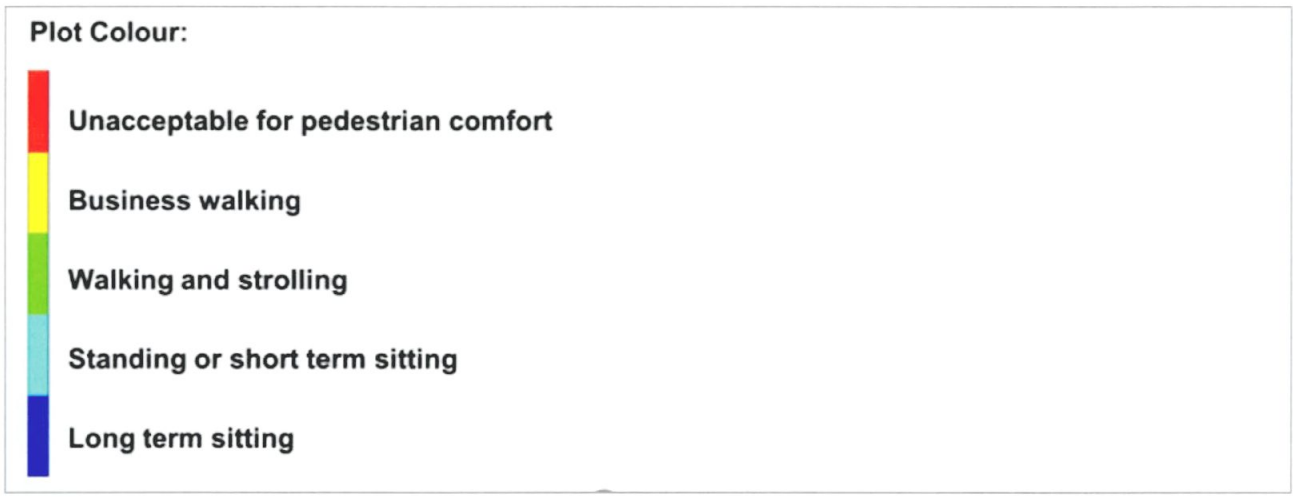

Figure 11-59: Lawson Comfort categories plot

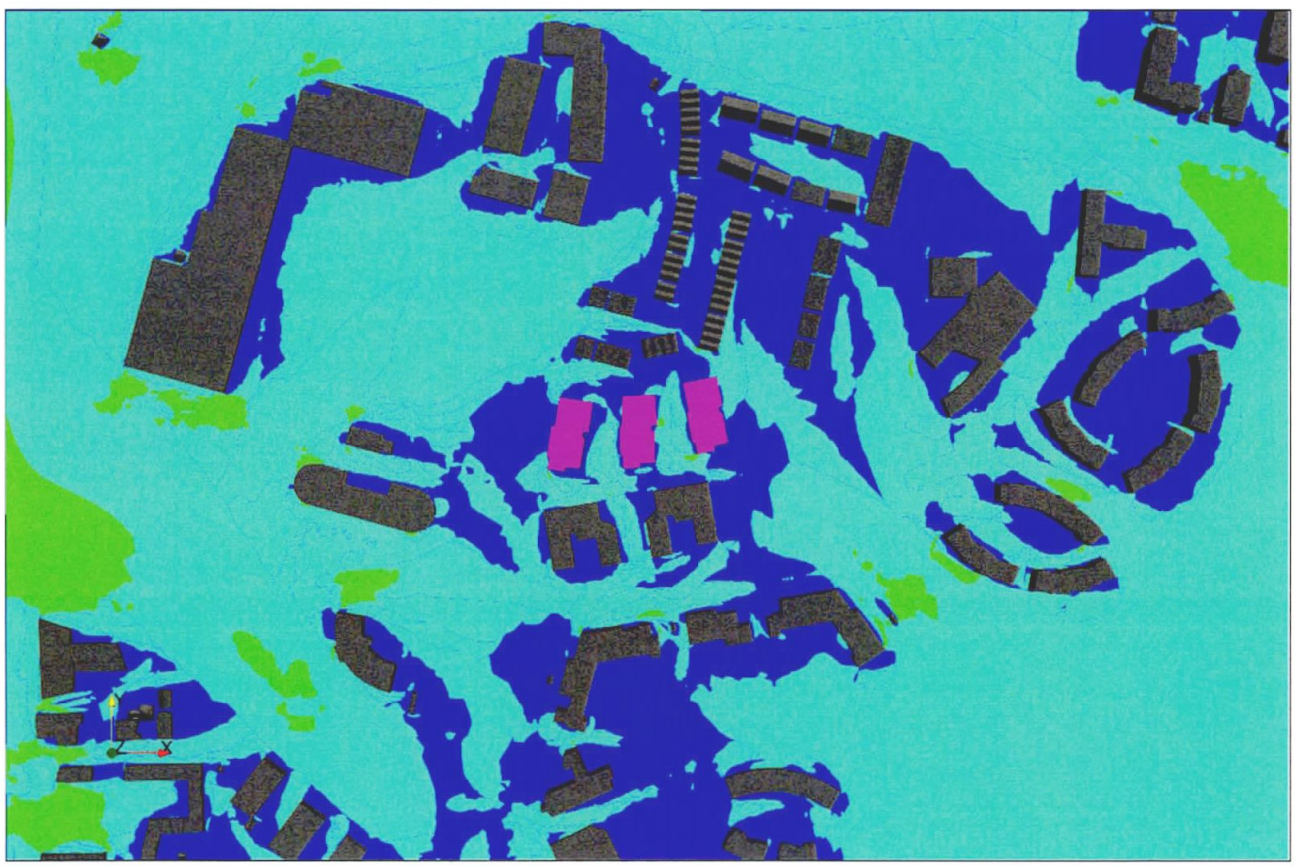

Figure 11-60: Lawson Map of Comfort and Distress- Proposed Development Scenario

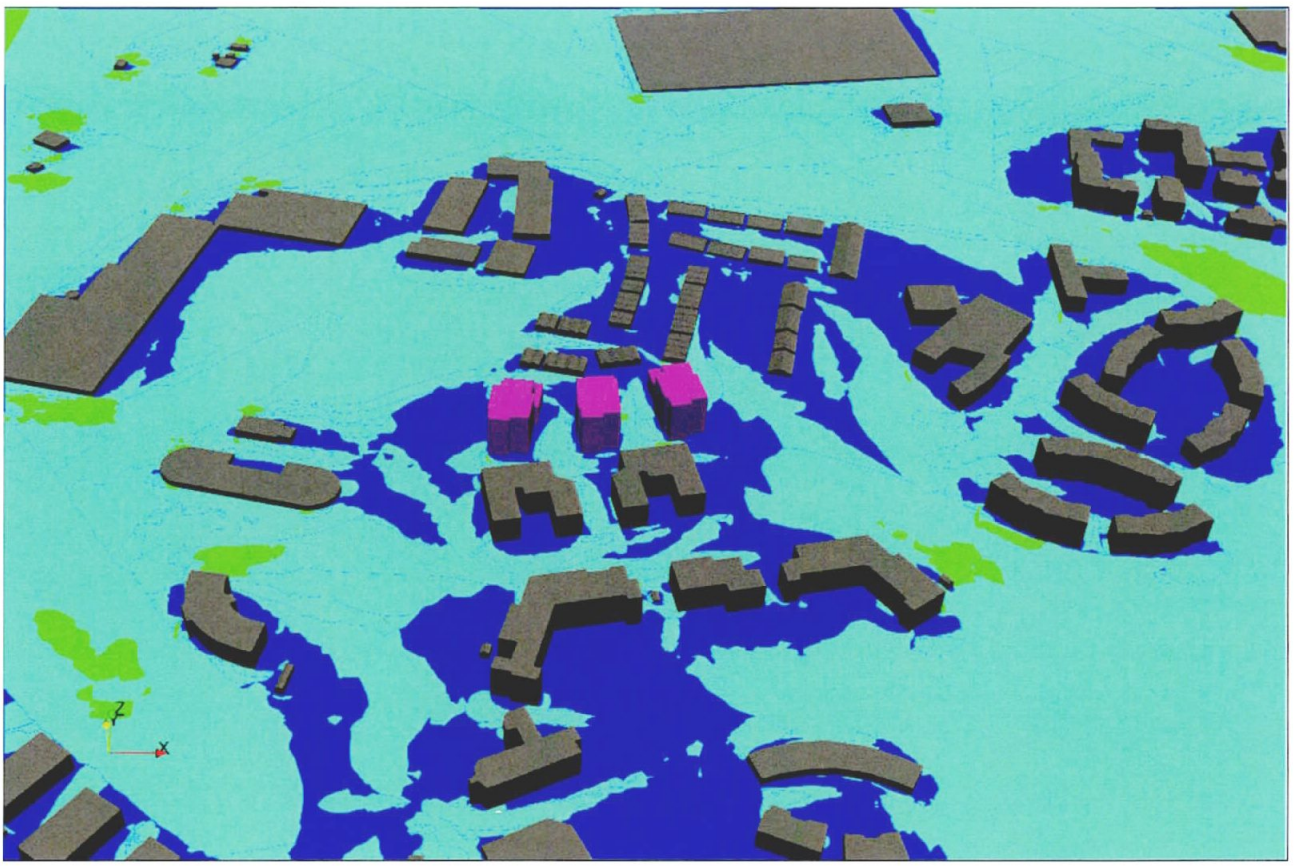

Figure 11-61: Lawson Map of Comfort and Distress- Proposed Development Scenario (3D view)

In summary, the following conclusions can be made by observing the results of the wind microclimate analysis and comparing the results obtained, under the same wind conditions for the baseline scenario versus the proposed development scenario:

- The assessment of the proposed scenario has shown that no area is unsafe, and no conditions of distress are created by the proposed development.
- All the roads proposed can be used for their intended scope (walking).
- The wind microclimate of the proposed development is comfortable and usable for pedestrians.

As a result of the proposed development construction, the wind in the surrounding urban context is also mitigated when compared with the baseline situation, in this sense the proposed development has a beneficial effect on the surrounding wind microclimate and can create comfortable pedestrian areas and public spaces. A summary of the impact of the proposed development following the significance criteria of **Section 11.2.3** is detailed in ***Table 11.11.6*** *Identification of Impact of proposed development on On-site and Off-site receptors (Proposed development* Scenario)..

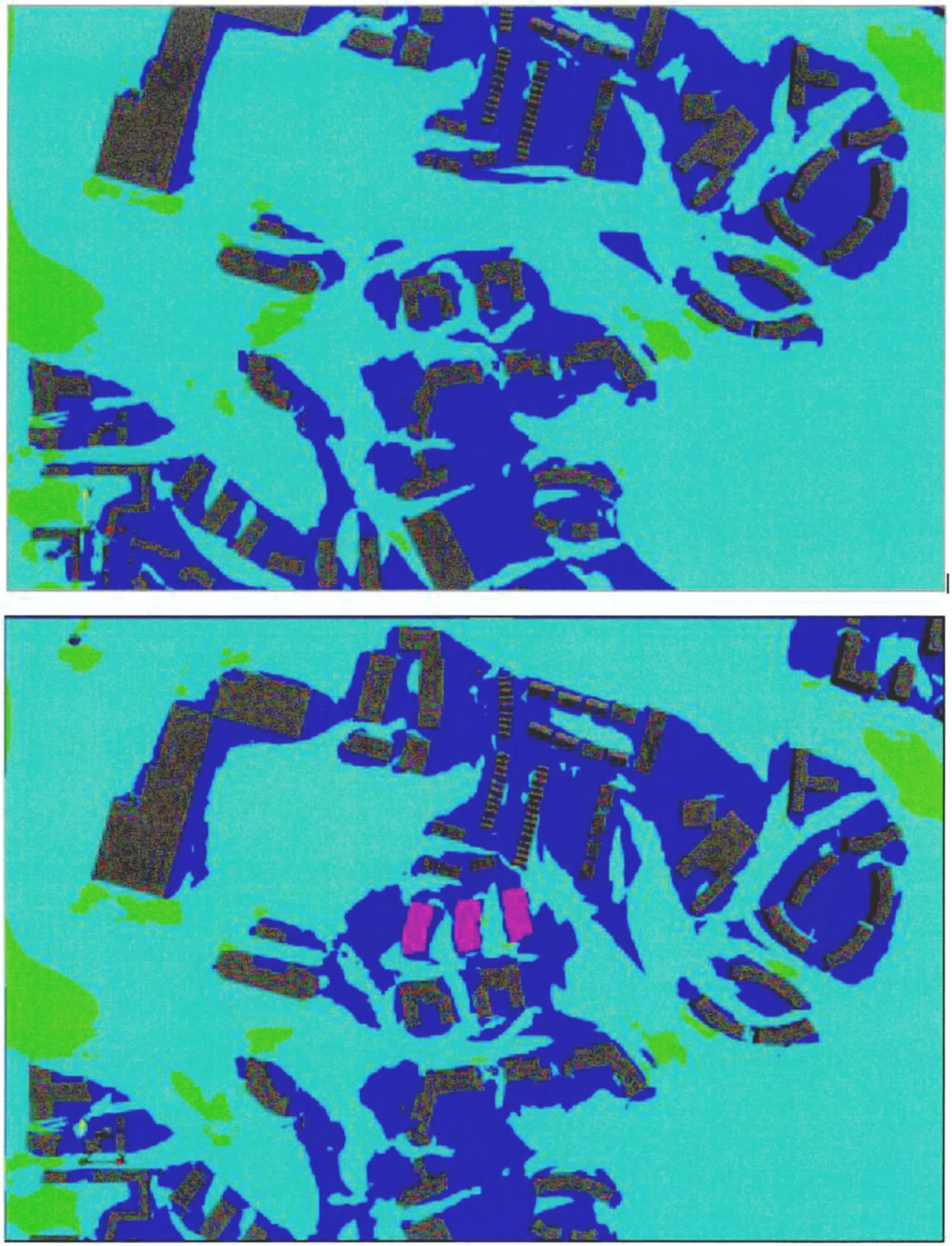

Figure 11-62: Comparison of Lawson Maps Baseline (top) versus Proposed Scenario(bottom)

Table 11.11.6 Identification of Impact of proposed development on On-site and Off-site receptors (Proposed development Scenario).

Potential Receptors *(on-site)*	Baseline Conditions	Proposed Development Conditions	Impact Significance

Roads	Conditions are "suitable" for the intended pedestrian use.	Conditions are calmer than required for the intended pedestrian use (by at least one comfort category). Between Block 1, Block 2 and Block 3, conditions are "suitable" for the intended pedestrian use.	*Beneficial/* *Negligible*
Entrances	Not applicable	Conditions are "suitable" for the intended pedestrian use.	*Negligible*
Pedestrian circulation areas	On the location designated for this use conditions are "suitable" for the intended pedestrian use.	Conditions are calmer than required for the intended pedestrian use (by at least one comfort category).	*Beneficial*
Potential Receptors *(off-site)*	**Baseline Conditions**	**Proposed Development Conditions**	**Impact**
Off-Site **Area-North**	Conditions are calmer than required for the intended pedestrian use (by at least one comfort category).	Conditions on the North area became windier for one comfort category passing from long-term sitting to short-term sitting, however the conditions still remain suitable and calmer than required for the intended pedestrian use (walking).	*Negligible*
Off-Site **Area-South**	Conditions are calmer than required for the intended pedestrian use (by at least one comfort category).	Conditions remain the same as in the baseline scenario.	*Negligible*
Off-Site **Area-East**	Conditions are calmer than required for the intended pedestrian use (by at least one comfort category).	Conditions remain the same as in the baseline scenario.	*Negligible*
Off-Site **Area-West**	Conditions are calmer than required for the intended pedestrian use (by at least one comfort category).	Conditions remain the same as in the baseline scenario.	*Negligible*

11.5 Mitigation Measures

11.5.1 Construction Phase

As construction of the proposed development progresses the wind conditions at the Site would gradually adjust to those of the completed development, and mitigation measures would need to be implemented before completion and operation.

11.5.2 Operational Phase

The simulation performed have included the impact of landscaping within the simulation. Landscaping indeed has a beneficial effect in mitigating the wind on a urban area. Within the CFD model the landscape is simulated as comprising effects of porous zones. This is an essential tool for accurately assessing the actual wind speed and pattern at a pedestrian level when landscape is available. No further mitigation measures are required for the wind comfort of the designed development.

11.6 Cumulative Impact

This section assesses the impact of the proposed development on the existing environment and also considers projects that have been:

a. granted planning permission but that are not built yet and,

b. projects that have been submitted for consent but not yet consented.

Following the guideline cited in **Section 11.1.1,** the wind microclimate study should consider the effect of the proposed development together with buildings (existing and/or permitted) that are within 400m from the center of the site. Other taller buildings outside of this zone that could have an influence on wind conditions within the project site should be included for wind directions where they are upwind of the project site.

The potential and permitted schemes within the vicinity of the proposed developments are listed below. None of these schemes is located upwind or has a height noteworthy taller than the project site, therefore the only criteria to select the relevance of these schemes for the wind microclimate is based on their distance from the center of the proposed site.

- Ref. F18A/0438
- Ref. F18A/0421
- Ref. F18A/0343
- Ref. FW19A/0151
- Ref. F19A/0401
- Ref. F19A/0419
- Ref. ABP-306075-19 – Blackwood Square is currently under construction, this development will be at a similar height to the proposed one, and it is expected to have a beneficial cumulative impact as it shields the proposed development from the westerly winds.
- Ref. ABP 313317 - Whitehaven SHD it is a recent application for the construction of five blocks of similar height to the Swift Square development which can partially shield the proposed development from the southeast winds and therefore the impact it is expected to be beneficial.

An analysis including the permitted or proposed schemes above which are within the relevant area (400m from the center of the development) has been performed and results are reported in the following paragraphs.

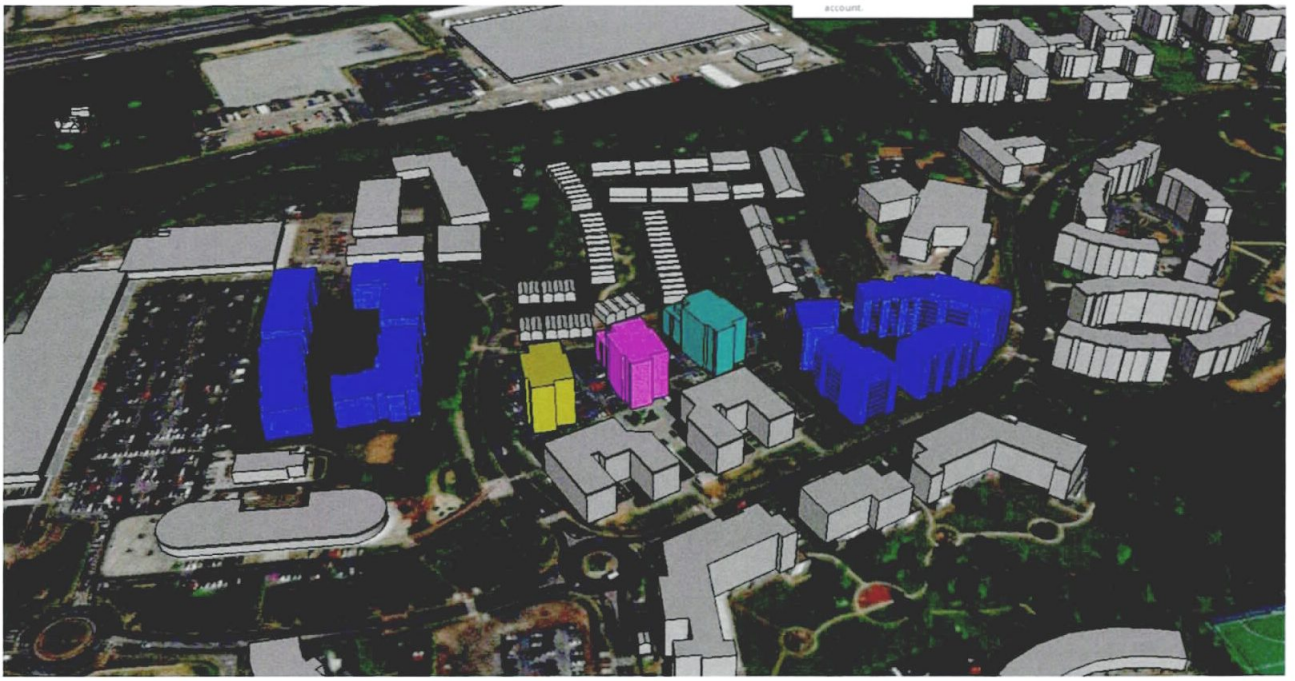

Figure 11-63: 3D Model of Cumulative Scenario with inclusion of the future constructions 'Blackwood Square' and 'Whitehaven SHD'

11.6.1 Wind Microclimate at Pedestrian Level

The wind simulations have been run again including, within the previous model, the cumulative scenario, and the same set of results and comfort maps are generated. The results of the simulations carried out are detailed in the following sections. These results present parameters as outlined in the acceptance criteria section described previously for the proposed development.

From a wind and microclimate perspective, no significant cumulative impact is expected from the proposed development on the existing, permitted, or future proposed projects within the region of interest for the wind microclimate assessment.

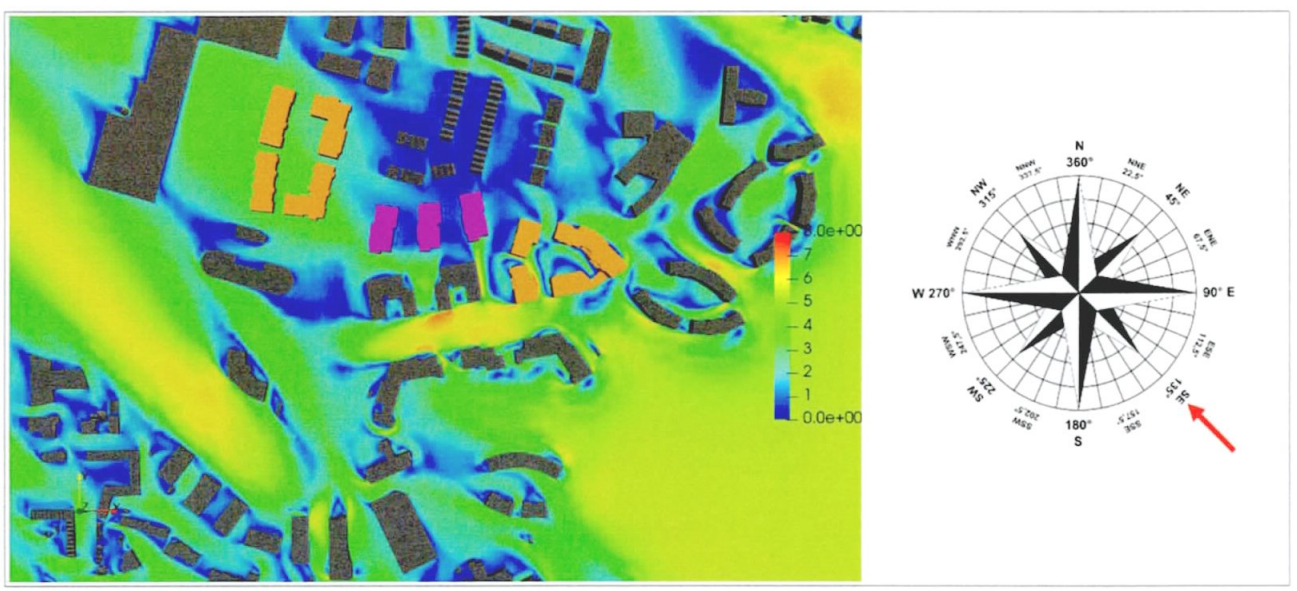

Figure 11-64: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 135°

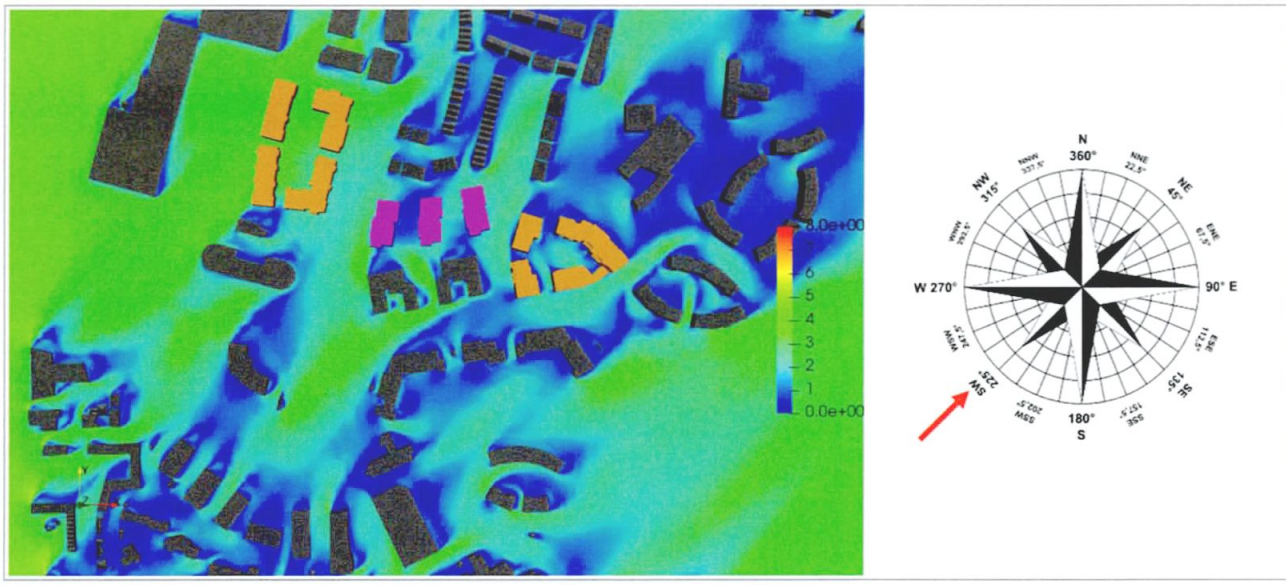

Figure 11-65: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 225°

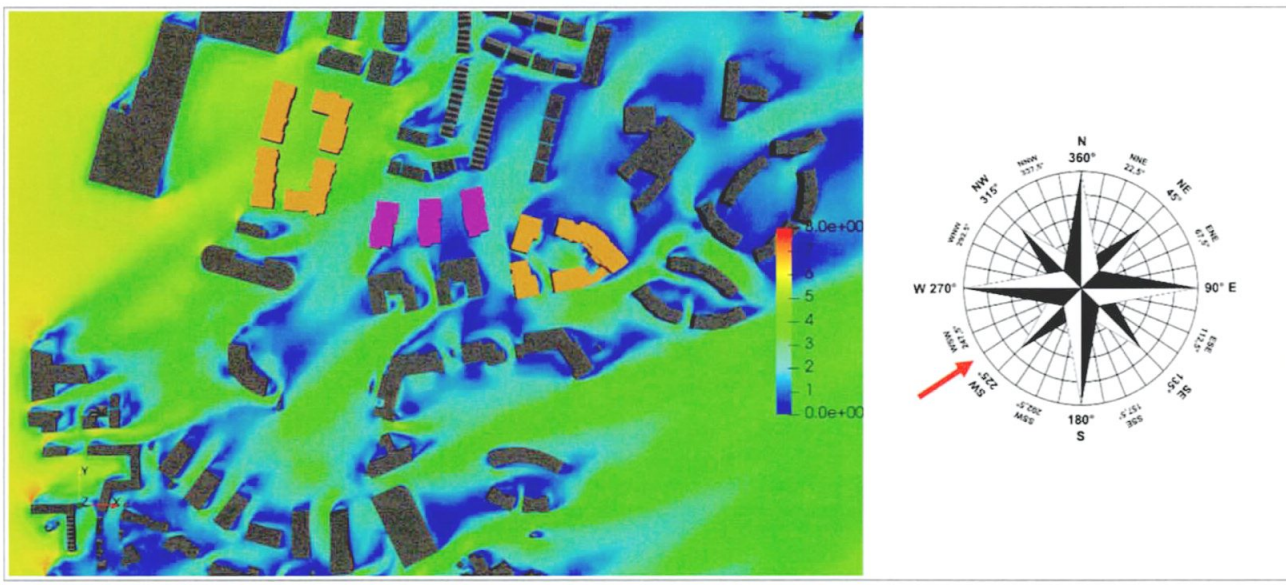

Figure 11-66: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 236°

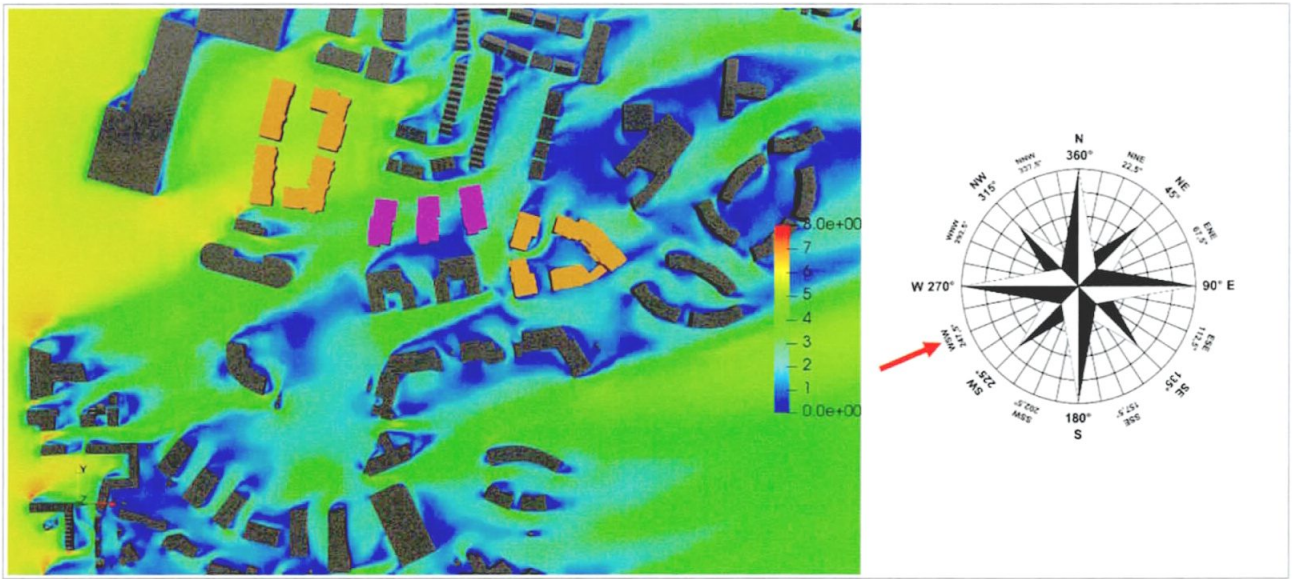

Figure 11-67: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 247°

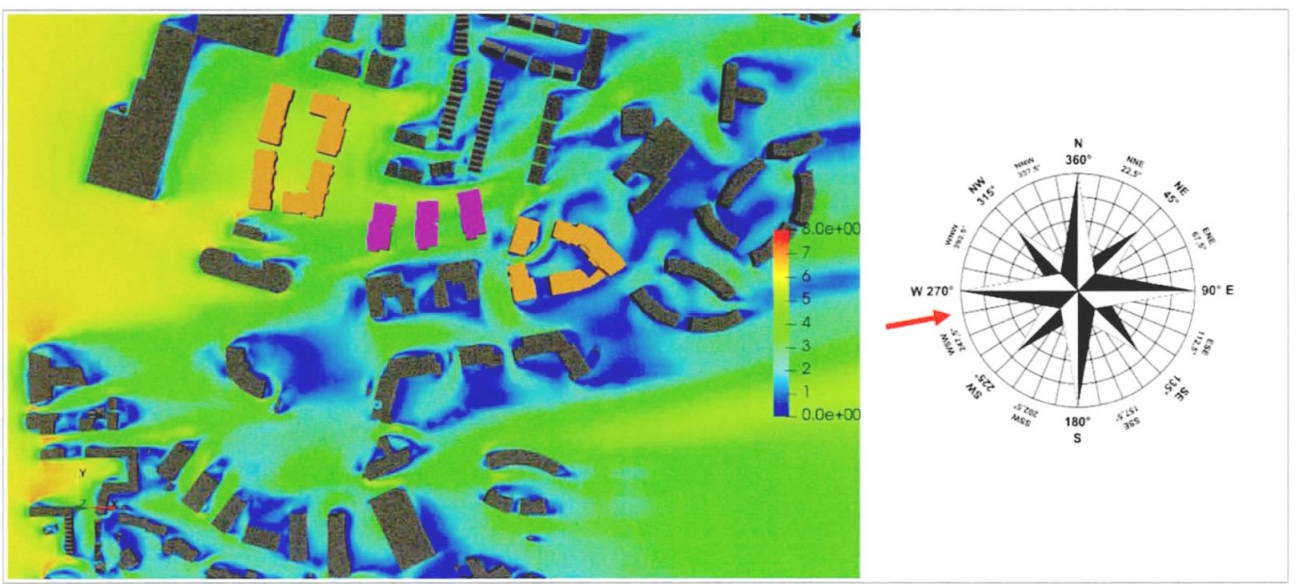

Figure 11-68: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 258°

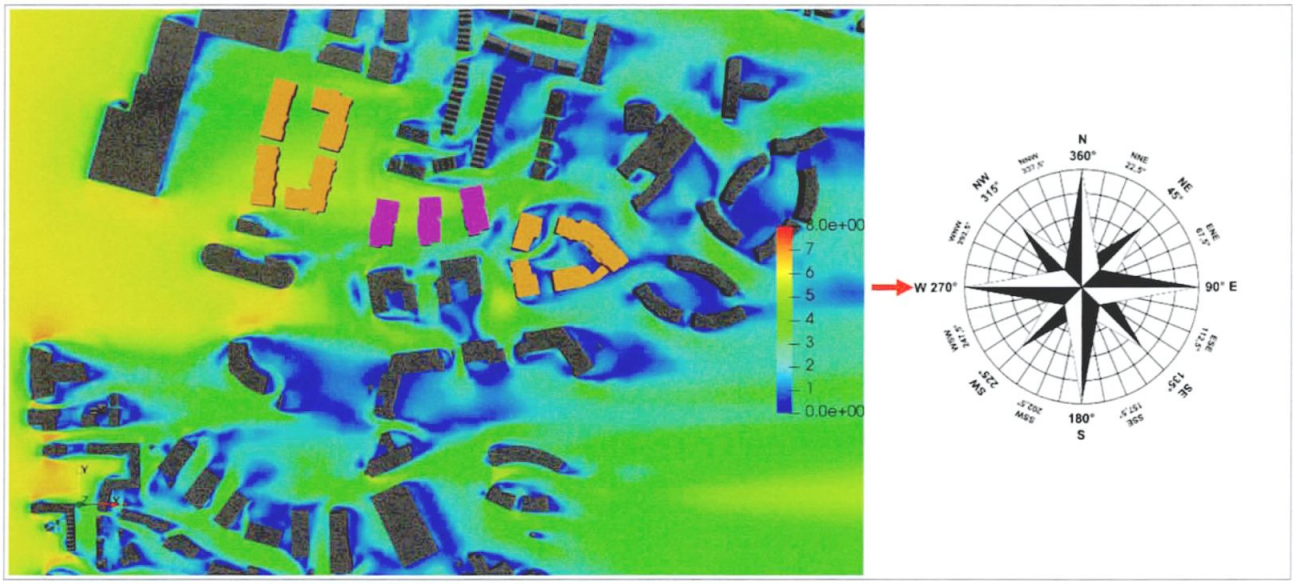

Figure 11-69: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 270°

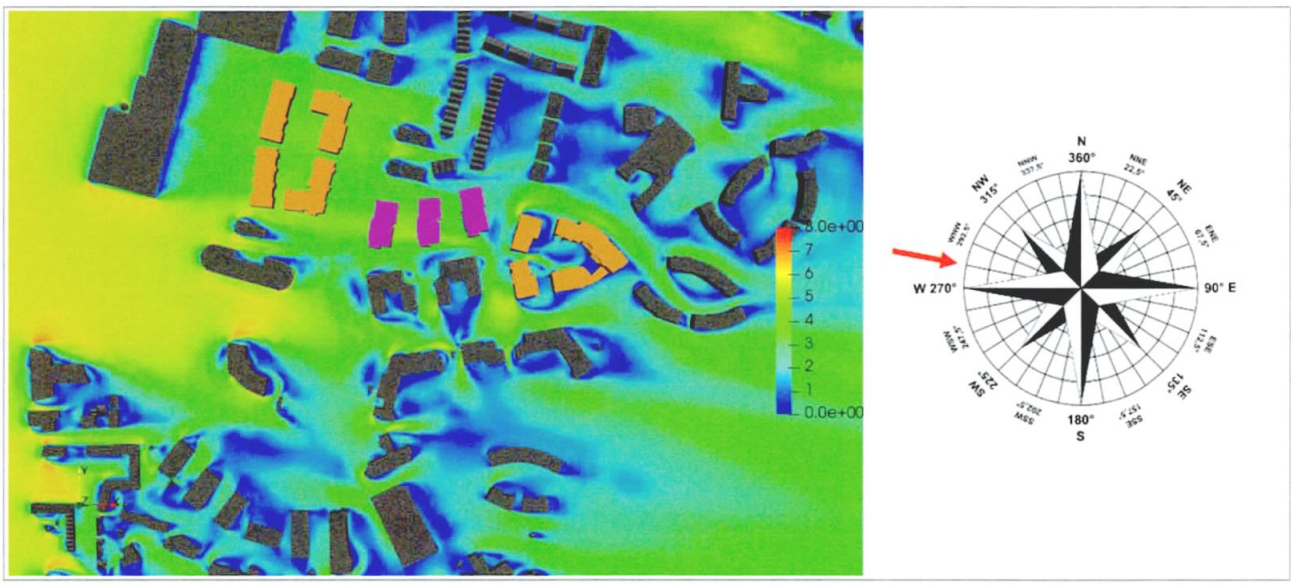

Figure 11-70: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 281°

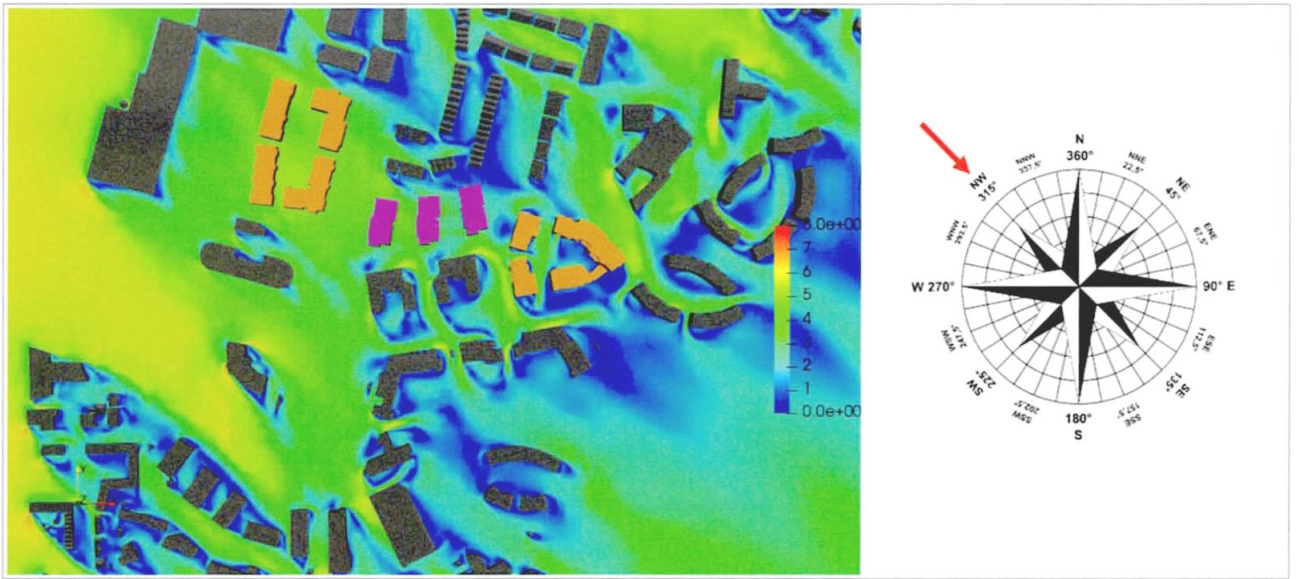

Figure 11-71: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 315°

3D Views

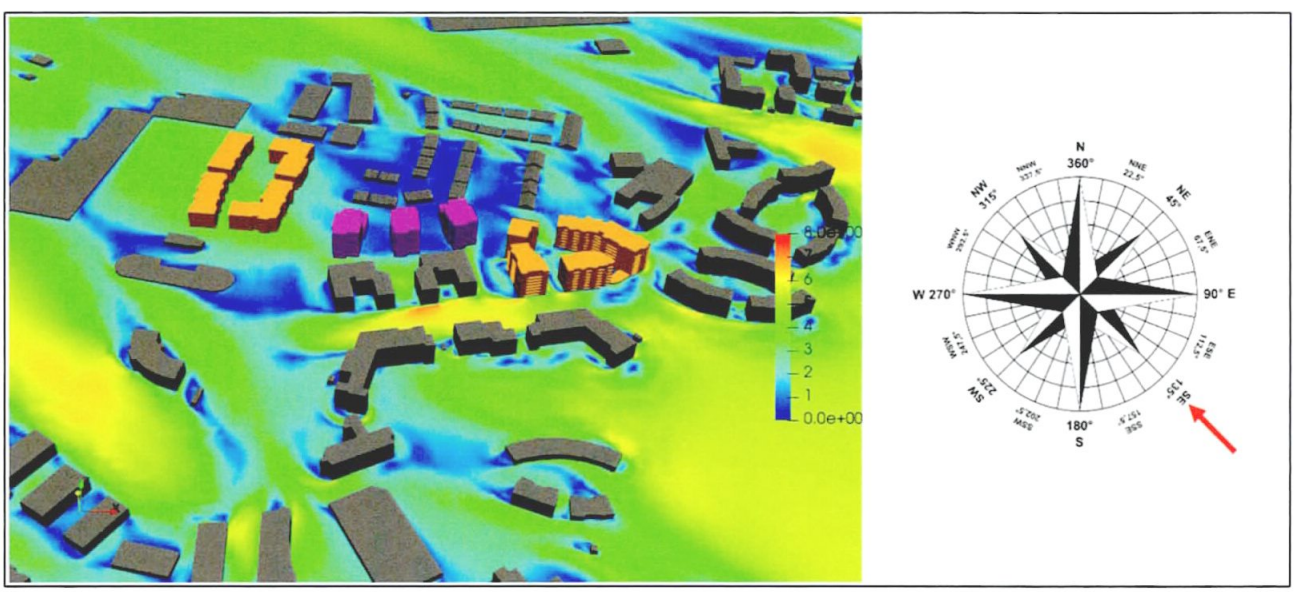

Figure 11-72: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 135°

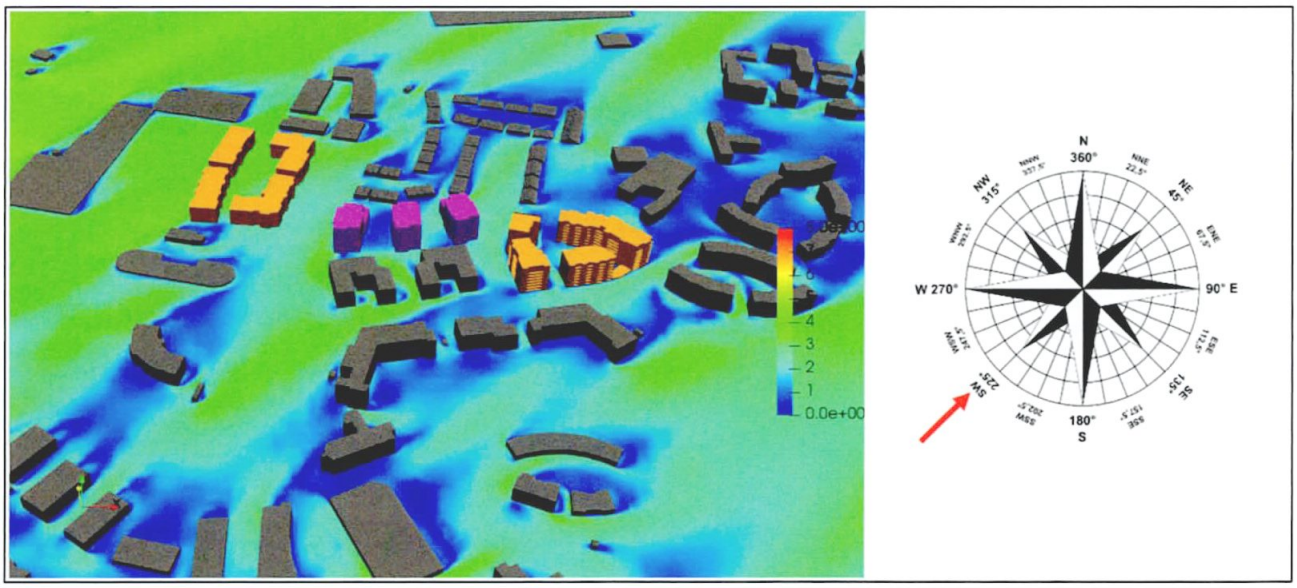

Figure 11-73: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 225°

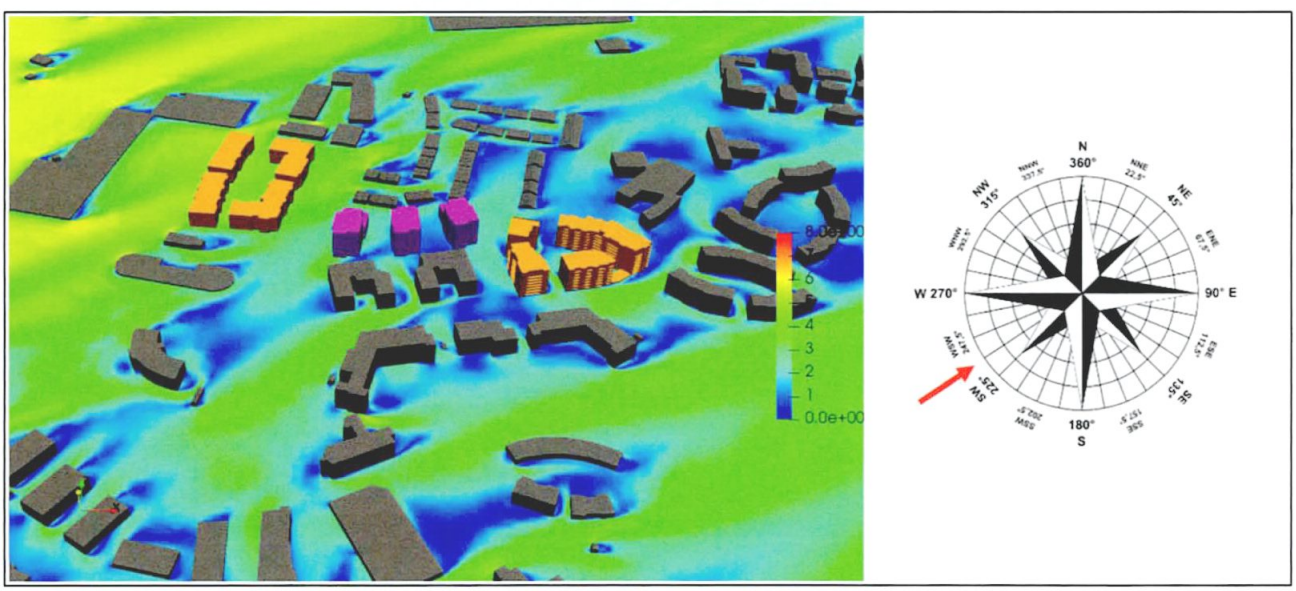

Figure 11-74: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 236°

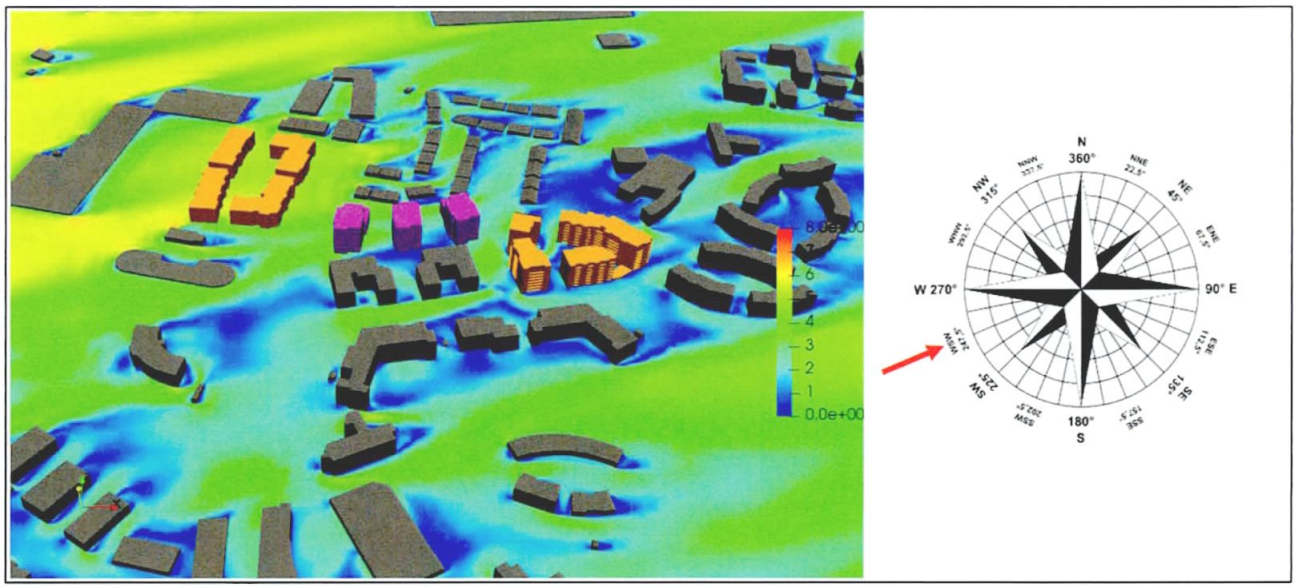

Figure 11-75: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 247°

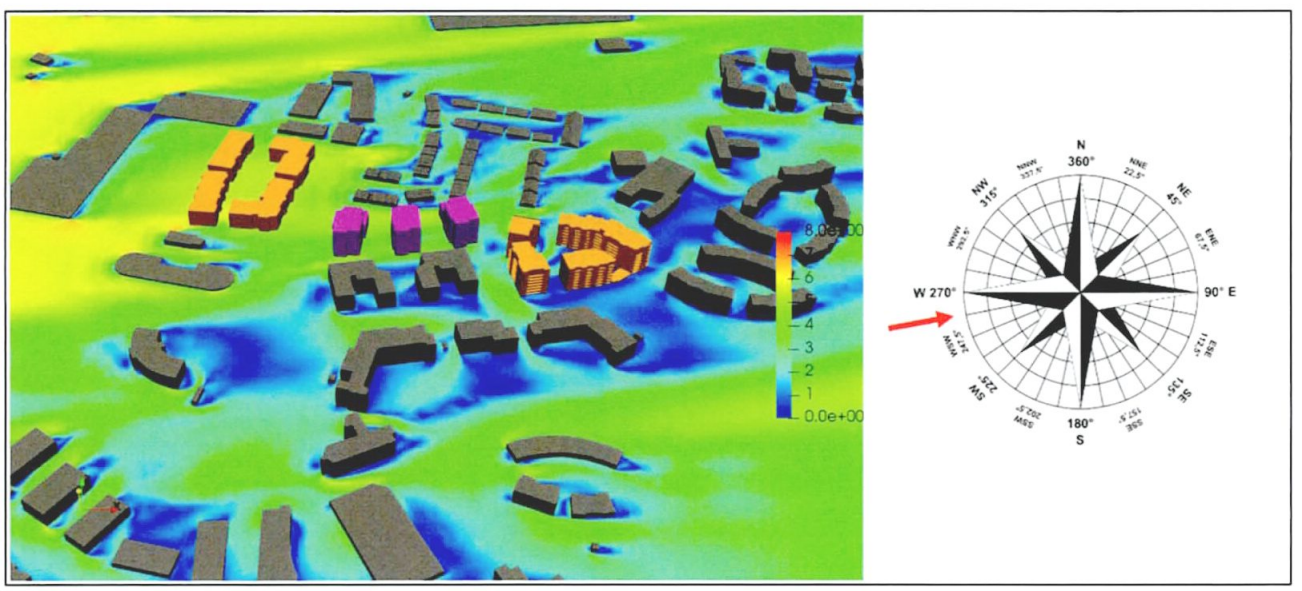

Figure 11-76: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 258°

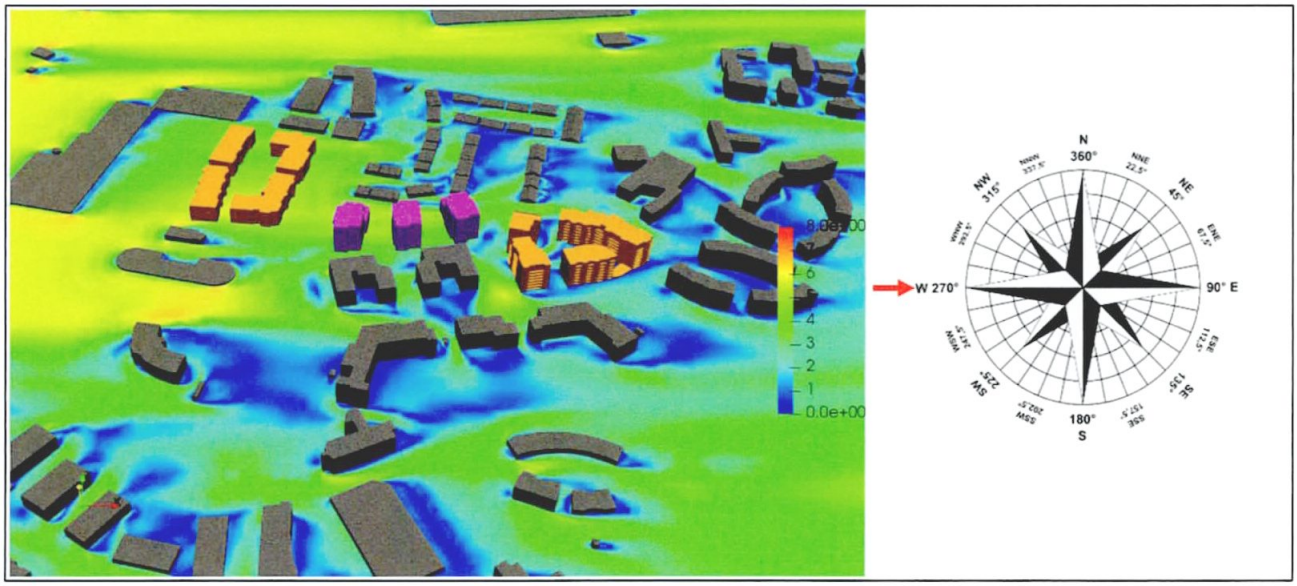

Figure 11-77 Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 270°

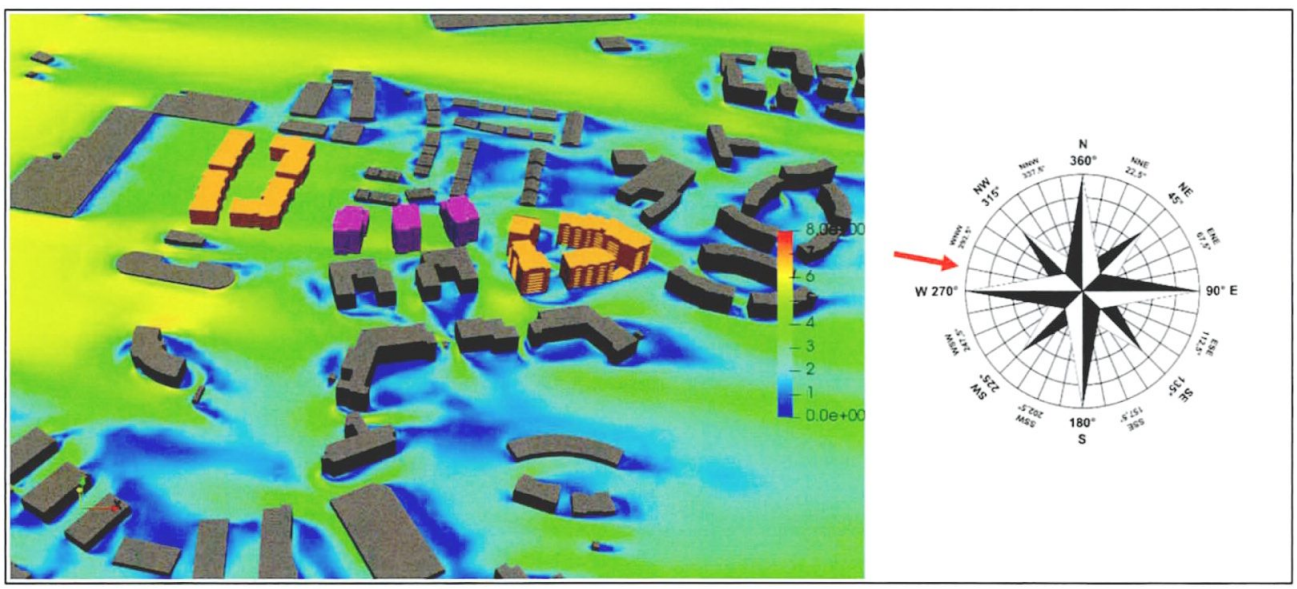

Figure 11-78 Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 281°

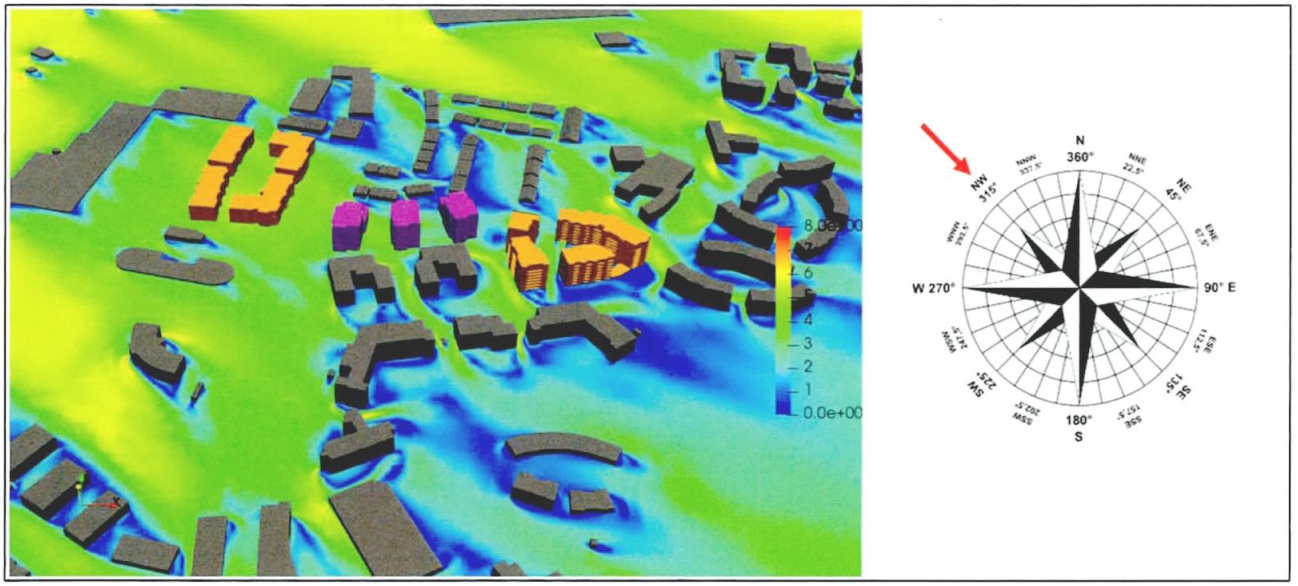

Figure 11-79: Pedestrian Level - Velocity Results at 1.5m above the ground - Wind Direction: 315°

11.6.2 Impact on Pedestrian Comfort and Distress

The wind flow results obtained simulating the different directions and wind speeds are combined with wind frequencies of occurrence to obtain comfort ratings at pedestrian level in all areas included within the model. The comparison of comfort ratings with intended pedestrian activities is shown in the Lawson Comfort and Distress Map that follows and the impact of the proposed development is classified on the potential receptors in line with the significance criteria cited in **Section 11.2.3.2** and detailed in the summary tables provided at the end of this section. The comfort/distress conditions are presented using a colour-coded diagram below formulated following the Lawson Criteria.

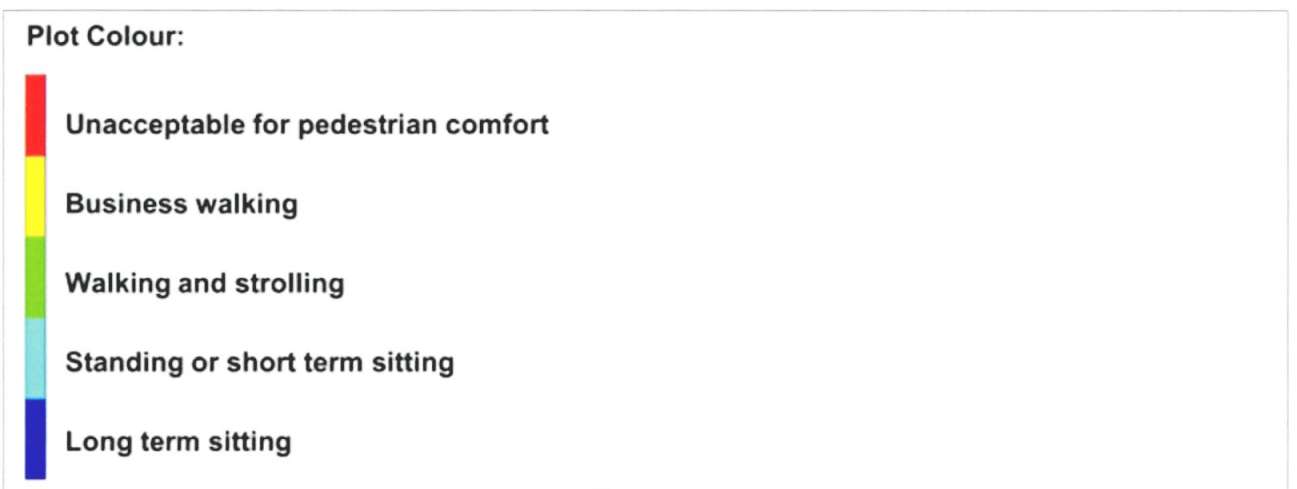

Figure 11-80: Lawson Comfort categories plot

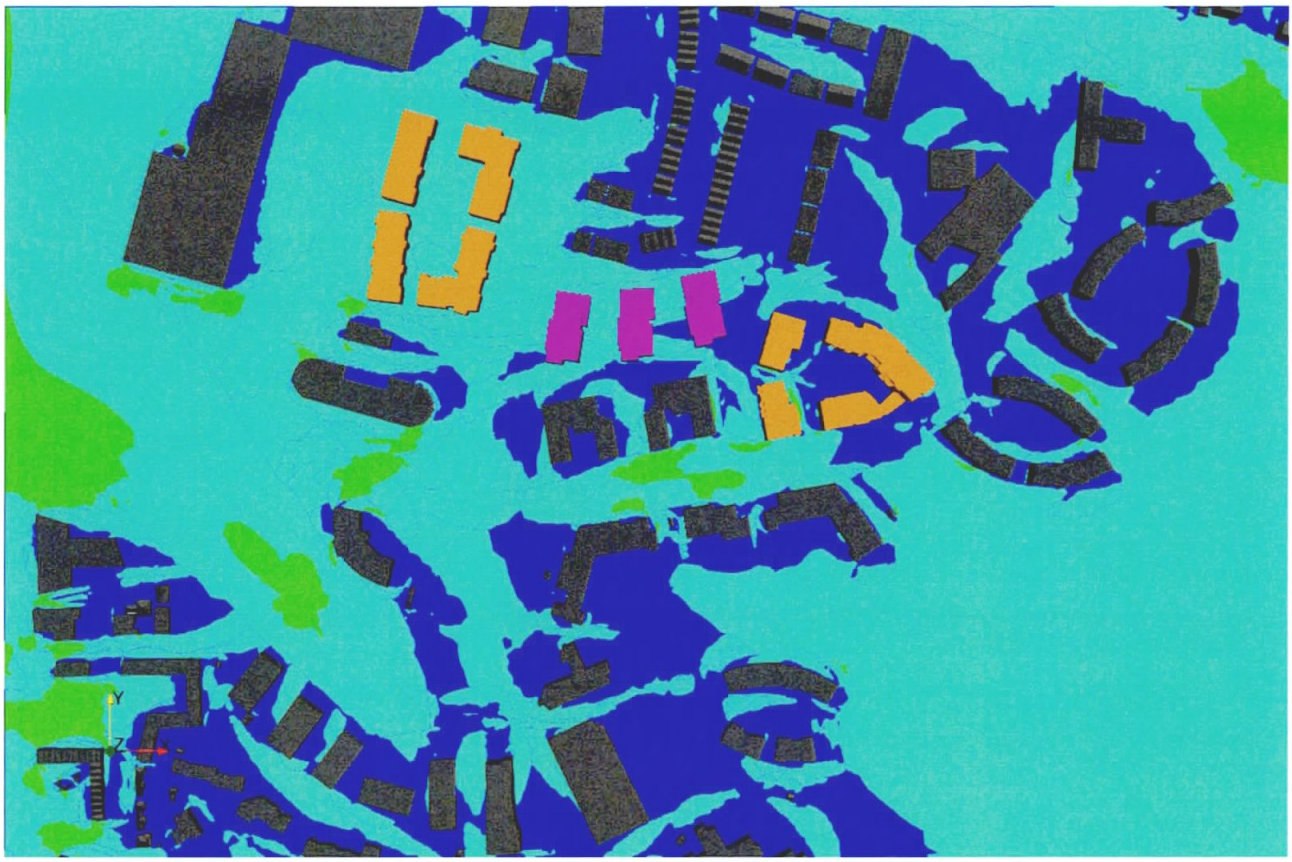

Figure 11-81: Lawson Map of Comfort and Distress- Cumulative Development Scenario

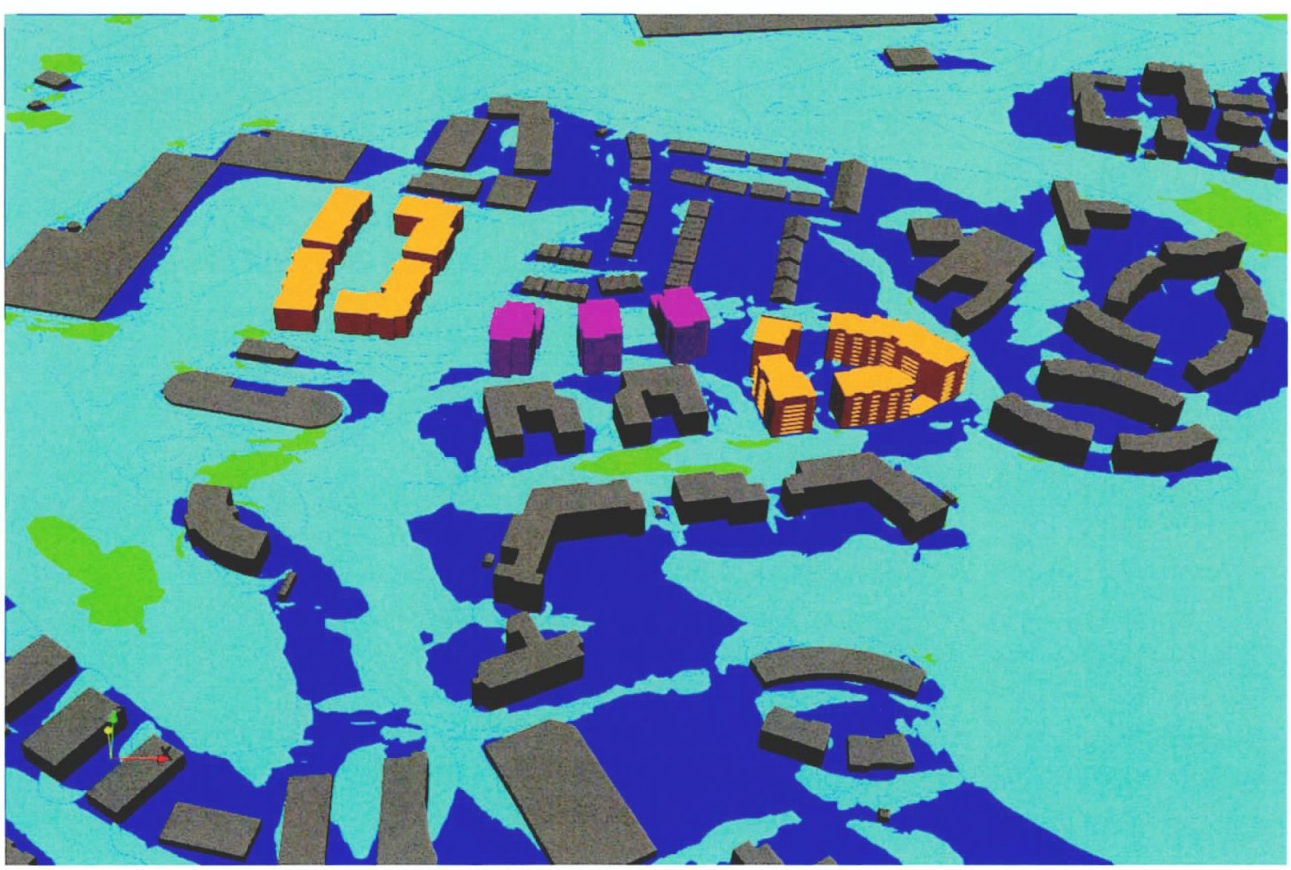

Figure 11-82: Lawson Map of Comfort and Distress- Cumulative Development Scenario (3D view)

In summary, the following conclusions can be made by observing the results of the wind microclimate analysis and comparing the results obtained, under the same wind conditions for the baseline scenario versus the proposed development scenario:

- The assessment of the proposed scenario has shown that no area is unsafe, and no conditions of distress are created by the proposed development also in the cumulative scenario.
- All the roads proposed can be used for their intended scope (walking).
- The wind microclimate of the proposed development is comfortable and usable for pedestrians.

As a result of the proposed development construction, the wind in the surrounding urban context is also mitigated when compared with the baseline situation, in this sense the proposed development has a beneficial effect on the surrounding wind microclimate and can create comfortable pedestrian areas and public spaces. A summary of the impact of the proposed development following the significance criteria of section **11.2.3** is detailed in **Table 11.11.6** Identification of Impact of proposed development on On-site and Off-site receptors (Proposed development Scenario)..

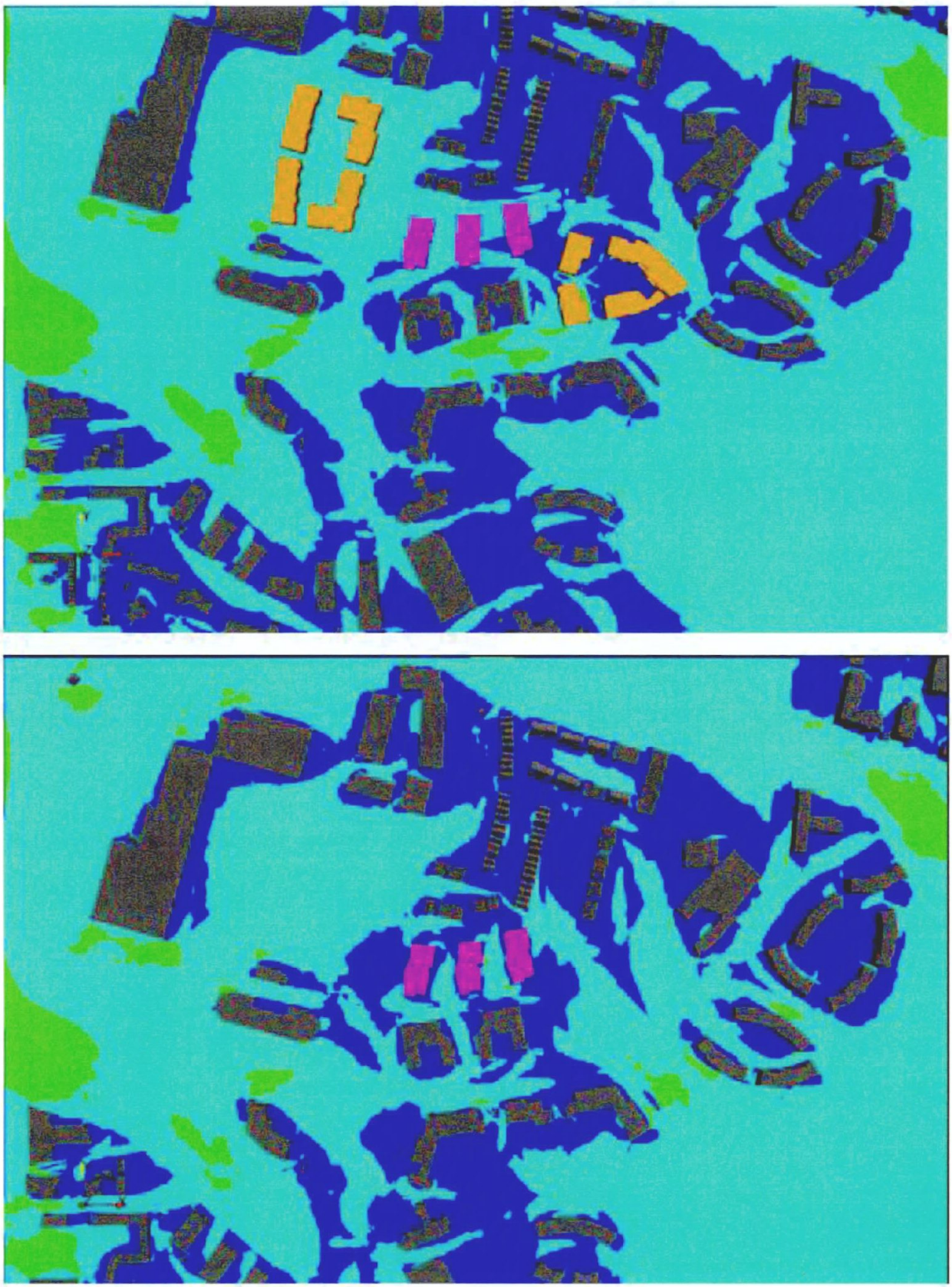

Figure 11-83: Comparison of Lawson Maps Cumulative (top) versus Proposed Scenario(bottom)

Table 11.7 Identification of Impact of the proposed development on On-site and Off-site receptors (Proposed development Scenario).

Potential Receptors *(on-site)*	Proposed Development	Cumulative Conditions	Impact Significance
Roads	Conditions are calmer than required for the intended pedestrian use (by at least one comfort category). Between Block 1, Block 2 and Block 3, conditions are "suitable" for the intended pedestrian use.	Conditions are calmer than in the proposed scenario due to shielding effect provided from the Blackwood development from the wind from the west-northwest direction	*Beneficial/* *Negligible*
Entrances	Conditions are "suitable" for the intended pedestrian use.	Conditions remain the same as in the proposed scenario	*Negligible*
Pedestrian circulation areas	Conditions are calmer than required for the intended pedestrian use (by at least one comfort category).	Conditions remain the same as in the proposed scenario	*Beneficial*
Potential Receptors *(off-site)*	**Cumulative Conditions**		**Impact**
Off-Site **Area-North**	Conditions on the North area became windier for one comfort category passing from long-term sitting to short term sitting, however the conditions still remain suitable and calmer than required for the intended pedestrian use (walking).	Conditions remain the same as in the proposed scenario	*Negligible*
Off-Site **Area-South**	Conditions remain the same as in the proposed scenario.	Conditions remain the same as in the proposed scenario	*Negligible*
Off-Site **Area-East**	Conditions remain the same as in the proposed scenario.	Conditions remain the same as in the proposed scenario	*Negligible*
Off-Site **Area-West**	Conditions remain the same as in the proposed scenario.	Conditions remain the same as in the proposed scenario	*Negligible*

11.7 Residual Impact

Wind cannot be eliminated or mitigated as it depends on weather conditions which could vary. The data of the historical wind conditions collected and reported in the previous sections show that the wind speeds likely to occur on the site are below critical values and that a pleasant and comfortable microclimate can be maintained for most of the time and under the most frequent wind scenarios.

Gusts and storms can still occur, however, and they can create unpleasant and sometimes unsafe conditions. The pedestrian activities concerning the Lawson Comfort and Distress Criteria are not in general carried out during those weather conditions.

Having considered the above, no further changes to the development design and further increase of the landscaping are suggested, as safety and pedestrian comfort are maintained under Lawson Comfort and Distress Criteria.

11.8 Monitoring

11.8.1 Construction Phase

There is no requirement to monitor wind impact during the construction phase for pedestrian comfort and distress as the designated amenity areas will not be in use during this phase of the project and pedestrians are not accessing construction sites.

11.8.2 Operational Phase

The development has been designed to conform to acceptable Lawson Criteria for Comfort and Distress following the Wind Beaufort Scale and considering the historical wind conditions of the site, there is no further element to monitor for this scope as far as the design and landscaping is maintained in place as proposed.

11.9 Interactions

Landscaping

The proposed landscaping acts as a means of mitigation to the incoming winds at the pedestrian level. In particular, the landscaping proposed or existing has a beneficial effect as it reduces the wind speed and produces a shielding effect. Through CFD Wind Modelling, the effects of landscaping trees/planting were implemented on the wind flowing through the urban environment. The landscape trees were simulated as comprising effects of porous zones within the modeled areas. This was an essential tool for accurately assessing the actual wind speed and pattern at a pedestrian level.

Population

Pedestrian Wind Comfort is measured in function of the frequency of wind speed threshold exceeded based on the pedestrian activity. In particular, the distress criteria relate to the physical well-being of the individual. For this assessment, to consider the wider population categories that are expected in the development, both the general public, both frail persons/cyclists were considered. This has implied that the threshold values for the evaluation of the acceptance criteria of a pedestrian category were adapted to suit the frailest categories of the public.

11.10 References

- Simiu, E., 2011, 'Design of buildings for wind: a guide for ASCE 7-10 Standard users and designers of special structures', 2nd Edition, John Wiley and Sons, Inc., Hoboken, New Jersey, U.S.A.
- Building Aerodynamics, Tom Lawson FREng. Imperial College Press, 2001
- Blocken, B., 2015. Computational Fluid Dynamics for Urban Physics: Importance, scales, possibilities, limitations and ten tips and tricks towards accurate and reliable simulations. Building and Environment.
- Blocken, B., Janssen, W.D. and van Hooff, T., 2012. CFD simulation for pedestrian wind comfort and wind safety in urban areas: General decision framework and case study for the Eindhoven University campus. Environmental Modelling and Software, 30, pp.15–34.
- Franke, J., Hellsten, A., Schlunzen, H., Carissimo, B, Ed. (2007); Best Practice Guidelines for the CFD Simulation of Flows in the Urban Environment, University of Hamburg

12 NOISE AND VIBRATION

12.1 Introduction

AWN Consulting Ltd has been commissioned to carry out a noise and vibration impact assessment of the proposed Swift Square development on lands at Northwood, Santry, Dublin 9.

In terms of the site, noise and vibration will be considered in terms of two aspects. The first is the outward impact of the development (i.e. the potential impact of the buildings on existing sensitive receptors in the study area) and the inward impact of existing noise and vibration sources on the development itself (with a particular focus on aircraft noise).

12.1.1 Author Information

This assessment has been prepared by Alistair Maclaurin BSc PgDip MIOA, Senior Consultant at AWN Consulting who has experience preparing multiple EIS and EIAR documents throughout his 10 years' experience as an environmental consultant. Additionally, he has worked as a noise specialist on major infrastructure projects such as Crossrail and Thames Tideway.

12.2 Assessment Methodology

12.2.1 Assessment Approach

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, this is summarised in the following sections;
- Predictive calculations have been performed to estimate the likely noise emissions during the construction phase of the project at the nearest sensitive locations (NSL's) 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;
- 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, and;
- The inward impact of noise of the surrounding environment (e.g. aircraft and road noise) into the proposed buildings has also been assessed to determine the requirements, for additional noise mitigation to provide suitable residential amenities.

12.2.2 Definition of Study Area

The study area for the noise and vibration assessment has been defined with reference to the area in which there is potential for noise and vibration as a result of the proposed development. This has been informed by the traffic assessment in terms of a change in noise level on public roads, the Fingal County Council (FCC) airport noise zones for inward impact to the development and the location of local sensitive receptors in terms of the potential for outward noise from the development. The extent of the study area is shown in **Figure 12-1**.

Figure 12-1: Approximate Study Area for Noise and Vibration Assessment (indicative outline in red)

Source: Google Maps

12.2.3 Assessment Criteria

12.2.3.1 Construction 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*.

The approach adopted here calls for the designation of a noise-sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a significant noise impact is associated with the construction activities.

This document sets out guidance on permissible noise levels relative to the existing noise environment. **Table 12.1** sets out the values that, when exceeded, signify a significant effect at the facades of residential receptors as recommended by BS 5228 – 1.

Table 12.1: Example of Threshold of Potential Significant Effect at Dwellings

Assessment Category & Threshold Value Period (L_{Aeq})	Threshold Value, in Decibels (dB)		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evening & Weekends Note D	55	60	65
Daytime (0700 to 19:00hrs) & Saturdays (07:00 to 13:00hrs)	65	70	75

- Note A) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.
- Note B) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as Category A values.
- Note C) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than Category A values.
- Note D) 19:00 – 23:00hrs weekdays; 13:00 – 23:00hrs Saturdays and 07:00 – 23:00hrs Sundays

It should be noted that this assessment method is only valid for residential properties.

This assessment process determines if a potential significant construction noise impact is likely. Notwithstanding the outcome of this assessment, the overall acceptable levels of construction noise which should not be exceeded at noise-sensitive locations during the construction phase of the development, as set out in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[16], are presented in **Table 12.2**.

Table 12.2: Maximum Permissible Noise Levels at the Facade of Dwellings during Construction

Days & Times	Noise Levels (dB re. $2x10^{-5}$ Pa)	
	$L_{Aeq,1hr}$	L_{Amax}
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturdays 08:00 to 16:30hrs	65	75
Sundays & Bank Holidays 08:00 to 16:30hrs	60*	65*

Note – Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

Proposed Significance Threshold Noise Levels

Taking into account the proposed documents outlined above and making reference to the baseline noise environment monitored around the development site (see Section 9.3), BS 5228-1:2009+A1:2014 has been used to inform the assessment approach for construction noise.

The following Construction Noise Threshold (CNT) levels are proposed for the construction stage of this development:

- For residential NSLs it is considered appropriate to adopt 65 dB(A) CNT depending on location. Given the baseline monitoring carried out, it would indicate that Category A values are appropriate using the ABC method.
- For non-residential receptors it is considered appropriate to adopt the 75 dB(A) CNT, given the urban environment.

Taking into account the proposed documents outlined above and making reference to the baseline noise environment monitored around the development site (see **Section 12.3**), BS 5228-1:2009+A1:2014 has been used to inform the assessment approach for construction noise, in line with the ABC method.

Interpretation of the CNT

In order to assist with the interpretation of CNTs, **Table 12.3** includes guidance as to the likely magnitude of the impact associated with construction activities, relative to the CNT. This guidance is derived from Table

16 *Good Practice Guidance for the Treatment of Noise during the Planning of National Road Schemes* (March 2014). Transport Infrastructure Ireland

3.16 of *DMRB: Noise and Vibration* and adapted to include the relevant significant effects from the EPA EIAR Guidelines.

Table 12.3: Example of Threshold of Potential Significant Effect at Dwellings

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIAR Significance Determination Effects	
Negligible	Below or equal to baseline noise level	Not Significant	Depending on CNT, duration & baseline noise level
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	
Moderate	Above CNT and below or equal to CNT +5 dB	Moderate to Significant	
Major	Above CNT +5 to +15 dB	Significant, to Very Significant	

The adapted DMRB guidance outlined will be used to assess the predicted construction noise levels at NSLs and comment on the likely impacts during the construction stages.

In accordance with the *DMRB Noise and Vibration*, construction noise and construction traffic noise impacts shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- Ten or more days or night in any 15 consecutive day or nights;
- A total number of days exceeding 40 in any six consecutive months.

12.2.3.2 Construction Vibration

Peak particle velocity (PPV) is commonly used to assess the structural response of buildings to vibration. 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.

BS5228-2 and BS7385 advise that, for soundly constructed residential properties 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 both documents referred to above, are reproduced in **Table 12.4**. The documents note that minor structural damage can occur at vibration magnitudes which are greater than twice those presented in **Table 12.4**. 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 12.4: Transient Vibration Guide Values for Cosmetic Damage

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**
15 mm/s	20 mm/s	50 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 12.4** can lead to concern. BS5228-2 also provides a useful guide relating to the assessment of human response to vibration in terms of PPV. **Table 12.5** summarises the range of vibration values and the associated potential effects on humans.

Table 12.5: 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 standard 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 might be more appropriate to determine whether time-varying exposure is likely to give rise to any degree of adverse comment.

12.2.3.3 Operational Noise

12.2.3.3.1 BS4142 2014 – Mechanical Plant

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound is the industry standard method for analysing building services plant sound emissions to residential receptors. 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 sound 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 sound emissions are found to be tonal, impulsive, intermittent or to have other sound characteristics that are readily distinctive against the residual acoustic environment, BS4142 advises that penalties be applied to the specific level to arrive at the rating level.

The subjective method for applying a penalty for tonal sound characteristics outlined in BS 4142 recommends the application of a 2dB penalty for a tone which is just perceptible at the receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible. In relation to intermittency, BS 4142 recommends that *If the intermittency us readily is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.*

The following definitions, as discussed in BS 4142 as summarised below:

"*ambient sound level,* $L_{Aeq,T}$"	equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at any given time, usually from many sources near and far, at the assessment location over a given time interval, T.
"*residual sound level,* $L_{Aeq,T}$"	equivalent continuous A-weighted sound pressure level of the residual sound (i.e. 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) at the assessment location over a given time interval, T.
"*specific sound level,* $L_{Aeq,T}$"	equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r.
"*rating level,* $L_{Ar,T}$"	specific sound level plus any adjustment for the characteristic features of the sound.
"*background sound level,* $L_{A90,T}$"	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location

for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

In order to establish an *initial estimate* of impact, BS 4142 states the following:

> *Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following.*
>
> *a. Typically, the greater this difference, the greater the magnitude of the impact.*
>
> *b. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
>
> *c. A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
>
> *d. 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 impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.*
>
> *Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.*

The assessment methodology described above (i.e. comparison of rated sound level to background sound level) is quoted in BS4142 as representing a methodology to '*obtain an initial estimate*' of impact. It is important to note that BS4142 also comments that *'Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration'*. BS4142 provides a list of potential pertinent factors that can influence the *'initial estimate'*. The plant noise assessment conducted in the following sections has been carried out with consideration of the guidance contained in BS4142 as summarised above.

12.2.3.3.2 Assessment of Significance

The draft '*Guidelines for Noise Impact Assessment*' produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party have been referenced in relation to the potential impact of changes in the ambient noise levels during the construction and operational phases of the proposed development.

The findings of the Working Party are draft at present, although they are of some assistance in this assessment. The draft guidelines state that for any assessment, the noise level threshold and significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise.

The draft '*Guidelines for Noise Impact Assessment*' impact scale adopted in this assessment is shown in **Table 12.6** below. The corresponding significance of impact presented in the EPA *Revised Guidelines on the Information to be contained in Environmental Impact Statements* (Draft September 2015) is also presented.

Table 12.6: Noise Impact Scale

Noise Level Change dB(A)	Subjective Response	Impact Guidelines for Noise Impact Assessment Significance (Institute of Acoustics)	Impact Guidelines on the Information to be contained in EIS's (EPA)
0	No change	None	Imperceptible
0.1 – 2.9	Barely perceptible	Minor	Not Significant
3.0 – 4.9	Noticeable	Moderate	Slight, Moderate
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial	Significant

10.0 or more	More than a doubling or halving of loudness	Major	Very Significant/ Profound

The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide a greater definition to the assessment of changes in noise level.

It is considered that the criteria specified in the above table provide a good indication as to the likely significance of changes in noise levels in this case and have been used to assess the impact of operational noise.

12.2.3.4 Operational Noise – Inward Noise Assessment

12.2.3.4.1 Dublin Agglomeration Noise Action Plan 2019 – 2023

The Dublin Agglomeration NAP states the following with respect to assessing the noise impact on new residential development:

> *"In the scenario where new residential development or other noise sensitive development is proposed in an area with an existing climate of environmental noise, there is currently no clear national guidance on appropriate noise exposure levels. The EPA has suggested in the interim, that Action Planning Authorities should examine planning policy guidance notes, such as ProPG (2017). Such guidance notes have been produced with a view to providing practitioners with guidance on a recommended approach to the management of noise within the planning system."*

In addition, the following is provided:

> *"In advance of any national guidance relating to noise in the planning process, the following actions relating to planning and development will be considered for implementation:*
>
> *To integrate Noise Action Plans into the County Development Plans.*
>
> *a) To develop guidelines relating to Noise and Planning for FCC* [Fingal County Council]. *These guidelines should outline the considerations to be taken into account when determining planning applications for both noise-sensitive developments and for those activities which will generate noise. They should introduce the concept of a risk based approach to assessment of noise exposure, and for Good Acoustic Design to be encouraged as part of all new residential developments in FCC.*
>
> *b) To require developers to produce a noise impact assessment and mitigation plans, where necessary, for any new development where the Planning Authority considers that any new development will impact negatively on pre-existing environmental noise levels within their Council area.*
>
> *c) To ensure that future developments are designed and constructed in such a way as to minimise noise disturbances in accordance with Department of the Environment, Community and Local Government planning guidelines such as the Urban Design Manual. e.g. the position, direction and height of new buildings, along with their function, their distance from roads, and the position of noise barriers and buffer zones with low sensitivity to noise,*
>
> *d) To ensure that new housing areas and in particular brown field developments will be planned from the outset in a way that ensures that at least the central area is quiet. This could mean designating the centre of new areas as pedestrian and cycling zones with future developments to provide road design layouts to achieve low speed areas where appropriate.*
>
> *e) To incorporate street design in new developments, which recognise that residential streets have multi-function uses (e.g. movement, recreation) for pedestrians, cyclists and vehicles, in that priority order. The noise maps will be used to identify and*

classify the priority areas and streets. In the design of streets, cognisance should be given to the Irish Manual for Roads and Streets 2013.

f) To require sound proofing for all windows, in all new residential developments, where noise maps have indicated undesirable high noise levels. This may also lead to a requirement to install ducted ventilation.

g) To advise during pre-planning meetings regarding site specific design, the orientation of sensitive rooms and balconies away from noise, designing the layout and internal arrangement in apartments to ensure that similar rooms in individual units are located above each other or adjoin each other and that halls are used as buffer zones between sensitive rooms and staircases."

In accordance with this NAP policy, the ProPG document has been referred to and an Acoustic Design Statement (ADS) has been prepared to comply with the requirements of this policy.

12.2.3.4.2 Fingal Development Plan Policy on Aircraft Noise

The Fingal Development Plan 2023-2029 Objective DAO11 outlines Noise Zones and policy objectives in relation to aircraft noise from Dublin Airport.

Four noise zones (Zone A to D) are now indicated representing potential site exposure to aircraft exposure. The council will actively resist residential development within Zone A, and resist in Zone B and C pending independent acoustic advice and mitigation measures. Certain specific residential developments located in Zone D may be required to demonstrate that aircraft noise intrusion has been considered in the design.

Table 12.7 below outlines the objectives to be adhered to by applicants for developments in each zone.

Table 12.7: Aircraft Noise Zones

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
D	≥ 50 dB and < 54 dB $L_{Aeq, 16hr}$ and ≥ 40 dB and < 48 dB L_{night}	**To identify noise sensitive developments which could potentially be affected by aircraft noise and to identify any larger residential developments in the vicinity of the flight paths serving the Airport in order to promote appropriate land use and to identify encroachment.** *All noise sensitive development within this zone is likely to be acceptable from a noise perspective. An associated application would not normally be refused on noise grounds, however where the development is residential-led and comprises non residential noise sensitive uses, or comprises 50 residential units or more, it may be necessary for the applicant to demonstrate that a good acoustic design has been followed.* *Applicants are advised to seek expert advice.*
C	≥ 54 dB and < 63 dB $L_{Aeq, 16hr}$ and ≥ 48 dB and < 55 dB L_{night}	**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure, where appropriate, noise insulation is incorporated within the development** *Noise sensitive development in this zone is less suitable from a noise perspective than in Zone D. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.* *The noise assessment must demonstrate that relevant internal noise guidelines will be met. This may require noise insulation measures.* *An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended.*

Zone	Indication of Potential Noise Exposure during Airport Operations	Objective
		Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels. *Applicants are strongly advised to seek expert advice.*
B	≥ 54 dB and < 63 dB $L_{Aeq, 16hr}$ And ≥ 55 dB L_{night}	**To manage noise sensitive development in areas where aircraft noise may give rise to annoyance and sleep disturbance, and to ensure noise insulation is incorporated within the development.** *Noise sensitive development in this zone is less suitable from a noise perspective than in Zone C. A noise assessment must be undertaken in order to demonstrate good acoustic design has been followed.* *Appropriate well-designed noise insulation measures must be incorporated into the development in order to meet relevant internal noise guidelines.* *An external amenity area noise assessment must be undertaken where external amenity space is intrinsic to the development's design. This assessment should make specific consideration of the acoustic environment within those spaces as required so that they can be enjoyed as intended. Ideally, noise levels in external amenity spaces should be designed to achieve the lowest practicable noise levels.* *Applicants must seek expert advice.*
A	≥ 63 dB $L_{Aeq, 16hr}$ and/or ≥ 55 dB L_{night}	**To resist new provision for residential development and other noise sensitive uses.** *All noise sensitive developments within this zone may potentially be exposed to high levels of aircraft noise, which may be harmful to health or otherwise unacceptable. The provision of new noise sensitive developments will be resisted.*

Notes:

- 'Good Acoustic Design' means following the principles of assessment and design as described in ProPG: Planning & Noise – New Residential Development, May 2017;
- Internal and External Amenity and the design of noise insulation measures should follow the guidance provided in British Standard BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

12.2.3.4.3 ProPG: Planning & Noise (Inward Noise Impact

The *Professional 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 UK or Irish government document, since its publication, it has been generally considered as 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.

A key component of the evaluation process is the preparation and delivery of an Acoustic Design Statement (ADS), which is intended for submission to the planning authority. This document is intended to clearly outline the methodology and findings of Stage 1 and Stage 2 assessments, so that the planning authority can make an informed decision on the permission. ProPG outlines the following possible recommendations in relation to the findings of the ADS:

A. Planning consent may be granted without any need for noise conditions;

B. Planning consent may be granted subject to the inclusion of suitable noise conditions;

C. Planning consent should be refused on noise grounds in order to avoid significant adverse effects ("avoid"); or,

D. Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects ("prevent").

Section 3.0 of the ProPG provides a more detailed guide on decision making to aid local authority planners on how to interpret the findings of an accompanying Acoustic Design Statement (ADS).

A summary of the ProPG approach is illustrated in **Figure 12-2**.

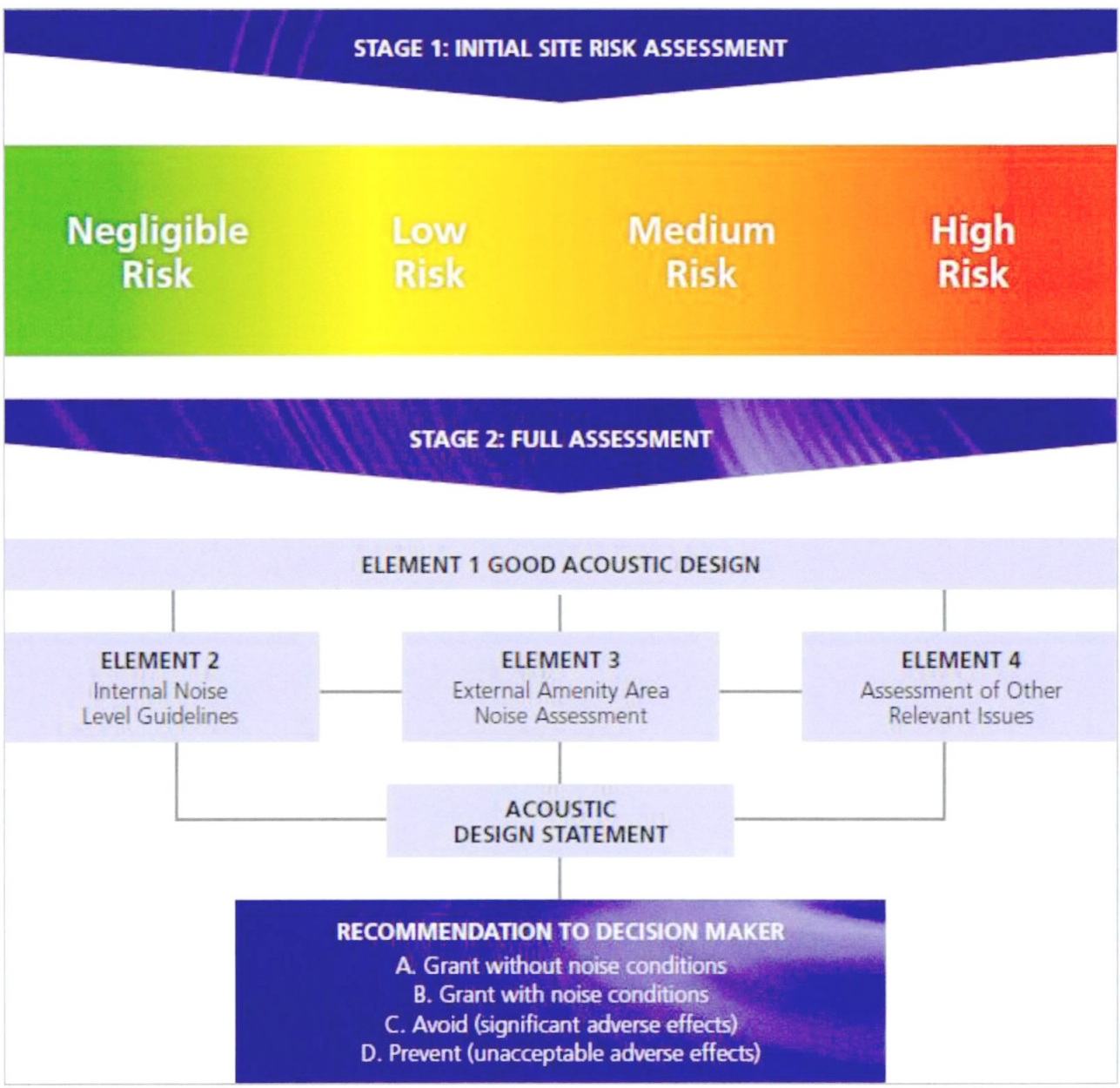

Figure 12-2: ProPG Approach (Source: ProPG)

12.3 Baseline Scenario (Existing Environment)

A series of baseline noise surveys have been undertaken across the development site to determine the range of noise levels at varying locations across the site and to establish the existing noise climate the nearest noise-sensitive locations and across the development site itself.

The surveys were conducted in general accordance with ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise. Specific details are set out below.

12.3.1 Choice of Measurement Locations

Unattended noise monitoring was undertaken at location A during both day and night periods. With further attended measurements were undertaken at locations B to G. At locations B and C, both day and night surveys were undertaken, and at locations D to G day surveys were undertaken. The locations were selected to be representative of the existing noise environment at the closest noise-sensitive locations and the noise climate within the development site itself.

The locations are described below and illustrated in **Figure 12-3**.

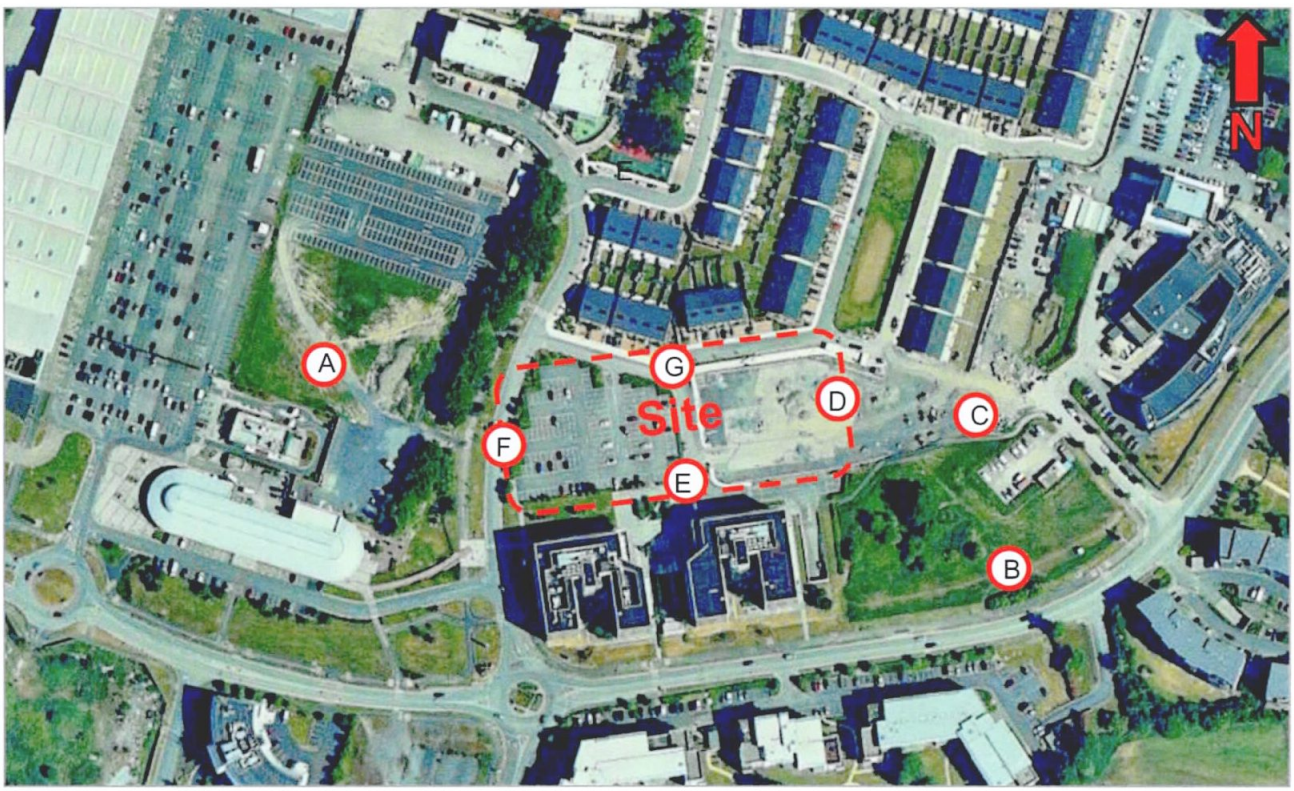

Figure 12-3: Noise Monitoring Locations

Source: Google Maps

12.3.2 Survey Periods

The surveys were undertaken over the following surveys periods:

- Unattended noise monitoring was undertaken at Location A between 15:22hrs on 12th November 2018 and 10:00hrs on 15th November 2018;
- Attended noise monitoring was undertaken at Locations B to D on 12th November 2018.
- Attended noise monitoring was undertaken at locations F and E over the course of the night of the 1st December to 2nd December 2021 and the day of 2nd December 2021.

- Attended noise monitoring was undertaken at locations G to J on the day of the 6th January, 2023.

12.3.3 Monitoring Equipment

The surveys were undertaken with a Rion NL-52 and a Brüel & Kjaer 2250 Sound Level Meter. Calibration certificates can be forwarded on request.

12.3.4 Measurement Parameters

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

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_{AFmax} is the instantaneous maximum sound level measured during the sample period using the 'F' time weighting.

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.

12.3.5 Survey Results

The results of the noise monitoring completed at the various locations are discussed in the following sections.

12.3.5.1 Location A

Table 12.8 reviews the measured noise levels at Location A.

Table 12.8: Noise Monitoring Results Location A

Date	Period	dB $L_{Aeq(T)}$	dB $L_{A90(T)}$
12 Nov 2018	Day (07:00 – 23:00)	56	53
	Night (23:00 – 07:00)	53	50
13 Nov 2018	Day (07:00 – 23:00)	55	52
	Night (23:00 – 07:00)	52	48
14 Nov 2018	Day (07:00 – 23:00)	55	52
	Night (23:00 – 07:00)	48	46
15 Nov 2018	Day (07:00 – 23:00)	55	54
Average	Day (07:00 – 23:00)	55	53
	Night (23:00 – 07:00)	51	48

In general, the following noise sources were noted across the site:

- Aircraft activity associated with Dublin Airport;
- M50 road traffic noise;
- A degree of construction noise from nearby sites (during daytime periods);
- Local traffic movements;

- Activity (typically reverse alarms and refrigeration plant) associated with the Compass Distribution Centre;
- Mechanical services associated with existing buildings in Northwood;
- Birdsong, and;
- A degree of wind generated noise.

Ambient noise levels averaged 55 dB $L_{Aeq,16hr}$ over daytime periods and 51 dB $L_{Aeq,8hr}$ during night time. Background noise levels averaged 53 dB $L_{A90,16hr}$ and 48 dB $L_{A90,8hr}$ during daytime and nighttime periods, respectively.

The L_{AFmax} levels are also of an interest here, in particular in relation to nighttime periods. The L_{AFmax} values were measured at 15-minute intervals over the duration of the unattended monitoring survey. **Figure 12-4** presents the distribution of the magnitude of L_{AFmax} events during the night period at the noise monitoring location considered for this assessment.

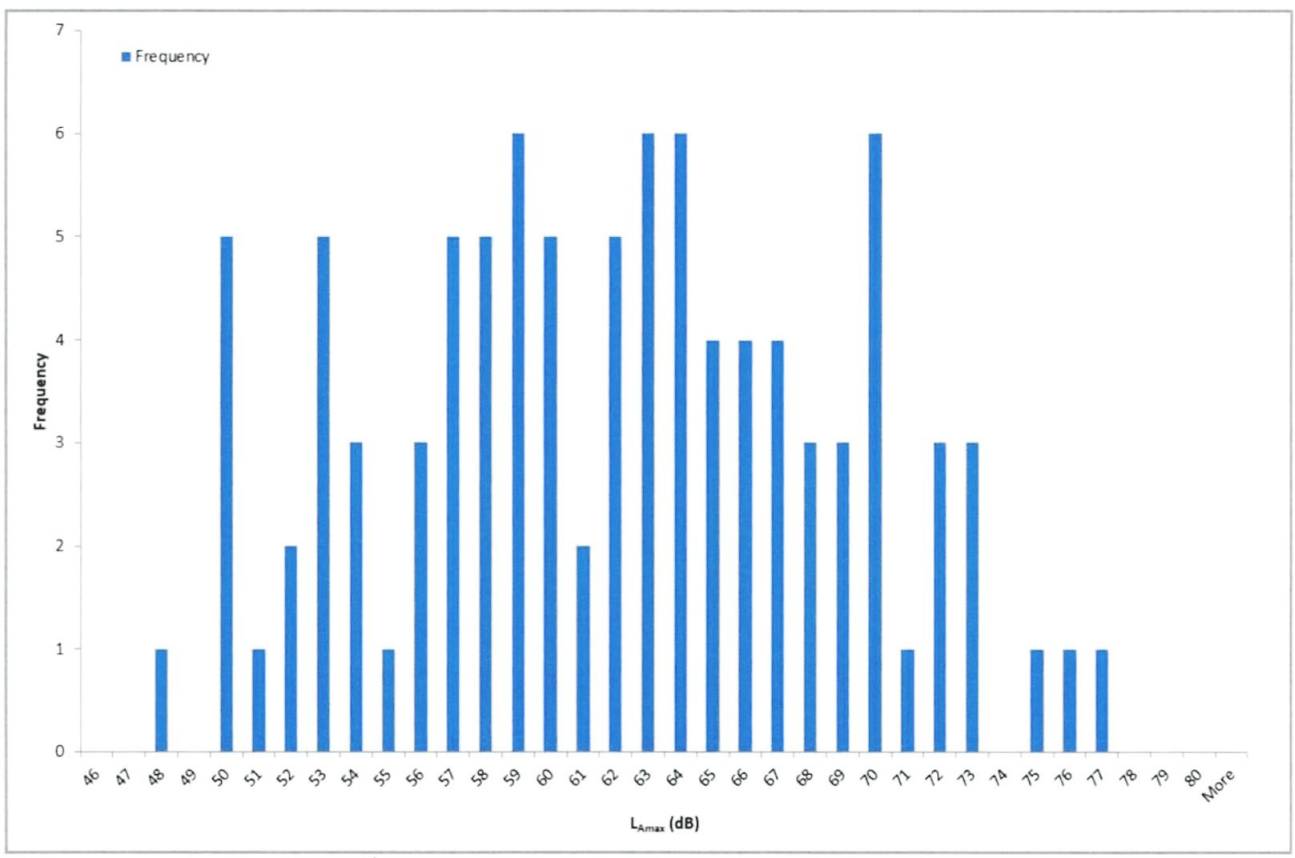

Figure 12-4: Review of L_{AFmax} Events over Night-time Periods

These L_{Amax} levels will be discussed in detail in subsequent sections of this assessment.

No significant level of vibration was noted at this location during setup and removal of the equipment from site.

12.3.5.2 Location B

Table 12-9 presents the results of the noise monitoring completed at Location E.

Table 12.9: Noise Monitoring Results Location B

Date	Time	dB $L_{Aeq(T)}$	L_{Amax}	dB $L_{A90(T)}$
02/12/2021	11:27	58	71	55
	12:02	57	71	55

	12:40	57	67	54
	00:28	56	68	50
	01:04	51	59	48
	01:40	50	58	47

During the day period, a low level of construction noise was audible from nearby sites. The M50, local traffic and aircraft noise were noted here along with traffic activities related to Covid centre in the Sports Surgery Centre. Noise levels were the order of 57 – 58 dB $L_{Aeq,15min}$ and 54 – 55 dB $L_{A90,15min}$.

During the night period, the M50, local traffic and aircraft noise were noted here. Noise levels were the order of 50 – 56 dB $L_{Aeq,15min}$ and 47 – 50 dB $L_{A90,15min}$.

12.3.5.3 Location C

Table 12.10 presents the results of the noise monitoring completed at Location F.

Table 12.10: Noise Monitoring Results Location C

Date	Time	dB $L_{Aeq(T)}$	L_{Amax}	dB $L_{A90(T)}$
02/12/2021	11:45	58	72	56
	12:19	59	69	54
	13:00	55	74	53
	00:45	50	57	49
	01:22	50	57	48
	01:58	51	65	46

During the day period a low level of construction noise was audible from nearby sites. The M50, local traffic and aircraft noise were noted here along with traffic activities related to Covid centre in the Sports Surgery Centre. Noise levels were the order of 55 – 59 dB $L_{Aeq,15min}$ and 53 – 56 dB $L_{A90,15min}$.

During the night period, the M50, local traffic and aircraft noise were noted here. Noise levels were the order of 50 – 51 dB $L_{Aeq,15min}$ and 46 – 49 dB $L_{A90,15min}$.

12.3.5.4 Location D

Table 12.11 presents the results of the noise monitoring completed at Location D.

Table 12.11: Noise Monitoring Results Location D

Date	Time	dB $L_{Aeq(T)}$	L_{Amax}	dB $L_{A90(T)}$
6/1/23	11:40	51	60	50
	12:57	51	63	49
	14:13	50	60	48

A low level of construction noise from nearby sites, M50 and local road traffic and aircraft noise were noted here. Noise levels were the order of 50 – 51 dB $L_{Aeq,15min}$ and 48 – 50 dB $L_{A90,15min}$.

No significant level of vibration was noted at this location during setup and removal of the equipment from site.

12.3.5.5 Location E

Table 12.12 presents the results of the noise monitoring completed at Location E.

Table 12.12: Noise Monitoring Results Location E

Date	Time	dB $L_{Aeq(T)}$	L_{Amax}	dB $L_{A90(T)}$
6/1/23	12:00	52	70	50
	13:18	52	69	48
	14:35	50	63	47

A low level of construction noise from nearby sites, M50 and local road traffic and aircraft noise were noted here. Noise levels were the order of 50 – 52 dB $L_{Aeq,15min}$ and 47 – 50 dB $L_{A90,15min}$.

No significant level of vibration was noted at this location during setup and removal of the equipment from site.

12.3.5.6 Location F

Table 12.13 presents the results of the noise monitoring completed at Location F.

Table 12.13: Noise Monitoring Results Location F

Date	Time	dB $L_{Aeq(T)}$	L_{Amax}	dB $L_{A90(T)}$
6/1/23	12:18	56	68	50
	13:36	56	70	50
	14:53	57	69	51

A low level of construction noise from nearby sites, M50 and local road traffic and aircraft noise were noted here. Noise levels were the order of 56 – 57 dB $L_{Aeq,15min}$ and 50 – 51 dB $L_{A90,15min}$.

No significant level of vibration was noted at this location during setup and removal of the equipment from site.

12.3.5.7 Location G

Table 12.14 presents the results of the noise monitoring completed at Location G.

Table 12.14: Noise Monitoring Results Location G

Date	Time	dB $L_{Aeq(T)}$	L_{Amax}	dB $L_{A90(T)}$
6/1/23	12:37	51	66	49
	13:55	54	85	50
	15:11	53	75	48

A low level of construction noise from nearby sites, M50 and local traffic and aircraft noise were noted here along with activities associated with nearby retail operations. Noise levels were in the range of 51 to 54 dB $L_{Aeq,15min}$ and 48 to 50 dB $L_{A90,15min}$.

No significant level of vibration was noted at this location during setup and removal of the equipment from site.

12.4 Impact Assessment

The proposed development comprises residential apartments; a full description of the development can be found in **Chapter 5** (Project Description) of Volume 2 of this EIAR

The potential noise and vibration impact on the surroundings are considered for both the construction and operational phases of this development.

During the construction phase, the main site activities will include site clearance, foundation works, building construction, road works, and landscaping. This phase has the greatest potential noise and vibration impacts on its surrounding environment, however this phase will be of short-term impact.

During the operational phase of the development, the primary source of outward noise in the operational context relates to any changes in traffic flows along the local road network and building services noise associated with commercial and office spaces.

The potential associated with each phase is assessed in the following sections.

12.4.1 Do Nothing

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 and vibration levels measured/noted during the baseline studies are considered representative of the Do-Nothing scenario. The Do-Nothing scenario is therefore considered neutral impact.

12.4.2 Construction Phase

12.4.2.1 Construction Noise

A variety of items of plant will be in use for the purposes site clearance and construction. The type and number of equipment will vary between the varying construction phases depending on the phasing of the works. There will be vehicular movements to and from the site that will make use of existing roads. Due to the nature of these activities, there is potential for the generation of elevated levels of noise.

The closest noise-sensitive locations to the main building works will be the residential units to the north of the site which are at a distance of approximately 15m from the potential construction works. Additionally, office blocks are located approximately 10m to the south of the site. This distance relates to the closest boundary to the nearest residential noise-sensitive locations. The remainder of works will take place across the site at varying distances of up to 150m from nearby sensitive receptors. Reference to the noise baseline survey results (**Section 12.3.5**) and guidance contained in BS 5228 Part 1 for construction noise levels presented in **Table 12.1**, the threshold for significance from constriction activities is set as follows for the closest residential noise-sensitive locations:

Significance Category – A:

- Daytime (08:00 – 19:00hrs)/ Saturdays (08:00 – 14:00hrs): **65 dB $L_{Aeq,T}$**
- Evening and Weekends: **55 dB $L_{Aeq,1hr}$**

An appropriate construction noise limit at the nearest commercial buildings is considered to be **75dB $L_{Aeq,1hr}$.**

For site clearance, building construction works and landscaping works (excavators, loaders, dozers, concreting works, mobile cranes, generators), noise source levels are quoted in the range of 70 to 80dB L_{Aeq} at distances of 10m within BS 5228-1. For the purposes of this assessment, a combined sound power value of 115dB L_w(A) has been used for construction noise calculations. This would include, for example, 5 no. items of construction plant with a sound pressure level of 80dB L_{Aeq} at 10m operating simultaneously along the closest works boundary.

Given the type and number of construction equipment will vary over the course of the construction phase, noise levels have been calculated at the closest noise-sensitive locations assuming the construction noise levels and distances noted above. For the purpose of the assessment, a standard site hoarding of 2.4m high has been included in the calculations for noise-sensitive boundaries. The calculations also assume that the equipment will operate for 66% of the working time. **Table 12-15** summarises the result of this assessment.

Table 12.15: Indicative Construction Noise Levels at Nearest Noise Sensitive Locations