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24th March 2020

Independent Planning Commission
Level 3, 201 Elizabeth St,
Sydney, NSW 2000

Dear Independent Planning Commission,

Subject: **Pedestrian Wind Environment Study for the Santa Sophia Catholic College Project**

In response to the IPC panel query regarding the undertaking of an independent wind analysis/modelling, please find attached a Pedestrian Wind Environment Study that was conducted by Windtech on the Santa Sophia Catholic College design, dated 30th January 2020.

Initial modelling was conducted in July 2019 on the outdoor decks, which incorporated learning and play spaces and found several areas that required wind mitigation treatments to ensure both comfort and safety criterion were achieved throughout the year.

In response to the results of the initial report and the initial design, the following treatments were proposed by Windtech and implemented into the current design;

- Wind screens at specific locations to combat high wind intensities;
- Inclusion of hedges and trees along sections of the school's boundary on Level 00 and 01; and
- Finalisation of the outdoor deck and learning spaces balustrade to diffuse high winds.

Final modelling was completed that included the treatment measures from the design team with the outcome of this modelling showing that the expected wind conditions based on site location for all outdoor decks and areas are well suited to use as learning and play environments. As such no further treatments were required to mitigate wind impacts and any areas that receive uncomfortable levels of wind following these treatments can be managed through operational management strategies.

The applicant, Catholic Education Diocese of Parramatta have accepted the treatments and the resulting comfort levels of wind and believe the Santa Sophia Catholic College will provide an exceptional learning and play environment for all students throughout the school year.

Yours faithfully,

Kenny Lim

Project Manager, TSA Management Pty Ltd

Attachments: Windtech Pedestrian Wind Environmental Study – WE759-02F02 (rev1)

PEDESTRIAN WIND ENVIRONMENT STUDY

SANTA SOPHIA CATHOLIC COLLEGE

WE759-02F02(REV1)- WE REPORT

JANUARY 30, 2020

Prepared for:

TSA Management Pty Ltd

Level 15, 207 Kent Street,
Sydney NSW 2000

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DOCUMENT CONTROL

Date	Revision History	Issued Revision	Prepared By (initials)	Instructed By (initials)	Reviewed & Authorised by (initials)
January 23, 2020	Update to WE759-02F01, with inclusion of treatment testing results	0	PT	SWR	HK
January 30, 2020	Update to in-principle treatment recommendations	1	PT	SWR	HK

EXECUTIVE SUMMARY

This report presents the results of a detailed investigation into the wind environment impact of the development of the Santa Sophia Catholic College, located at Box Hill North, New South Wales. Testing was performed at Windtech's boundary layer wind tunnel facility. The wind tunnel has a 3.0m wide working section and a fetch length of 14m, and measurements were taken from 16 wind directions at 22.5 degree increments. Testing was carried out using a 1:300 detailed scale model of the development. The effects of nearby buildings and land topography have been accounted for through the use of a proximity model which represents an area with a radius of 375m.

Peak gust and mean wind speeds were measured at selected critical outdoor trafficable locations within and around the subject development. Wind velocity coefficients representing the local wind speeds are derived from the wind tunnel and are combined with a statistical model of the regional wind climate (which accounts for the directional strength and frequency of occurrence of the prevailing regional winds) to provide the equivalent full-scale wind speeds at the site. The wind speed measurements are compared with criteria for pedestrian comfort and safety, based on Gust-Equivalent Mean (GEM) and annual maximum gust winds, respectively.

The model was tested in the wind tunnel without the effect of any forms of wind ameliorating devices such as screens, balustrades, etc., which are not already shown in the architectural drawings. The effect of vegetation was also excluded from the testing.

The results of the study indicate that wind conditions for the majority of trafficable outdoor locations within and around the development will be suitable for their intended uses, with the inclusion of the following treatments which have been tested in the wind tunnel:

- Inclusion of 12 metre high densely foliating evergreen trees to the west of Building Central and to the east of Building North on Level 00.
- Inclusion of 1.8 metre high hedges to the east of Building North, to the west of Building Central and to the west of Building North on Level 00.
- Retention of the gate at the north-eastern corner of Building North on Level 00.
- Inclusion of a 1.8 metre high screen with a maximum porosity of 50% between Building Central and Building North on Level 00.
- Inclusion of 12 metre high densely foliating evergreen trees to the south and east of Building South on Level 01.
- Inclusion of 1.8 metre high hedges to the south of Building South on Level 01.
- Inclusion of 1.8 metre high shrubs to the south of Building South on Level 01.
- Inclusion of a 1.8 metre high screen with a maximum porosity of 50% to the north of Building South on Level 01.
- Inclusion of full height impermeable screens between Building South and Building Central, and between Building Central and Building North on Level 01.

- Inclusion of 1.2 metre high vertical fin balustrades on the western aspect of the development between Building South and Building Central, and between Building Central and Building North on Levels 02 and 03.
- Inclusion of full height screens between Building South and Building Central, and between Building Central and Building North on Level 02 and 03.
- Inclusion of a full height curved impermeable to maximum 30% porosity screen between Building Central and Building North on Levels 02 and 03.
- Inclusion of 1.2 metre high vertical fin balustrades on the western aspect of the development between Building South and Building Central on Level 04.
- Inclusion of full height screens between Building South and Building Central, and between Building Central and Building North on Level 04.
- Inclusion of a 2.0 metre high impermeable screen to extend along the western aspect of Building North on Level 04.
- Inclusion of 1.2 metre high vertical fin balustrades on the western aspect of the development between Building South and Building Central on Level 05
- Inclusion of full height screens between Building South and Building Central, and to the north of Building Central on Level 05.

Note that the tested full-height impermeable screens on Levels 1-5 can have, in principle, a maximum porosity of 30%. With the inclusion of these proposed treatments to the final design, it is expected that wind conditions for all outdoor trafficable areas within and around the development will be suitable for their intended uses.

CONTENTS

1 INTRODUCTION

A wind tunnel study has been undertaken to assess wind speeds at selected critical outdoor trafficable areas within and around the subject development. The test procedures followed for this wind tunnel study were based on the guidelines set out in the Australasian Wind Engineering Society Quality Assurance Manual (AWES-QAM-1-2019), ASCE 7-16 (Chapter C31), and CTBUH (2013).

A scale model of the development was prepared, including the surrounding buildings and land topography. Testing was performed at Windtech's boundary layer wind tunnel facility. The wind tunnel has a 3.0m wide working section and a fetch length of 14m, and measurements were taken from 16 wind directions at 22.5 degree increments. The wind tunnel was configured to the appropriate boundary layer wind profile for each wind direction. Wind speeds were measured using Dantec hot-wire probe anemometers, positioned to monitor wind conditions at critical outdoor trafficable areas of the development.

The model was tested in the wind tunnel without the effect of any forms of wind ameliorating devices such as screens, balustrades, etc., which are not already shown in the architectural drawings. The effect of vegetation was also excluded from the testing. The wind speeds measured during testing were combined with a statistical model of the regional wind climate to provide the equivalent full-scale wind speeds at the site. The measured wind speeds were compared against appropriate criteria for pedestrian comfort and safety, and in-principle treatments have been recommended for any area which was exposed to strong winds. These treatments could be in the form of retaining vegetation that is already proposed for the site, or including additional vegetation, screens, awnings, etc. Note however that, in accordance with the AWES Guidelines (2014), only architectural elements or modifications are used to treat winds which represent an exceedance of the existing wind conditions and exceed the safety limit.

2 WIND TUNNEL MODEL

Wind tunnel testing was carried out using a 1:300 scale model of the development and surroundings. The study model incorporates all necessary architectural features on the façade of the development to ensure an accurate wind flow is achieved around the model, and was constructed using a Computer Aided Manufacturing (CAM) process to ensure that a high level of detail and accuracy is achieved. The effect of nearby buildings and land topography has been accounted for through the use of a proximity model, which represents a radius of 375m from the development site. Photographs of the wind tunnel model are presented in Figures 1. A plan of the proximity model is provided in Figure 2.

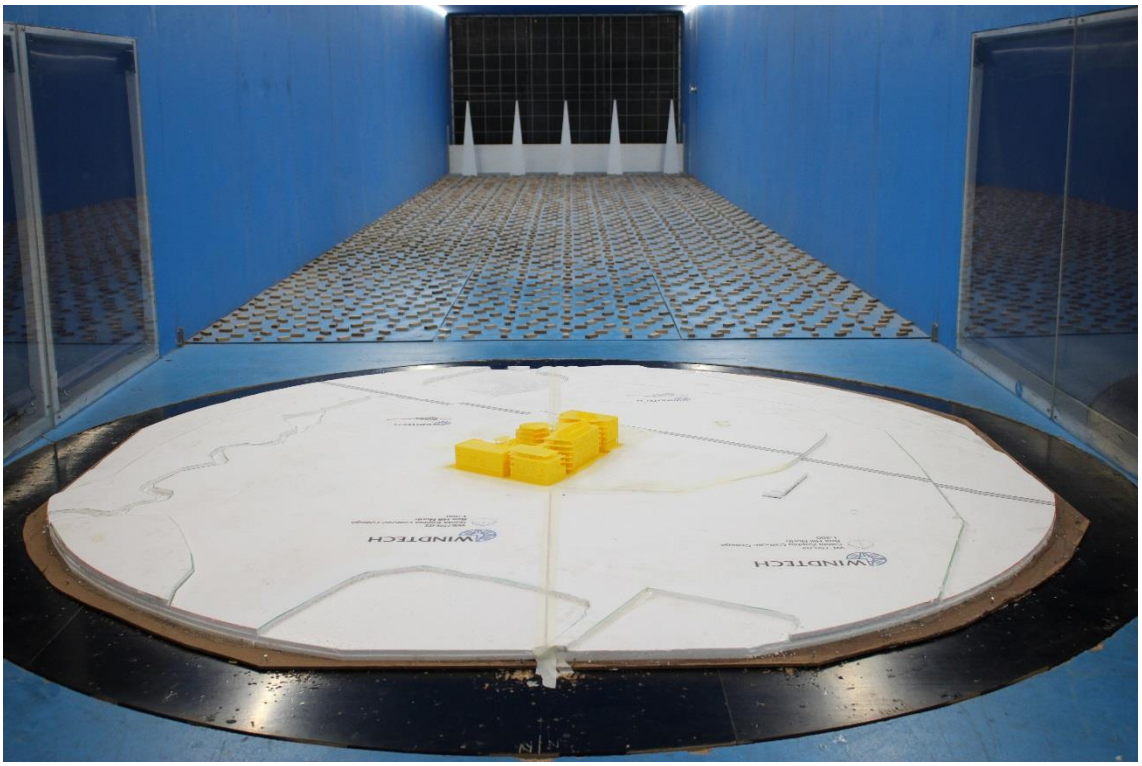

Figure 1a: Photograph of the Wind Tunnel Model (view from the north)

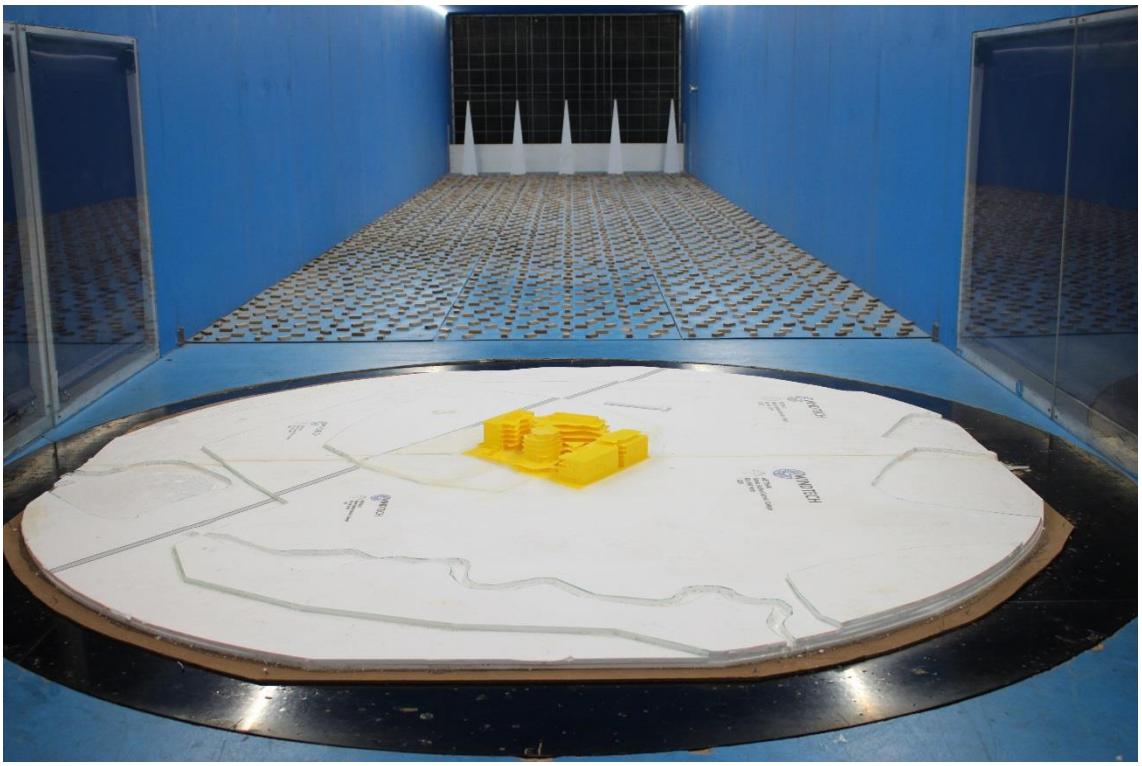

Figure 1b: Photograph of the Wind Tunnel Model (view from the east)

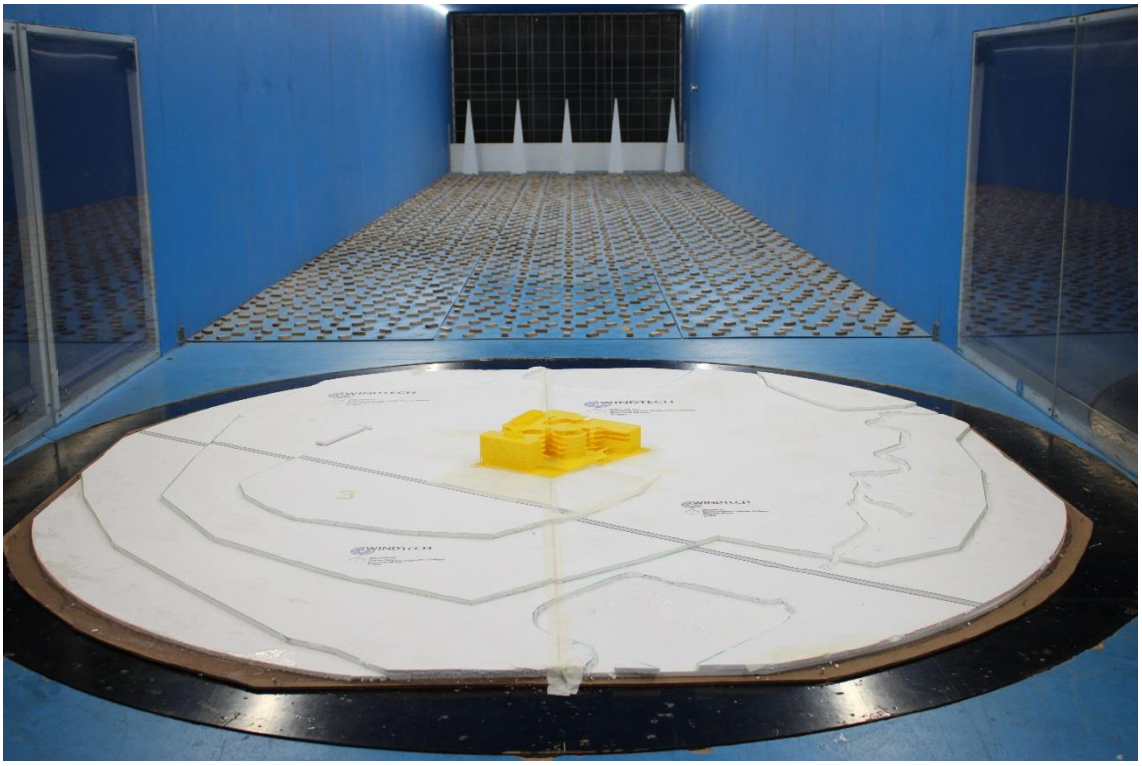

Figure 1c: Photograph of the Wind Tunnel Model (view from the south)

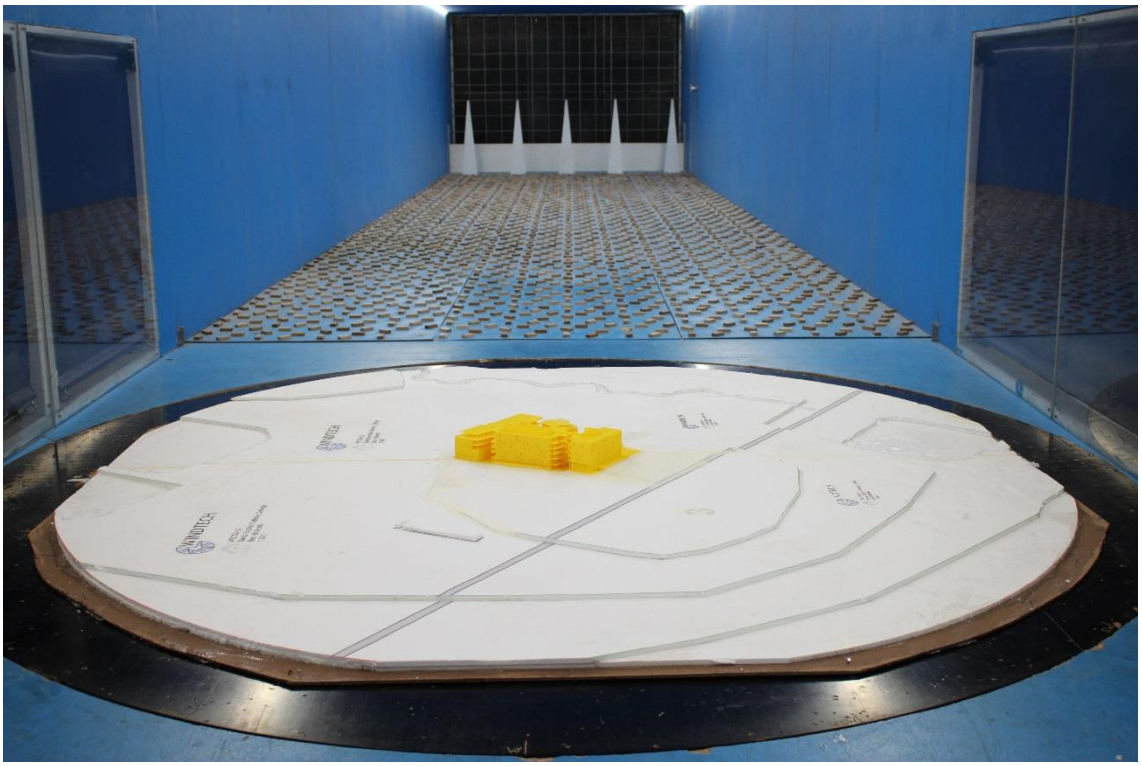

Figure 1d: Photograph of the Wind Tunnel Model (view from the west)

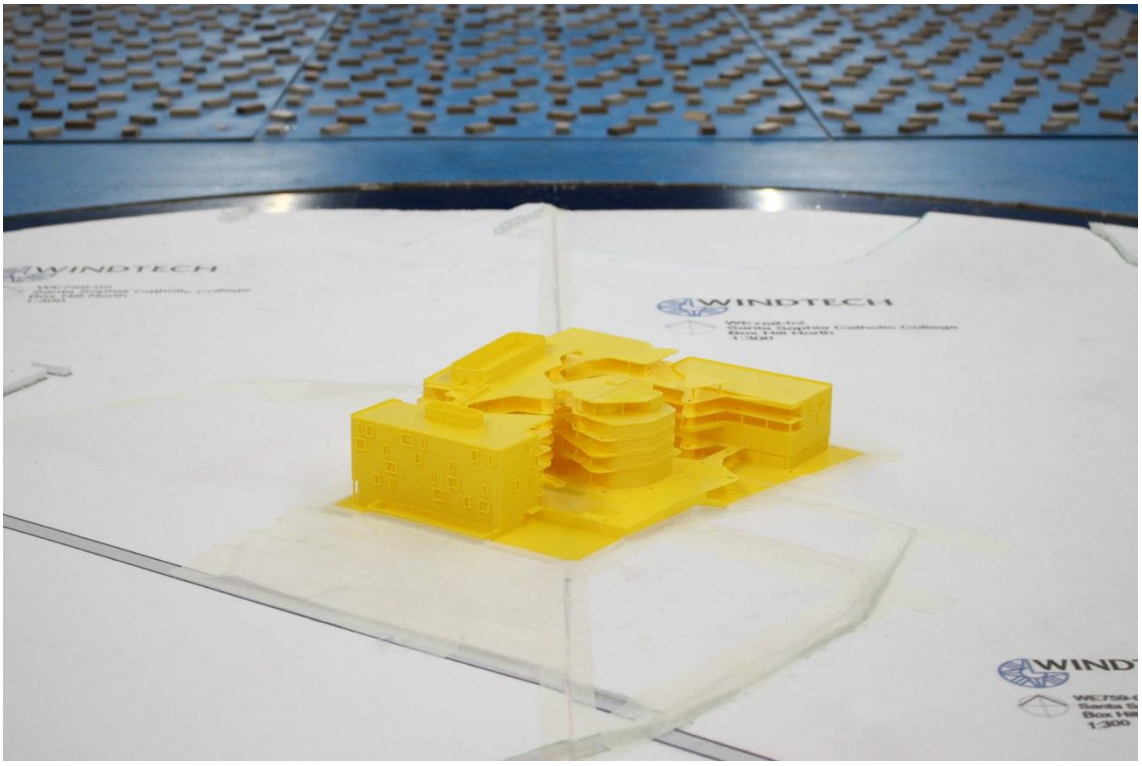

Figure 1e: Photograph of the Wind Tunnel Model (view from the south)

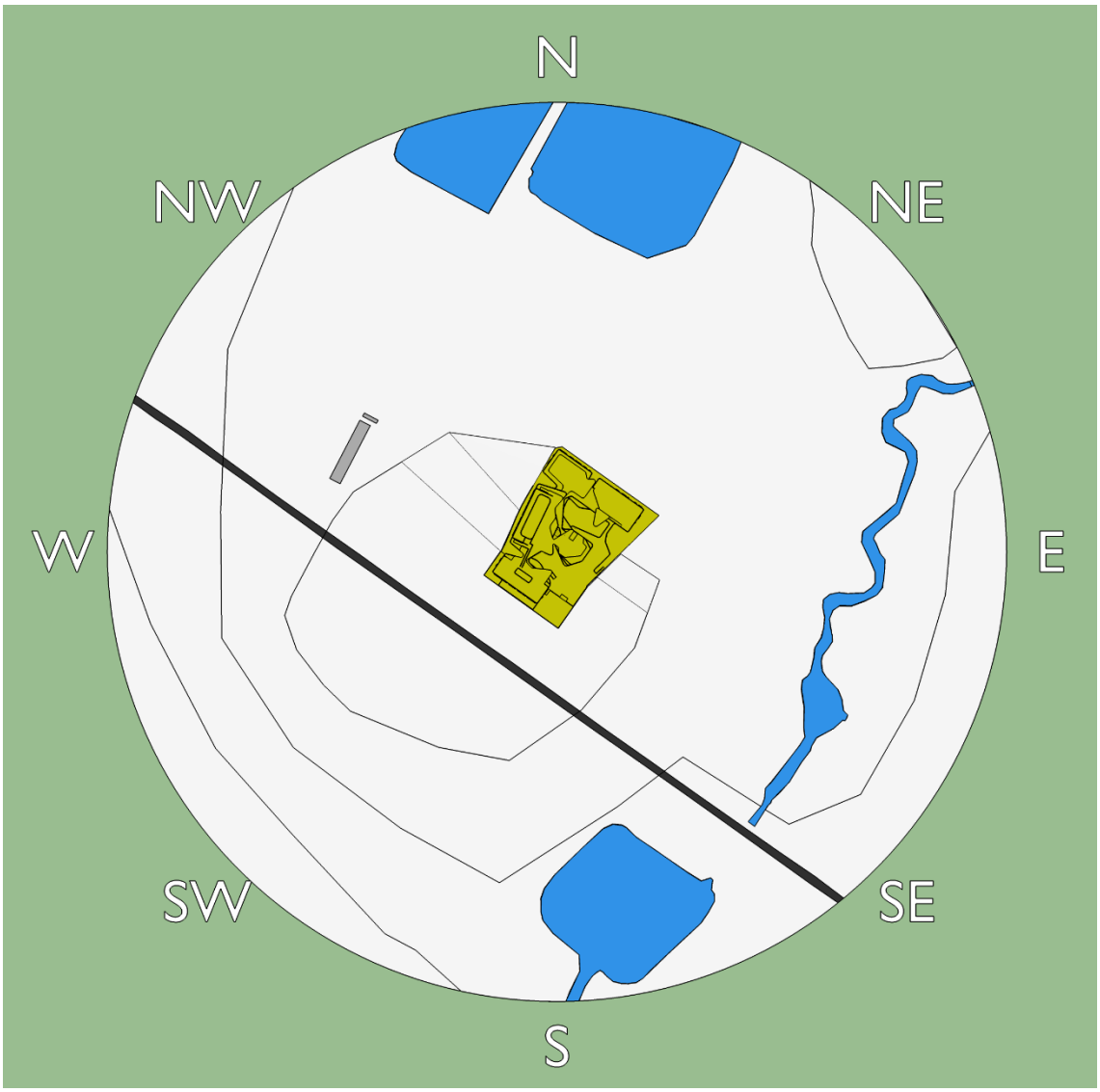

Figure 2: Proximity Model Plan

3 BOUNDARY LAYER WIND PROFILES AT THE SITE

The roughness of the surface of the earth has the effect of slowing down the wind near the ground. This effect is observed up to the boundary layer height, which can range between 500m to 3km above the earth's surface depending on the roughness of the surface (ie: oceans, open farmland, etc). Within this range the prevailing wind forms a boundary layer wind profile.

Various wind codes and standards and other publications classify various types of boundary layer wind flows depending on the surface roughness z_0. Descriptions of typical boundary layer wind profiles, based on Deaves & Harris (1978), are summarised as follows:

- Flat terrain (0.002m < z_0 < 0.003m). Examples include inland water bodies such as lakes, dams, rivers, etc, and the open ocean.
- Semi-open terrain (0.006m < z_0 < 0.01m). Examples include flat deserts and plains.
- Open terrain (0.02m < z_0 < 0.03m). Examples include grassy fields, semi-flat plains, and open farmland (without buildings or trees).
- Semi-suburban/semi-forest terrain (0.06m < z_0 < 0.1m). Examples include farmland with scattered trees and buildings and very low-density suburban areas.
- Suburban/forest terrain (0.2m < z_0 < 0.3m). Examples include suburban areas of towns and areas with dense vegetation such as forests, bushland, etc.
- Semi-urban terrain (0.6m < z_0 < 1.0m). Examples include centres of small cities, industrial parks, etc.
- Urban terrain (2.0m < z_0 < 3.0m). Examples include centres of large cities with many high-rise towers, and also areas with many closely-spaced mid-rise buildings.

The boundary layer wind profile does not change instantly due to changes in the terrain roughness. It can take many kilometres (at least 100km) of a constant surface roughness for the boundary layer wind profile to achieve a state of equilibrium. Hence an analysis of the effect of changes in the upwind terrain roughness is necessary to determine an accurate boundary layer wind profile at the development site location.

For this study this has been undertaken based on the method given in AS/NZS1170.2:2011, which uses a "fetch" length of 60 times the study reference height. However, it should be noted that this "fetch" commences *beyond* a "lag distance" area, which has a length of 20 times the study reference height (in accordance with AS/NZS1170.2:2011), so the actual "fetch" of terrain analysed is the area between 20 and 60 times the study reference height away from the site. The proximity model accounts for the effect of the near field topographic effects as well as the influence of the local built forms.

An aerial image showing the surrounding terrain is presented in Figure 3 for a range of 0.9km from the edge of the proximity model used for the wind tunnel study. The resulting mean and gust terrain and height multipliers at the site location are presented in Table 1, referenced to the study reference height (which is approximately half of the height of the subject development since typically we are most interested in the wind effects at the ground plane). Details of the boundary layer wind profiles at the site are combined with the regional wind model (see Section 4) to determine the site wind speeds.

Table 1: Approaching Boundary Layer Wind Profile Analysis Summary (at the study reference height)

Wind Sector (degrees)	Terrain and Height Multiplier			Turbulence Intensity	Equivalent Terrain Category
	$k_{tr,T=1hr}$ *(hourly)*	$k_{tr,T=10min}$ *(10min)*	$k_{tr,T=3s}$ *(3sec)*	I_v	*(AS/NZS1170.2:2011 naming convention)*
0	0.64	0.68	1.01	0.193	2.3
30	0.59	0.62	0.96	0.217	2.6
60	0.57	0.60	0.95	0.227	2.8
90	0.59	0.62	0.96	0.217	2.6
120	0.59	0.62	0.96	0.217	2.6
150	0.63	0.67	1.00	0.196	2.4
180	0.61	0.65	0.99	0.204	2.5
210	0.54	0.58	0.93	0.239	2.9
240	0.61	0.65	0.98	0.205	2.5
270	0.62	0.65	0.99	0.202	2.5
300	0.66	0.69	1.02	0.187	2.2
330	0.65	0.68	1.01	0.191	2.3

For each of the 16 wind directions tested in this study, the approaching boundary layer wind profiles modelled in the wind tunnel closely matched the profiles listed in Table 1. Plots of the boundary layer wind profiles used for the wind tunnel testing are presented in Appendix D of this report.

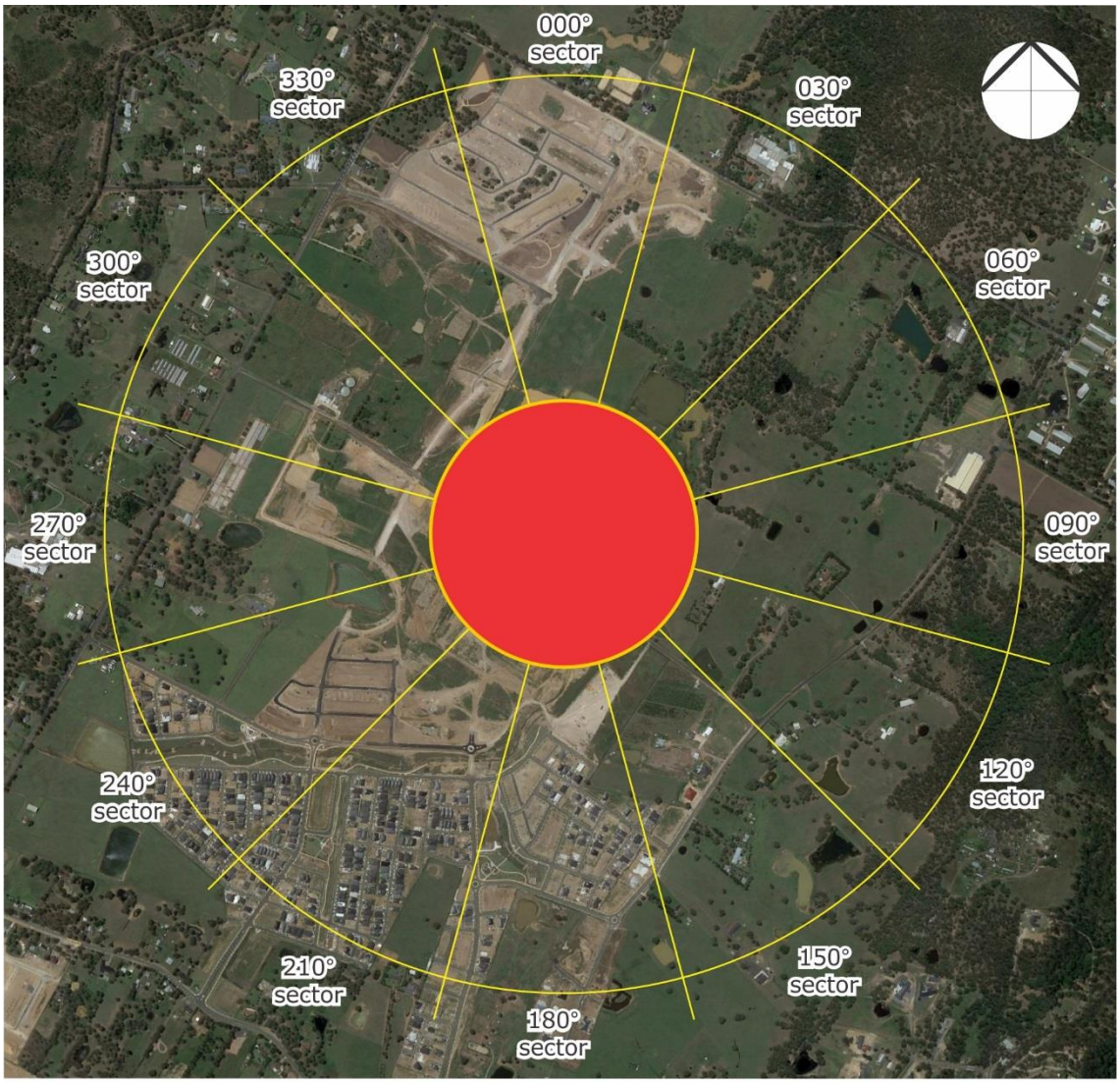

Figure 3: Aerial Image of the Surrounding Terrain
(radius of 0.9km from the edge of the proximity model, which is coloured red)

4 REGIONAL WIND MODEL

The Box Hill/Richmond region is governed by two principal wind directions, and these can potentially affect the subject development. These winds prevail from the southerly sector and the westerly sector. The north-easterly winds are not very strong, however, they have a high frequency of occurrence, and have been taken into consideration.

A summary of the principal time of occurrence of these winds is presented in Table 2 below. This summary is based on a detailed analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological recording station located at Richmond Airport by the Bureau of Meteorology.

Table 2: Principal Time of Occurrence of Winds for the Box Hill / Richmond Region

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
Summer	X	X	
Autumn		X	
Winter		X	X
Spring	X	X	X

The southerly and north-easterly winds are the most frequent winds for the Richmond region, however the westerly winds are the strongest. The westerly winds occur most frequently during the winter season, and they are usually a cold wind hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently during the warmer months of the year for the Richmond region, and are typically not as strong as the southerly or westerly winds.

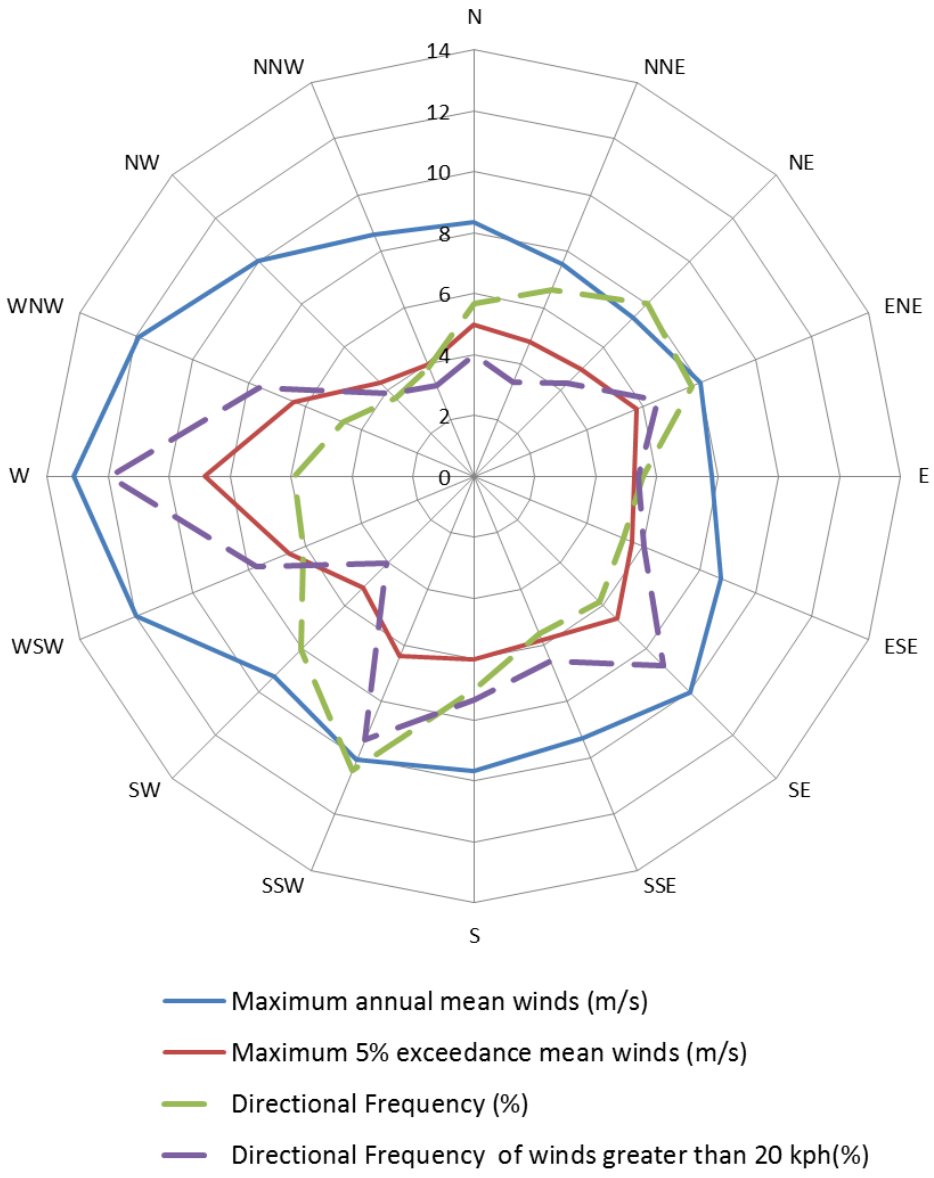

Figure 4: Annual and 5% Exceedance Hourly Mean Wind Speeds, and Frequencies of Occurrence, for the Richmond Region (referenced to 10m above ground in standard open terrain)

5 PEDESTRIAN WIND COMFORT AND SAFETY

The acceptability of wind conditions of an area is determined by comparing the measured wind speeds against an appropriate criteria. This section outlines how the measured wind speeds were obtained, the criteria considered for the development, as well as the critical trafficable areas that were assessed and their corresponding criteria designation.

5.1 Measured Wind Speeds

Wind speeds were measured using Dantec hot-wire probe anemometers, positioned to monitor wind conditions at critical outdoor trafficable areas of the development. The reference mean free-stream wind speed measured in the wind tunnel, which is at a full-scale height of 200m and measured 3m upstream of the study model.

Measurements were acquired for 16 wind directions at 22.5 degree increments using a sample rate of 1,024Hz. The full methodology of determining the wind speed measurements at the site from the Dantec Hot-wire probe anemometers is provided in Appendix B. Based on the results of the analysis of the boundary layer wind profiles at the site (see Section 3), and incorporating the regional wind model (see Section 4), the data sampling length of the wind tunnel test for each wind direction corresponds to a full-scale sample length ranging between 30 minutes and 1 hour. Research by A.W. Rofail and K.C.S. Kwok (1991) has shown that, in addition to the mean and standard deviation of the wind being stable for sample lengths of 15 minutes or more (full-scale), the peak value determined using the upcrossing method is stable for sample lengths of 30 minutes or more.

5.2 Wind Speed Criteria Used for This Study

For this study the measured wind conditions of the selected critical outdoor trafficable areas are compared against two sets of criteria; one for pedestrian safety, and one for pedestrian comfort. The safety criterion is applied to the annual maximum gust winds, and the comfort criteria is applied to Gust Equivalent Mean (GEM) winds. In accordance with ASCE (2003), the GEM wind speed is defined as follows:

$$GEM = max\left(\bar{V}, \frac{\hat{V}}{1.85}\right) \tag{5.1}$$

Where:

$\bar{V}$ is the mean wind speed.

$\hat{V}$ is the 3-second gust wind speed.

For pedestrian safety, the safety limit criterion of 23m/s applies to 3-second duration annual maximum gust winds for all areas, in accordance with W.H. Melbourne (1978).

For pedestrian comfort, the A.G. Davenport (1972) criteria are used in conjunction with the GEM wind speed using a 5% probability of exceedance. Research by A.W. Rofail (2007) has shown that the A.G. Davenport (1972) criteria, used in conjunction with a GEM wind speed, has proven over time and through field observations to be the most reliable indicator of pedestrian comfort. A more detailed comparison of published criteria has been provided in Appendix A.

The criteria considered in this study are summarised in Tables 3 and 4 for pedestrian comfort and safety, respectively. The results of the wind tunnel study are presented in the form of directional plots attached in Appendix C of this report. For each study point there is a plot of the GEM wind speeds using the comfort criteria, and a plot for the annual maximum gust wind speeds using the safety criterion.

Table 3: Comfort Criteria (from A.G. Davenport, 1972)

Classification	Description	Maximum 5% Exceedance GEM Wind Speed (m/s)
Long Exposure	Long duration stationary activities such as in outdoor restaurants and theatres, etc.	3.5
Short Exposure	Short duration stationary activities (generally less than 1 hour), including window shopping, waiting areas, etc.	5.5
Comfortable Walking	For pedestrian thoroughfares, private swimming pools, most communal areas, private balconies and terraces, etc.	7.5

Table 4: Safety Criterion (from W.H. Melbourne, 1978)

Classification	Description	Annual Maximum Gust Wind Speed (m/s)
Safety	Safety criterion applies to all trafficable areas.	23

5.3 Layout of Study Points

For this study a total of 85 study point locations were selected for analysis in the wind tunnel. This includes the following:

- 17 study points on the building entrances and pedestrian thoroughfares of Level 00.
- 20 study points on the building entrances and pedestrian thoroughfares of Level 01
- 7 study points on the building entrances, pedestrian thoroughfares, sitting areas and open play spaces of Level 02
- 11 study points on the building entrances, pedestrian thoroughfares and open play spaces of Level 03
- 14 study points on the building entrances, pedestrian thoroughfares and open play spaces of Level 04
- 16 study points on the building entrances, pedestrian thoroughfares and open play spaces of Level 05

The locations of the various study points tested for this study, as well as the target wind speed criteria for the various outdoor trafficable areas of the development, are presented in Figures 5 in the form of marked-up plans. It should be noted that only the most critical outdoor locations of the development have been selected for analysis.

Figure 5a: Study Point Locations and Target Wind Speed Criteria
Level 00 Plan

Figure 5b: Study Point Locations and Target Wind Speed Criteria
Level 01 Plan

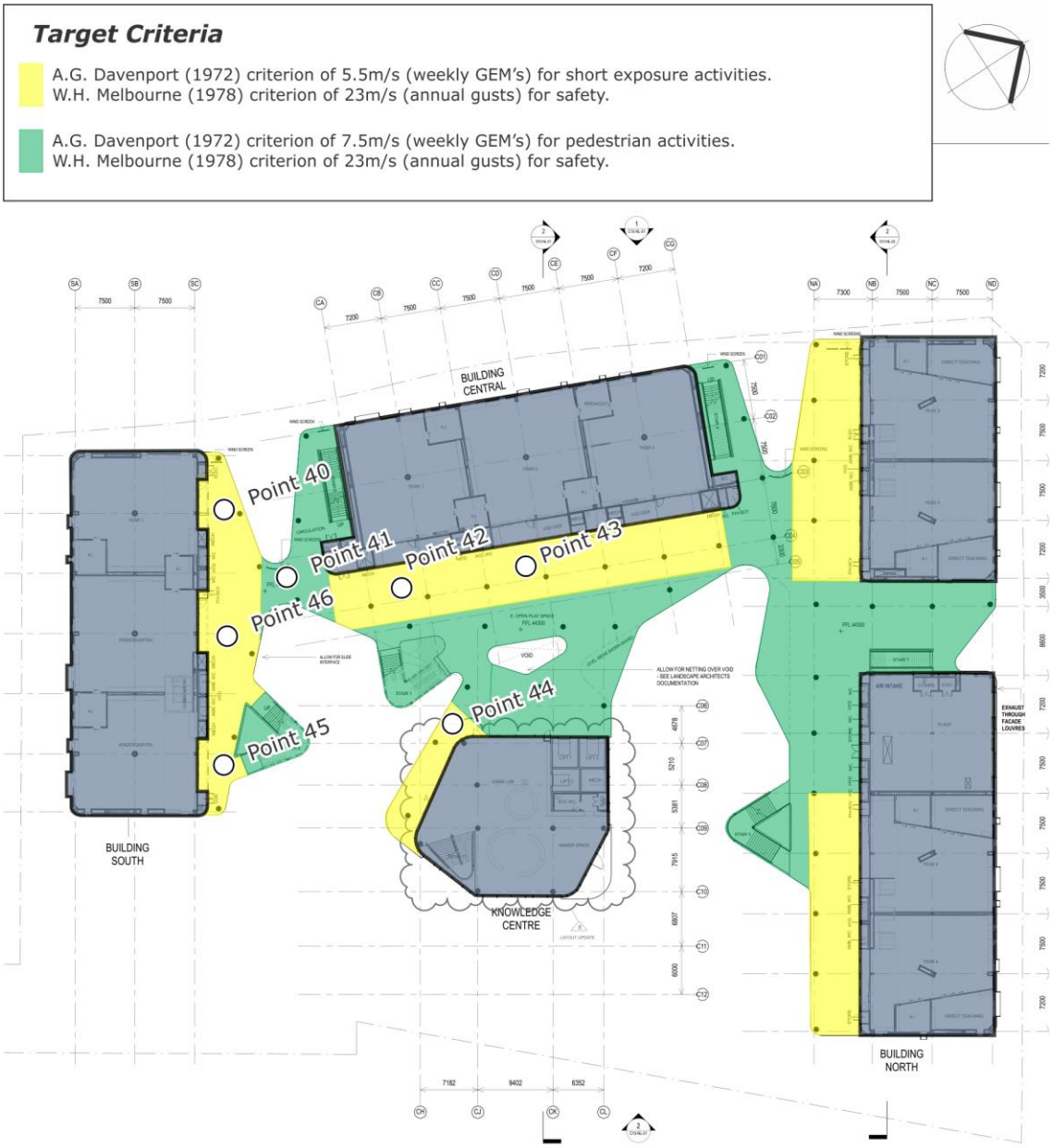

Figure 5c: Study Point Locations and Target Wind Speed Criteria
Level 02 Plan

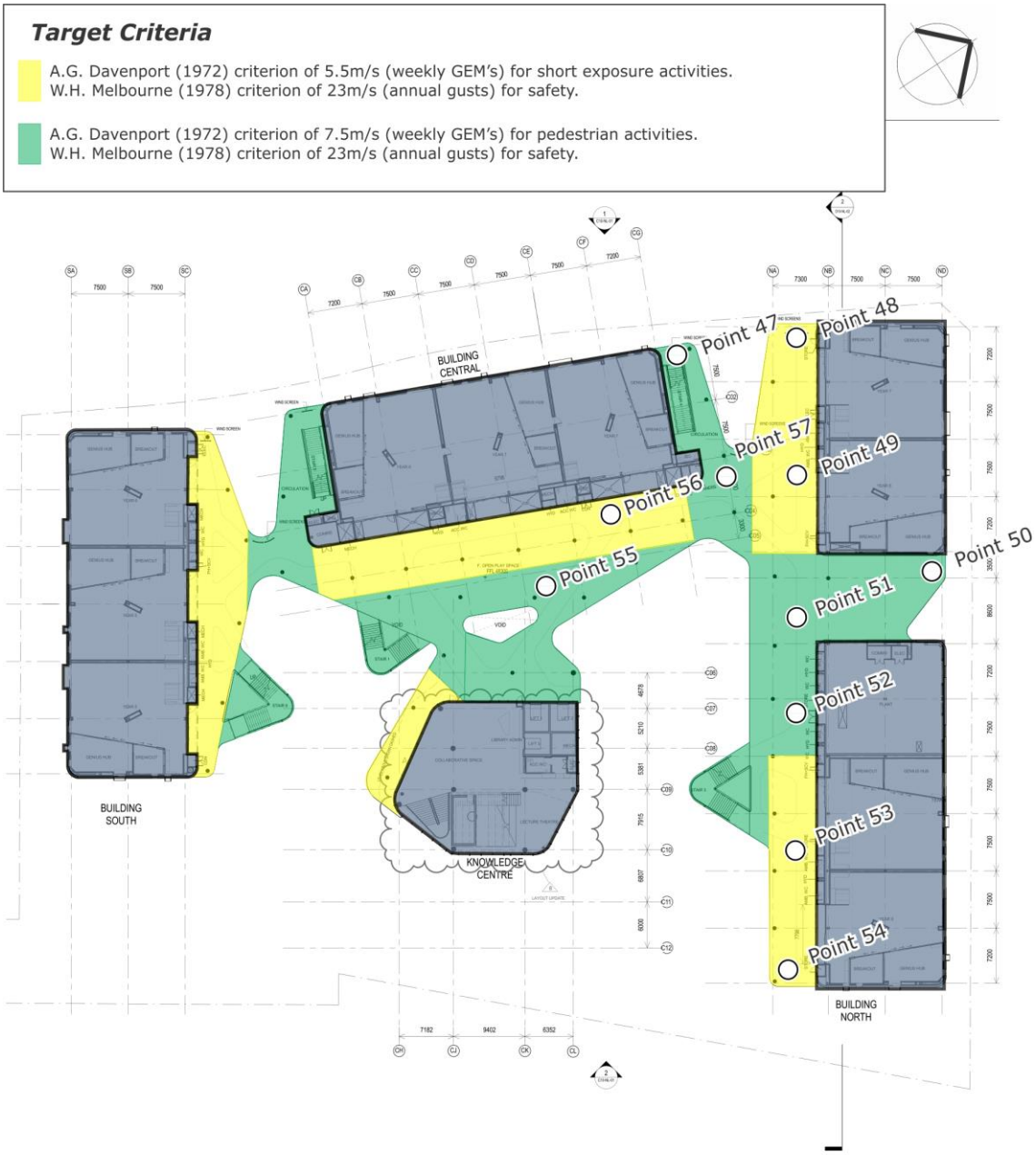

Figure 5d: Study Point Locations and Target Wind Speed Criteria
Level 03 Plan

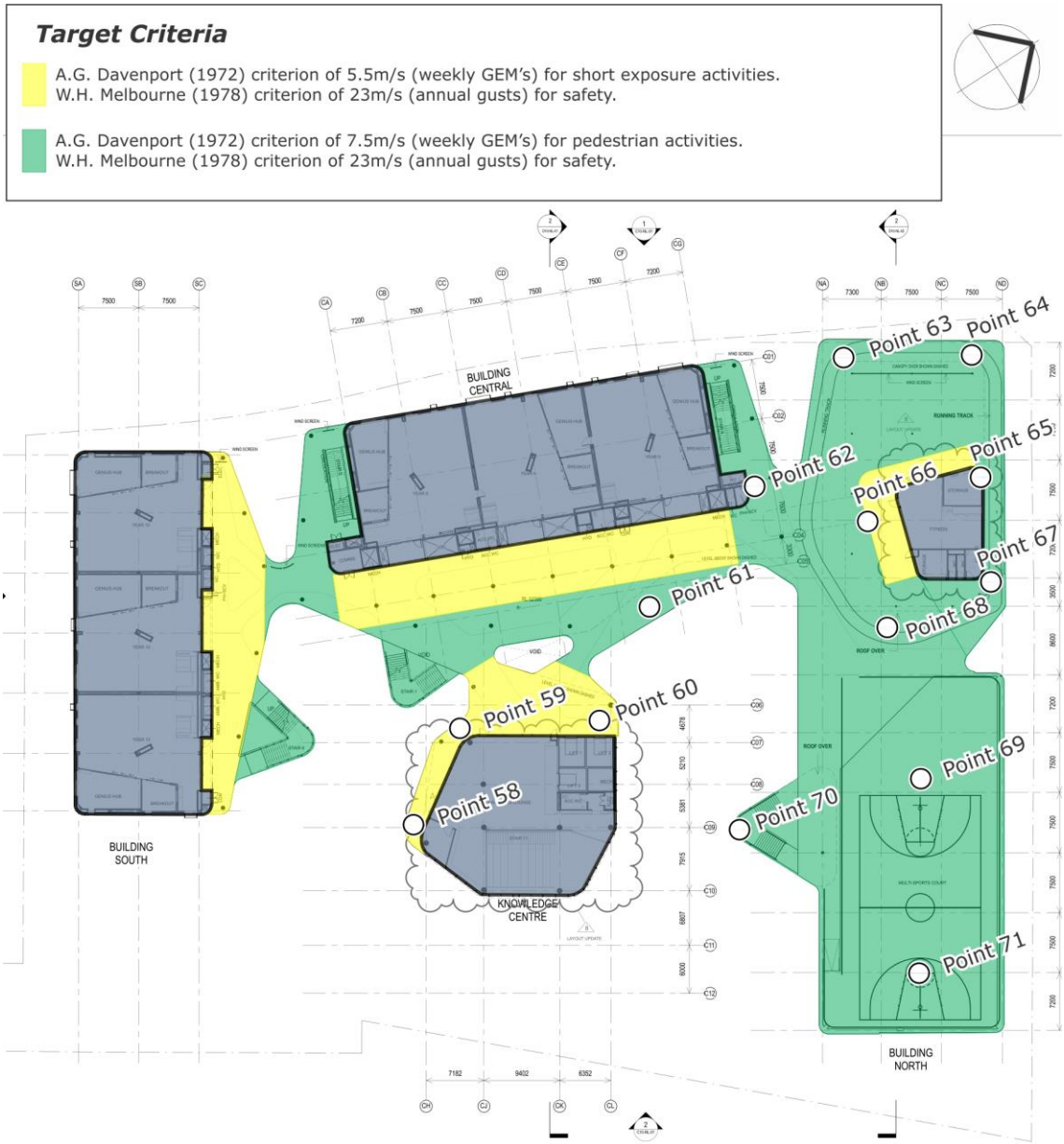

Figure 5e: Study Point Locations and Target Wind Speed Criteria

Level 04 Plan

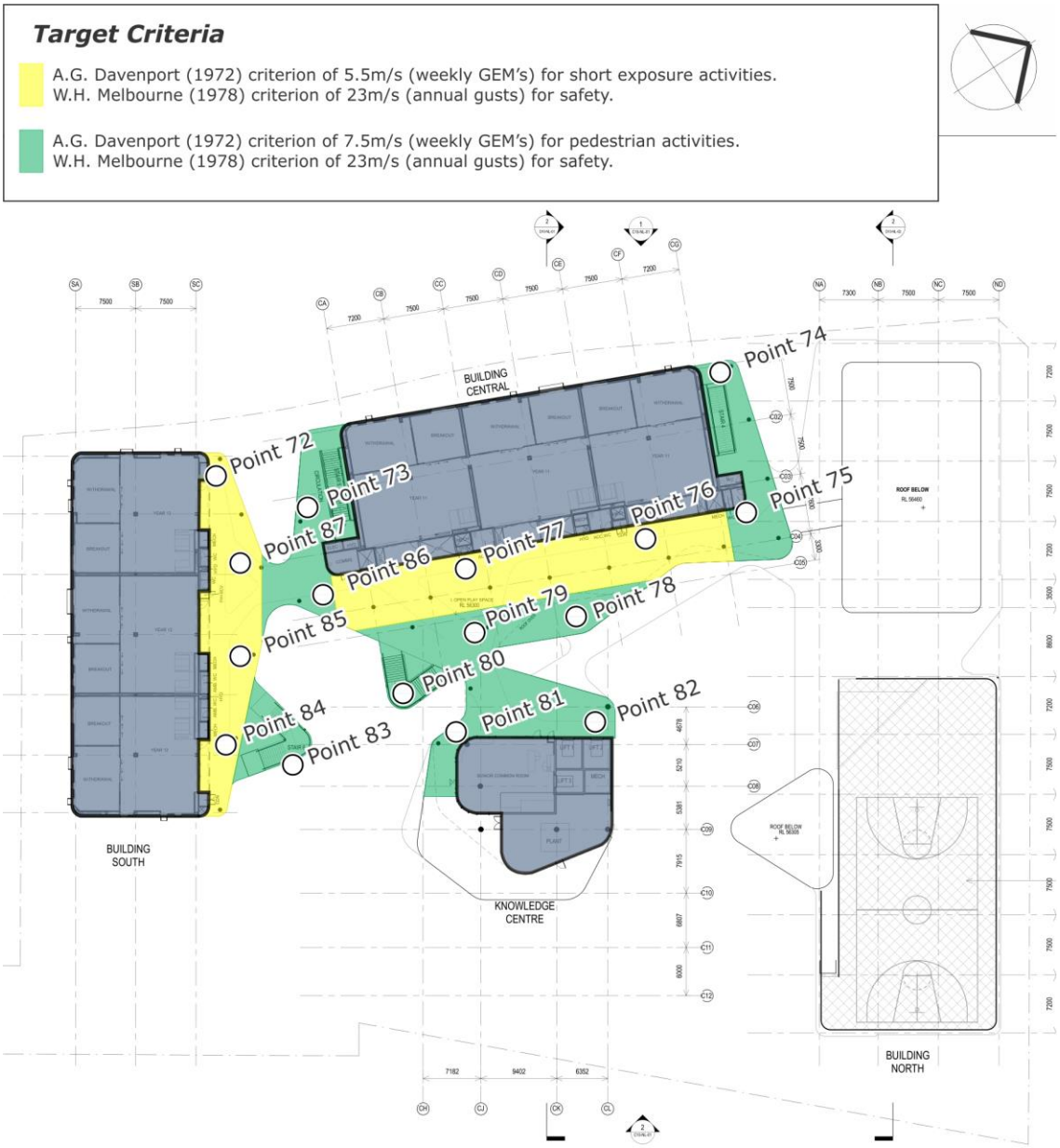

Figure 5f: Study Point Locations and Target Wind Speed Criteria

Level 05 Plan

6 RESULTS AND DISCUSSION

The results of the wind tunnel study are presented in the form of directional plots in Appendix C for all study points locations, summarised in Table 5, and shown on marked-up plans in Figures 6. The wind speed criteria that the wind conditions should achieve are also listed in Table 5 for each study point location, as well as in Figures 5.

The results of the study indicate that wind conditions for the majority of trafficable outdoor locations within and around the development will be suitable for their intended uses, with the inclusion of the following treatments which have been tested in the wind tunnel:

6.1 Level 00

The treatments that have been modelled and tested for this level are the following:

- Inclusion of 12 metre high densely foliating evergreen trees to the west of Building Central and to the east of Building North, as shown in Figure 7a.
- Inclusion of 1.8 metre high hedges to the east of Building North, to the west of Building Central and to the west of Building North, as shown in Figure 7a.
- Based on wind tunnel testing, it is recommended to retain the gate at the north-eastern corner of Building North.
- Inclusion of a 1.8 metre high screen with a maximum porosity of 50% between Building Central and Building North, as shown in Figure 7a.

6.2 Level 01

The treatments that have been modelled and tested for this level are the following:

- Inclusion of 12 metre high densely foliating evergreen trees to the south and east of Building South, as shown in Figure 7b.
- Inclusion of 1.8 metre high hedges to the south of Building South, as shown in Figure 7b.
- Inclusion of 1.8 metre high shrubs to the south of Building South, as shown in Figure 7b.
- Inclusion of a 1.8 metre high screen with a maximum porosity of 50% to the north of Building South, as shown in Figure 7b.
- Inclusion of full height impermeable screens between Building South and Building Central, and between Building Central and Building North, as shown in Figure 7b. These can also in principle be up to a maximum porosity of 30%.

6.3 Level 02 and Level 03

The treatments that have been modelled and tested for this level are the following:

- Inclusion of 1.2 metre high vertical fin balustrades on the western aspect of the development between Building South and Building Central, and between Building Central and Building North, as shown in Figures 7c and 7d.
- Inclusion of full height screens between Building South and Building Central, and between Building Central and Building North, as shown in Figures 7c and 7d. These can also in principle be up to a maximum porosity of 30%.

Based on our wind tunnel analysis, the following in-principle treatment recommendations have been made to provide suitable conditions, and are described as follows:

- Inclusion of a full height curved screen with a maximum porosity of 30% between Building Central and Building North, as shown in Figures 7c and 7d.

6.4 Level 04

The treatments that have been modelled and tested for this level are the following:

- Inclusion of 1.2 metre high vertical fin balustrades on the western aspect of the development between Building South and Building Central, as shown in Figures 7e.
- Inclusion of full height screens between Building South and Building Central, and between Building Central and Building North, as shown in Figure 7e.
- Inclusion of a 2.0 metre high impermeable screen to extend along the western aspect of Building North, as shown in Figure 7e. These can also in principle be up to a maximum porosity of 30%.

6.5 Level 05

The treatments that have been modelled and tested for this level are the following:

- Inclusion of 1.2 metre high vertical fin balustrades on the western aspect of the development between Building South and Building Central, as shown in Figures 7f.
- Inclusion of full height screens between Building South and Building Central, and to the north of Building Central, as shown in Figure 7f. These can also in principle be up to a maximum porosity of 30%.

With the inclusion of these proposed treatments to the final design, it is expected that wind conditions for all outdoor trafficable areas within and around the development will be suitable for their intended uses.

Figure 6a: Wind Tunnel Results – Level 00

Results without Treatments

Figure 6b: Wind Tunnel Results – Level 00
Results with Treatments

Figure 6c: Wind Tunnel Results – Level 01

Results without treatments

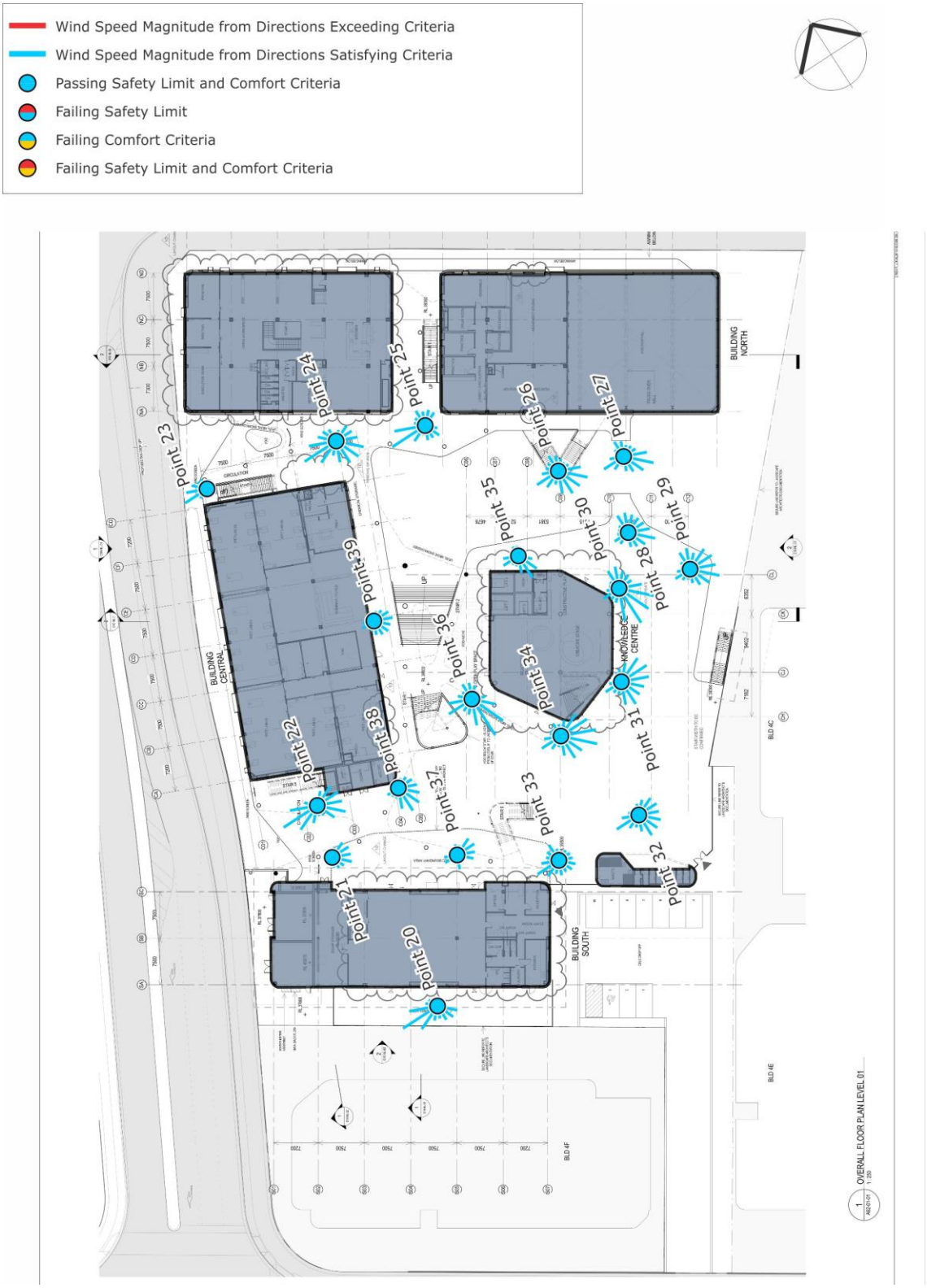

Figure 6d: Wind Tunnel Results – Level 01
Results with Treatments

Figure 6e: Wind Tunnel Results – Level 02

Results without Treatments

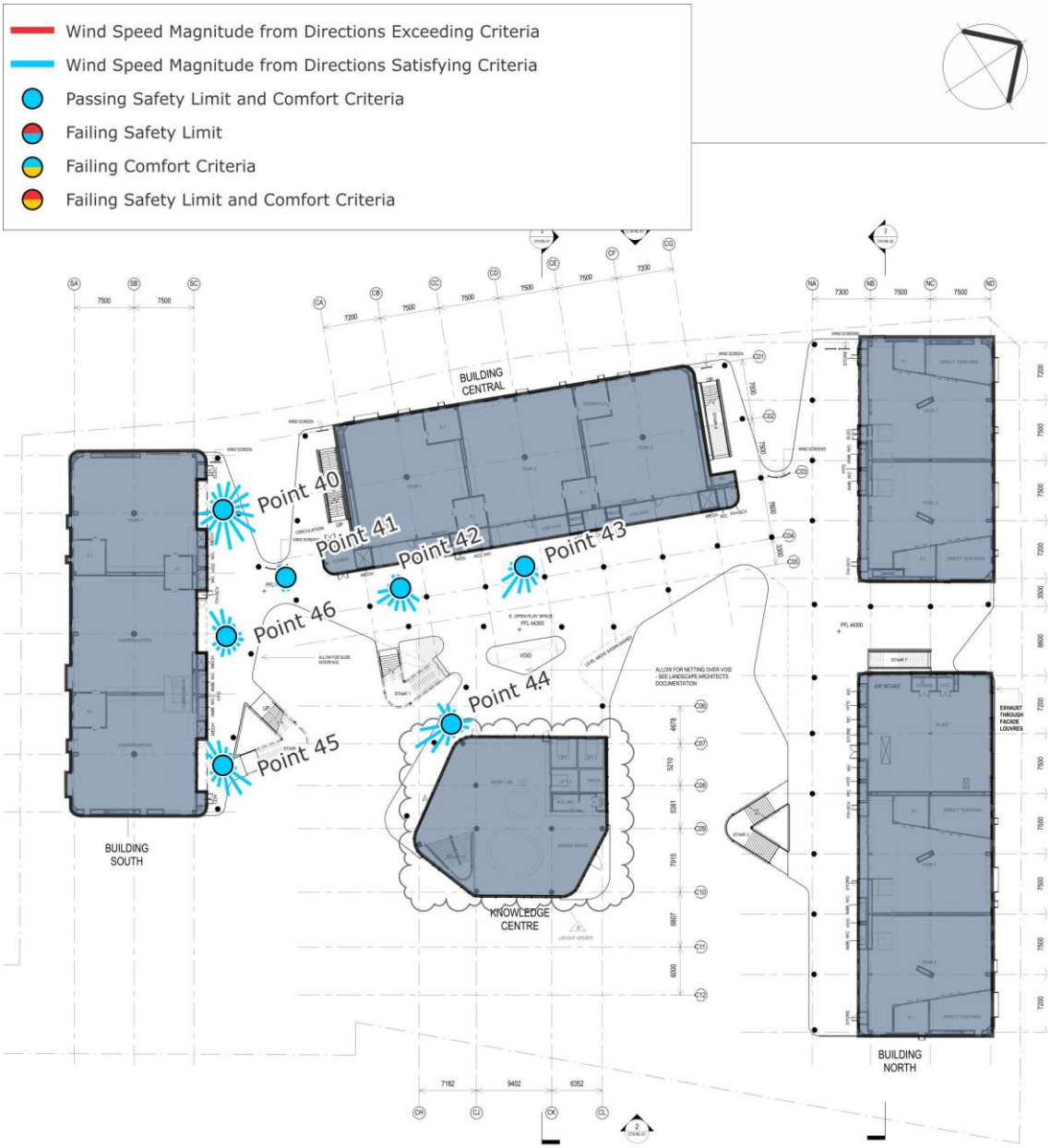

Figure 6f: Wind Tunnel Results – Level 02
Results with Treatments

Figure 6g: Wind Tunnel Results – Level 03

Results without treatments

Figure 6h: Wind Tunnel Results – Level 03

Results with Treatments

Figure 6i: Wind Tunnel Results – Level 04

Results without Treatments

Figure 6j: Wind Tunnel Results – Level 04
Results with Treatments

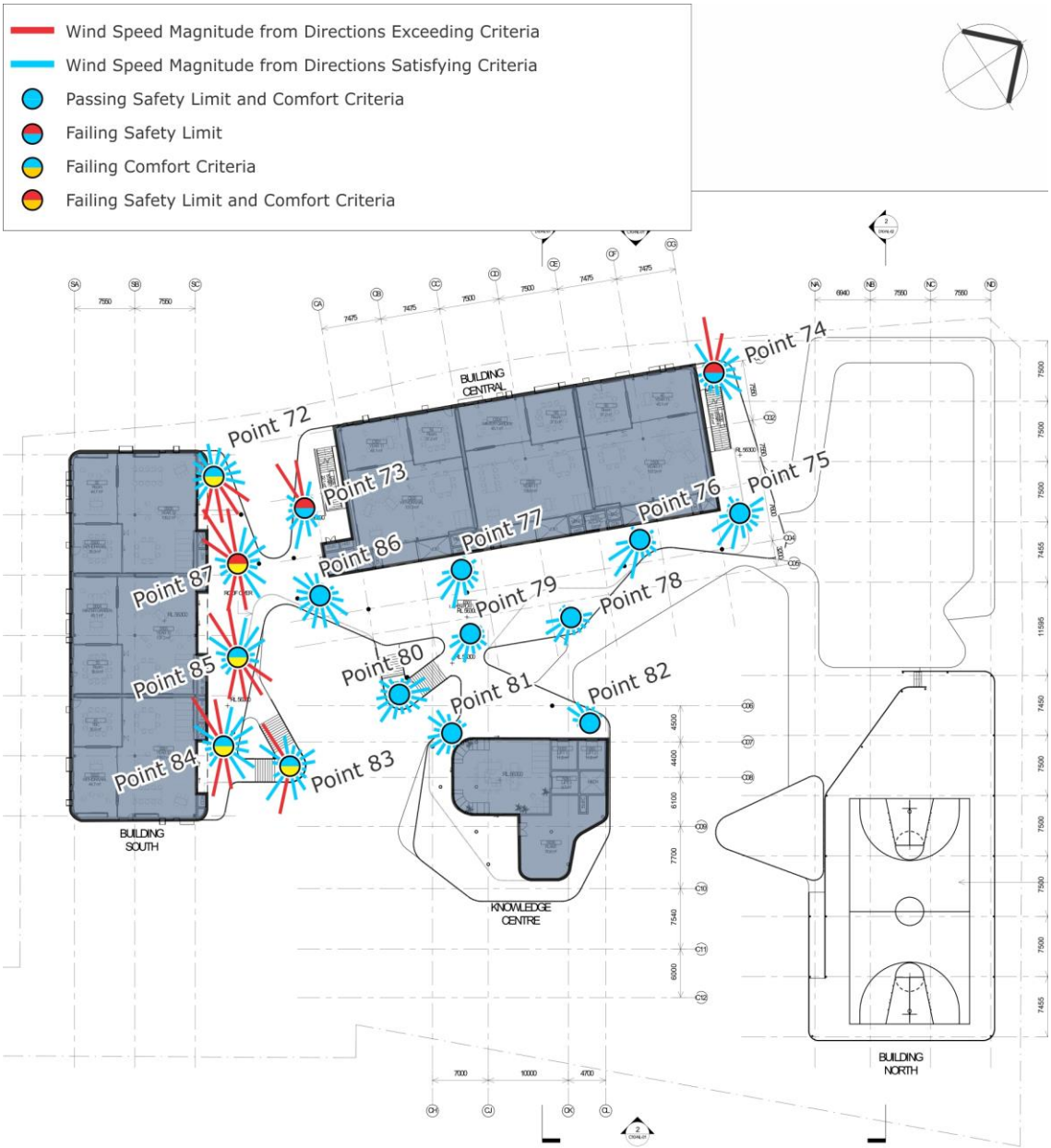

Figure 6k: Wind Tunnel Results – Level 05

Results without treatments

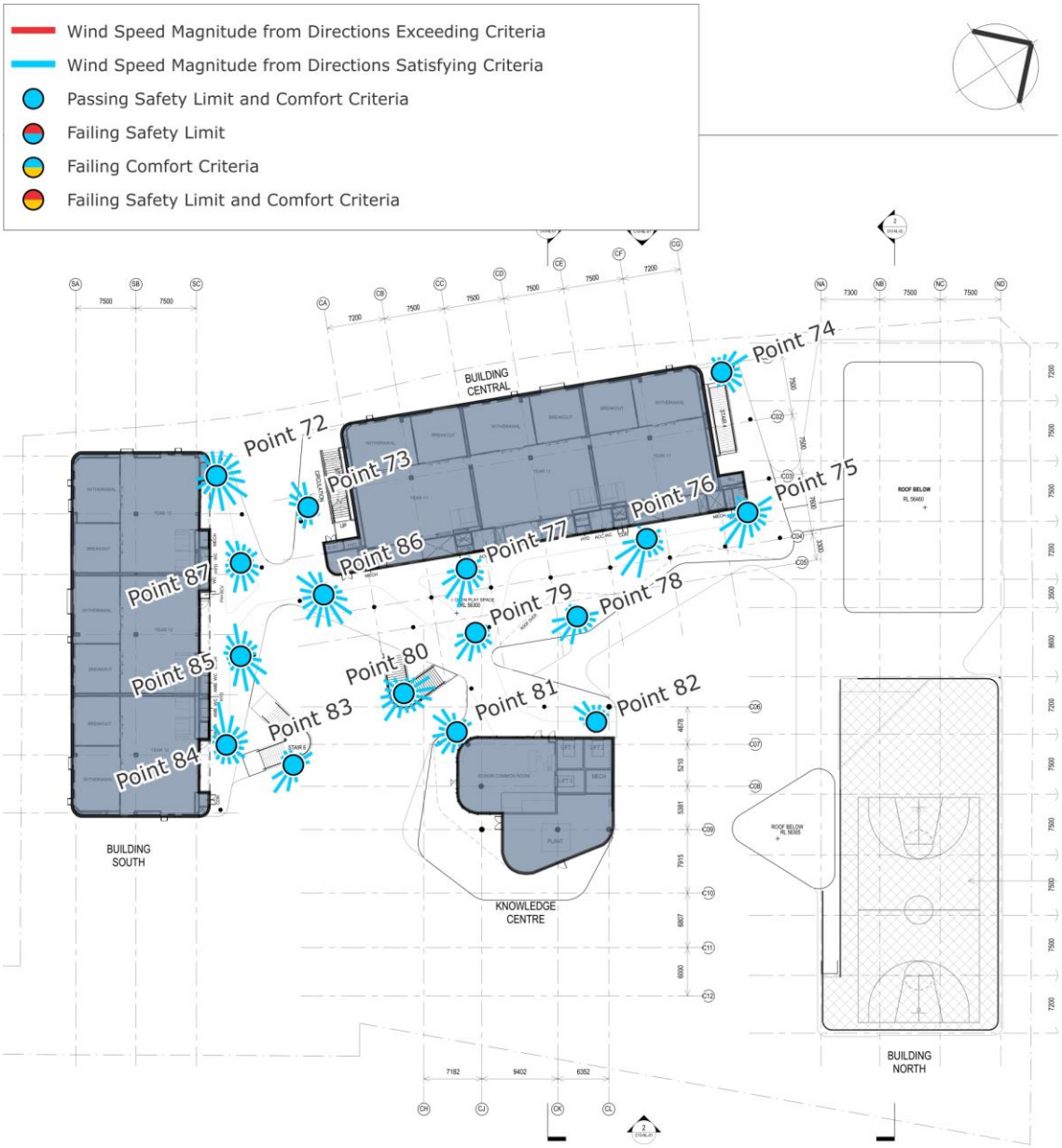

Figure 6I: Wind Tunnel Results – Level 05

Results with Treatments

Table 5: Wind Tunnel Results Summary

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Point 01	7.5	1%	Pass	23	16	Pass	Pass	-
Point 04	7.5	3%	Pass	23	16	Pass	Pass	Refer to Figure 7a.
Point 05	7.5	3%	Pass	23	18	Pass	Pass	Refer to Figure 7a.
Point 06	7.5	3%	Pass	23	15	Pass	Pass	Refer to Figure 7a.
Point 07	7.5	4%	Pass	23	20	Pass	Pass	-
Point 08	7.5	1%	Pass	23	16	Pass	Pass	-
Point 09	7.5	0%	Pass	23	10	Pass	Pass	-
Point 10	7.5	6%	Fail	23	18	Pass	Fail	Refer to Figure 7a.
Point 11	7.5	2%	Pass	23	19	Pass	Pass	-
Point 12	7.5	0%	Pass	23	11	Pass	Pass	-
Point 13	5.5	4%	Pass	23	15	Pass	Pass	-
Point 14	5.5	1%	Pass	23	12	Pass	Pass	-
Point 15	7.5	0%	Pass	23	14	Pass	Pass	-
Point 16	5.5	2%	Pass	23	12	Pass	Pass	-
Point 17	5.5	0%	Pass	23	11	Pass	Pass	-
Point 18	7.5	4%	Pass	23	17	Pass	Pass	Refer to Figure 7a.
Point 19	7.5	4%	Pass	23	22	Pass	Pass	-
Point 20	7.5	4%	Pass	23	23	Pass	Pass	Refer to Figure 7b.
Point 21	5.5	0%	Pass	23	7	Pass	Pass	Refer to Figure 7b.
Point 22	7.5	5%	Pass	23	20	Pass	Pass	-
Point 23	7.5	1%	Pass	23	15	Pass	Pass	-
Point 24	5.5	5%	Pass	23	14	Pass	Pass	-
Point 25	7.5	3%	Pass	23	23	Pass	Pass	-
Point 26	7.5	2%	Pass	23	16	Pass	Pass	-
Point 27	7.5	1%	Pass	23	16	Pass	Pass	-
Point 28	7.5	1%	Pass	23	15	Pass	Pass	-
Point 29	7.5	1%	Pass	23	16	Pass	Pass	-
Point 30	7.5	5%	Pass	23	22	Pass	Pass	-
Point 31	7.5	2%	Pass	23	17	Pass	Pass	-
Point 32	7.5	1%	Pass	23	15	Pass	Pass	-
Point 33	7.5	0%	Pass	23	13	Pass	Pass	-
Point 34	5.5	4%	Pass	23	17	Pass	Pass	-
Point 35	7.5	0%	Pass	23	14	Pass	Pass	-
Point 36	5.5	5%	Pass	23	17	Pass	Pass	-
Point 37	5.5	0%	Pass	23	9	Pass	Pass	Refer to Figure 7b.
Point 38	7.5	1%	Pass	23	14	Pass	Pass	-
Point 39	7.5	0%	Pass	23	12	Pass	Pass	-
Point 40	5.5	5%	Pass	23	16	Pass	Pass	Refer to Figure 7c.

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Point 41	7.5	0%	Pass	23	7	Pass	Pass	Refer to Figure 7c.
Point 42	5.5	0%	Pass	23	11	Pass	Pass	-
Point 43	5.5	1%	Pass	23	15	Pass	Pass	-
Point 44	5.5	2%	Pass	23	16	Pass	Pass	-
Point 45	5.5	1%	Pass	23	12	Pass	Pass	Refer to Figure 7c.
Point 46	5.5	1%	Pass	23	12	Pass	Pass	Refer to Figure 7c.
Point 47	7.5	0%	Pass	23	15	Pass	Pass	Refer to Figure 7d.
Point 48	5.5	4%	Pass	23	20	Pass	Pass	Refer to Figure 7d.
Point 49	5.5	8%	Fail	23	21	Pass	Fail	Refer to Figure 7d.
Point 50	7.5	1%	Pass	23	14	Pass	Pass	-
Point 51	7.5	4%	Pass	23	19	Pass	Pass	-
Point 52	7.5	2%	Pass	23	17	Pass	Pass	Refer to Figure 7d.
Point 53	5.5	5%	Pass	23	20	Pass	Pass	-
Point 54	5.5	1%	Pass	23	14	Pass	Pass	Refer to Figure 7d.
Point 55	7.5	1%	Pass	23	15	Pass	Pass	-
Point 56	5.5	0%	Pass	23	8	Pass	Pass	-
Point 57	7.5	3%	Pass	23	18	Pass	Pass	-
Point 58	5.5	0%	Pass	23	10	Pass	Pass	Refer to Figure 7e.
Point 59	5.5	5%	Pass	23	16	Pass	Pass	Refer to Figure 7e.
Point 60	5.5	1%	Pass	23	12	Pass	Pass	-
Point 61	7.5	0%	Pass	23	15	Pass	Pass	-
Point 62	7.5	3%	Pass	23	22	Pass	Pass	-
Point 63	7.5	3%	Pass	23	22	Pass	Pass	Refer to Figure 7e.
Point 64	7.5	2%	Pass	23	21	Pass	Pass	Refer to Figure 7e.
Point 65	7.5	2%	Pass	23	16	Pass	Pass	Refer to Figure 7e.
Point 66	5.5	5%	Pass	23	17	Pass	Pass	Refer to Figure 7e.
Point 67	7.5	4%	Pass	23	18	Pass	Pass	-
Point 68	7.5	4%	Pass	23	22	Pass	Pass	-
Point 69	7.5	4%	Pass	23	19	Pass	Pass	-
Point 70	7.5	5%	Pass	23	20	Pass	Pass	-
Point 71	7.5	4%	Pass	23	19	Pass	Pass	-
Point 72	5.5	3%	Pass	23	14	Pass	Pass	Refer to Figure 7f.
Point 73	7.5	0%	Pass	23	15	Pass	Pass	Refer to Figure 7f.
Point 74	7.5	1%	Pass	23	17	Pass	Pass	Refer to Figure 7f.
Point 75	7.5	2%	Pass	23	18	Pass	Pass	-
Point 76	5.5	3%	Pass	23	17	Pass	Pass	-
Point 77	5.5	2%	Pass	23	15	Pass	Pass	-
Point 78	7.5	1%	Pass	23	15	Pass	Pass	-
Point 79	7.5	1%	Pass	23	15	Pass	Pass	-
Point 80	7.5	1%	Pass	23	18	Pass	Pass	-

Study Point	GEM (5% exceedance)			Annual Gust			Final Result	Description of Treatment
	Criterion (m/s)	Results (%)	Grade	Criterion (m/s)	Results (m/s)	Grade		
Point 81	7.5	1%	Pass	23	17	Pass	Pass	-
Point 82	7.5	0%	Pass	23	16	Pass	Pass	-
Point 83	7.5	1%	Pass	23	17	Pass	Pass	Refer to Figure 7f.
Point 84	5.5	2%	Pass	23	18	Pass	Pass	Refer to Figure 7f.
Point 85	5.5	3%	Pass	23	15	Pass	Pass	Refer to Figure 7f.
Point 86	7.5	2%	Pass	23	20	Pass	Pass	Refer to Figure 7f.
Point 87	5.5	1%	Pass	23	11	Pass	Pass	Refer to Figure 7f.

Figure 7a: Suggested Treatments – Level 00

Figure 7b: Wind Tunnel Results – Level 01

Figure 7c: Suggested Treatments – Level 02

Figure 7d: Wind Tunnel Results – Level 03

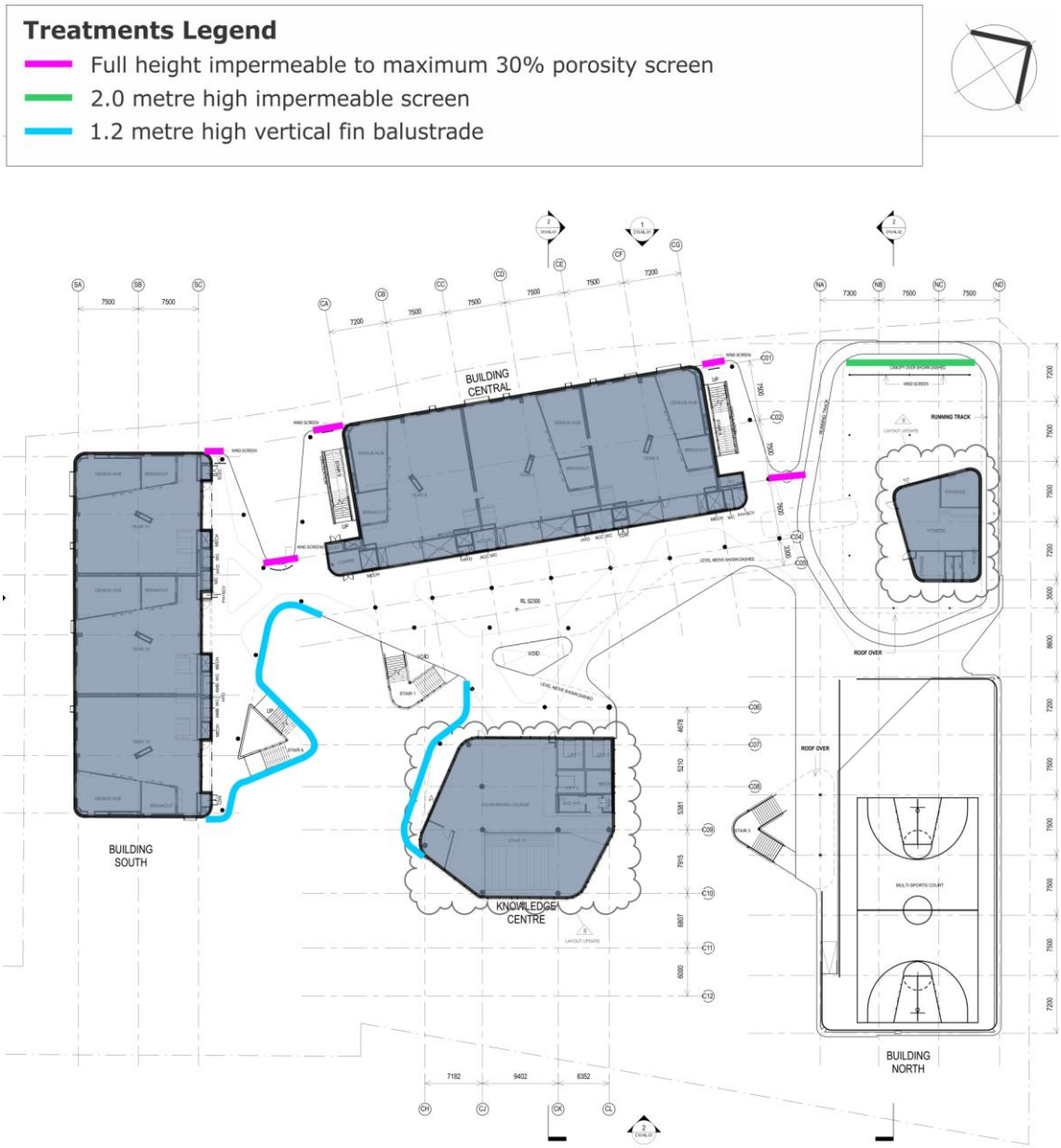

Figure 7e: Suggested Treatments – Level 04

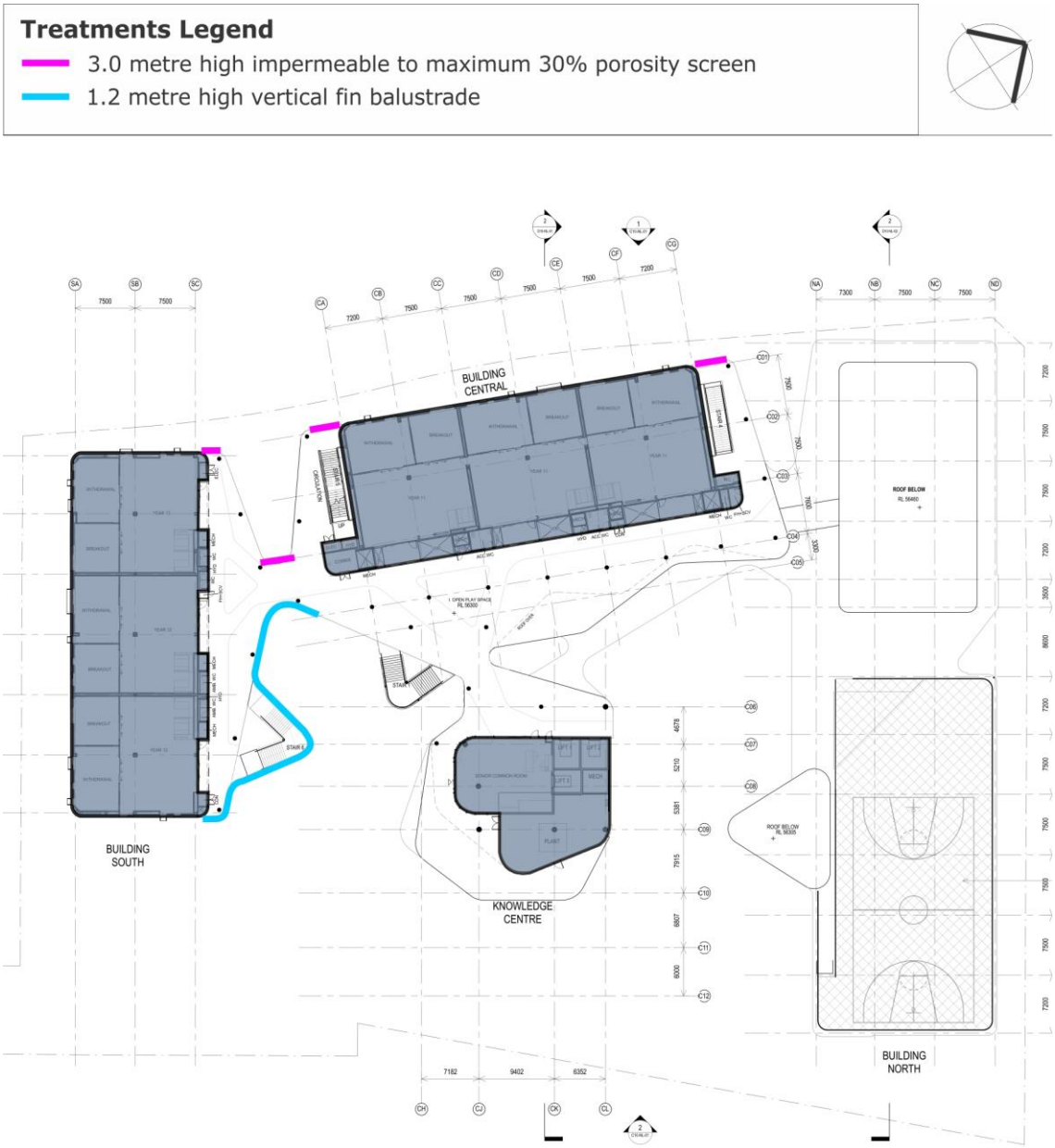

Figure 7f: Wind Tunnel Results – Level 05

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APPENDIX A PUBLISHED ENVIRONMENTAL CRITERIA

A.1 Wind Effects on People

The acceptability of wind in an area is dependent upon the use of the area. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Quantifying wind comfort has been the subject of much research and many researchers, such as A.G. Davenport, T.V. Lawson, W.H. Melbourne, and A.D. Penwarden, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. This section discusses and compares the various published criteria.

A.1.1 A.D. Penwarden (1973) Criteria for Mean Wind Speeds

A.D. Penwarden (1973) developed a modified version of the Beaufort scale which describes the effects of various wind intensities on people. Table A.1 presents the modified Beaufort scale. Note that the effects listed in this table refers to wind conditions occurring frequently over the averaging time (a probability of occurrence exceeding 5%). Higher ranges of wind speeds can be tolerated for rarer events.

Table A.1: Summary of Wind Effects on People (A.D. Penwarden, 1973)

Type of Winds	Beaufort Number	Hourly Mean Wind Speed (m/s)	Effects
Calm	0	0 - 0.25	
Calm, light air	1	0 25 - 1.55	No noticeable wind
Light breeze	2	1.55 - 3.35	Wind felt on face
Gentle breeze	3	3.35 - 5.45	Hair is disturbed, clothing flaps, newspapers difficult to read
Moderate breeze	4	5.45 - 7.95	Raises dust, dry soil and loose paper, hair disarranged
Fresh breeze	5	7.95 – 10.75	Force of wind felt on body, danger of stumbling
Strong breeze	6	10.75 – 13.85	Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant
Near gale	7	13.85 – 17.15	Inconvenience felt when walking
Gale	8	17.15 - 20.75	Generally impedes progress, difficulty balancing in gusts
Strong gale	9	20.75 – 24.45	People blown over

A.1.2 A.G. Davenport (1972) Criteria for Mean Wind Speeds

A.G. Davenport (1972) also determined a set of criteria in terms of the Beaufort scale and for various return periods. Table A.2 presents a summary of the criteria based on a probability of exceedance of 5%.

Table A.2: Criteria by A.G. Davenport (1972)

Classification	Activities	5% exceedance Mean Wind Speed (m/s)
Walking Fast	Acceptable for walking, main public accessways.	7.5 - 10.0
Strolling, Skating	Slow walking, etc.	5.5 - 7.5
Short Exposure Activities	Generally acceptable for walking & short duration stationary activities such as window-shopping, standing or sitting in plazas.	3.5 - 5.5
Long Exposure Activities	Generally acceptable for long duration stationary activities such as in outdoor restaurants & theatres and in parks.	0 - 3.5

A.1.3 T.V. Lawson (1975) Criteria for Mean Wind Speeds

In 1973, T.V. Lawson, while referring to the Beaufort wind speeds of A.D. Penwarden (1973) (as listed in Table A.1), quoted that a Beaufort 4 wind speed would be acceptable if it is not exceeded for more than 4% of the time, and that a Beaufort 6 wind speed would be unacceptable if it is exceeded more than 2% of the time. Later, in 1975, T.V. Lawson presented a set of criteria very similar to those presented in A.G. Davenport (1972) (as listed in Table A.2). These criteria are presented in Table A.3 and Table A.4 for safety and comfort respectively.

Table A.3: Safety Criteria by T.V. Lawson (1975)

Classification	Activities	Annual Mean Wind Speed (m/s)
Safety (all weather areas)	Accessible by the general public.	0 – 15
Safety (fair weather areas)	Private areas, balconies/terraces, etc.	0 – 20

Table A.4: Comfort Criteria by T.V. Lawson (1975)

Classification	Activities	5% exceedance Mean Wind Speed (m/s)
Business Walking	Objective Walking from A to B.	8 - 10
Pedestrian Walking	Slow walking, etc.	6 - 8
Short Exposure Activities	Pedestrian standing or sitting for short times.	4 – 6
Long Exposure Activities	Pedestrian sitting for a long duration.	0 - 4

A.1.4 W.H. Melbourne (1978) Criteria for Gust Wind Speeds

W.H. Melbourne (1978) introduced a set of criteria for the assessment of environmental wind conditions that were developed for a temperature range of 10°C to 30°C and for people suitably dressed for outdoor conditions. These criteria are presented in Table A.5, and are based on maximum gust wind speeds with a probability of exceedance of once per year.

Table A.5: Criteria by W.H. Melbourne (1978)

Classification	Human Activities	Annual Gust Wind Speed (m/s)
Limit for Safety	Completely unacceptable: people likely to get blown over.	23
Marginal	Unacceptable as main public accessways.	16 - 23
Comfortable Walking	Acceptable for walking, main public accessways	13 - 16
Short Exposure Activities	Generally acceptable for walking & short duration stationary activities such as window-shopping, standing or sitting in plazas.	10 - 13
Long Exposure Activities	Generally acceptable for long duration stationary activities such as in outdoor restaurants & theatres and in parks.	0 - 10

A.2 Comparison of the Published Wind Speed Criteria

W.H. Melbourne (1978) presented a comparison of the criteria of various researchers on a probabilistic basis. Figure A.1 presents the results of this comparison, and indicates that the criteria of W.H. Melbourne (1978) are comparatively quite conservative. This conclusion was also observed by A.W. Rofail (2007) when undertaking on-site remedial studies. The results of A.W. Rofail (2007) concluded that the criteria by W.H. Melbourne (1978) generally overstates the wind effects in a typical urban setting due to the assumption of a fixed 15% turbulence intensity for all areas. It was observed in A.W. Rofail (2007) that the 15% turbulence intensity assumption is not real and that the turbulence intensities at 1.5m above ground is at least 20% and in a suburban or urban setting is generally in the range of 30% to 60%.

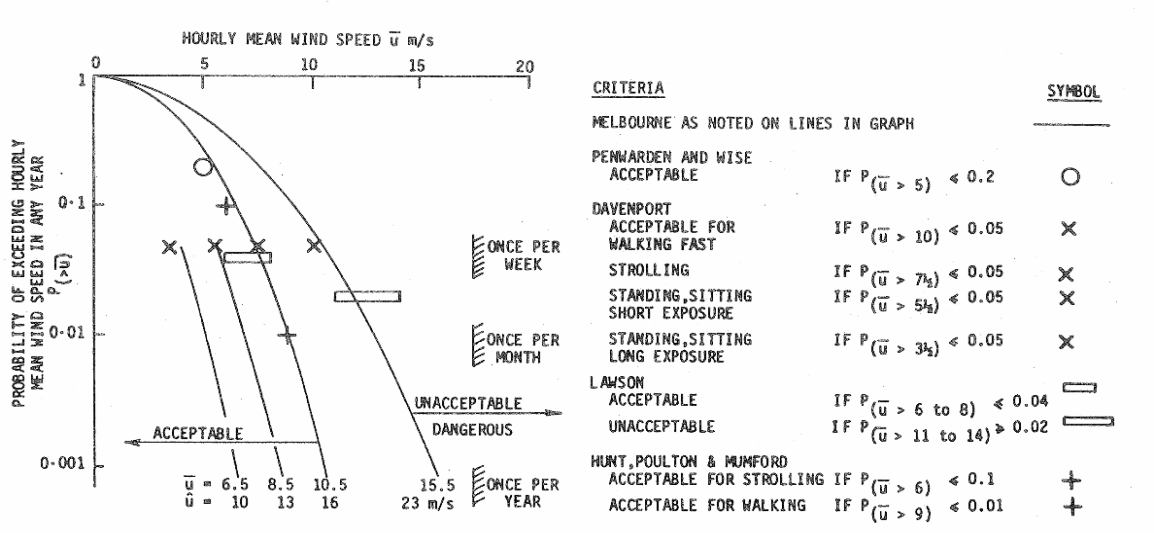

Figure A.1: Comparison of Various Mean and Gust Wind Environment Criteria, assuming 15% turbulence and a Gust Factor of 1.5 (W.H. Melbourne, 1978)

A.3 References relating to Pedestrian Comfort Criteria

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APPENDIX B DATA ACQUISITION

The wind tunnel testing procedures for this study were based on the guidelines set out in the Australasian Wind Engineering Society Quality Assurance Manual (AWES-QAM-1-2019), ASCE 7-16 (Chapter C31), and CTBUH (2013).

The wind speed measurements for the wind tunnel study were acquired as coefficients by Dantec hot-wire anemometers and converted to full-scale wind speeds using details of the regional wind climate obtained from an analysis of directional wind speed recordings from the local meteorological recording station(s).

B.1 Measurement of the Velocity Coefficients

The study model and proximity model were setup within the wind tunnel which was configured to the appropriate boundary layer profile, and the wind velocity measurements were monitored using Dantec hot-wire probe anemometers at selected critical outdoor locations. The anemometers were positioned at each study location at a full-scale height of approximately 1.5m above ground/slab level. The support of the probe was mounted such that the probe wire was vertical as much as possible to ensure that the measured wind speeds are independent of wind direction along the horizontal plane. In addition, care was taken in the alignment of the probe wire and in avoiding wall-heating effects.

Wind speed measurements were made in the wind tunnel for 16 wind directions, at 22.5° increments. The output from the hot-wire probes was obtained using a National Instruments 12-bit data acquisition card. The data was acquired for each wind direction using a sample rate of 1024Hz. The sample length was determined to produce a full-scale sample time that is sufficient for this type of study.

The mean, gust and standard deviation velocity coefficients were measured in the wind tunnel. The gust velocity coefficients were also derived for each wind direction from by the following relation:

$$\hat{C}_V = \bar{C}_V + g \cdot \sigma_{C_V} \qquad \text{B.1}$$

Where:

$\hat{C}_V$ is the gust coefficient.

$\bar{C}_V$ is the mean coefficient.

g is the peak factor, taken as 3.0 for a 3s gust and 3.4 for a 0.5s gust.

σ_{C_V} is the standard deviation of coefficient measurement.

B.2 Calculation of the Full-Scale Results

The full-scale results determine if the wind conditions at a study location satisfy the designated criteria of that location. More specifically, the full-scale results need to determine the probability of exceedance of a given wind speed at a study location. To determine the probability of exceedance, the measured velocity coefficients were combined with a statistical model of the local wind climate that relates wind speed to a probability of exceedance. Details of the wind climate model are outlined in Section 4 of the main report.

The statistical model of the wind climate includes the impact of wind directionality as any local variations in wind speed or frequency with wind direction. This is important as the wind directions that produce the highest wind speed events for a region may not coincide with the most wind exposed direction at the site.

The methodology adopted for the derivation of the full-scale results for the maximum gust and the GEM wind speeds are outlined in the following sub-sections.

B.2.1 Maximum Gust Wind Speeds

The full-scale maximum gust wind speed at each study point location is derived from the measured coefficient using the following relationship:

$$V_{study} = V_{ref,RH}\left(\frac{k_{200m,tr,T=1hr}}{k_{RH,tr,T=1hr}}\right)C_V \qquad \text{B.2}$$

Where:

V_{study} is the full-scale wind speed at the study point location, in m/s.

$V_{ref,RH}$ is the full-scale reference wind speed, measured 3m upstream at the study reference height. This value is determined by combining the directional wind speed data for the region (detailed in Section 4) and the upwind terrain and height multipliers for the site (detailed in Section 3).

$k_{200m,tr,T=1hr}$ is the standard deviation of the wind speed.

$k_{RH,tr,T=1hr}$ is the hourly mean terrain and height multiplier at the study reference height (see Section 3).

C_V is the velocity coefficient measurement obtained from the hot-wire anemometer, which is derived from the following relationship:

$$C_V = \frac{C_{V,study}}{C_{V,200m}} \qquad \text{B.3}$$

Where:

$C_{V,study}$ is the coefficient measurement obtained from the hot-wire anemometer at the study point location.

$C_{V,200m}$ is the coefficient measurement obtained from the hot-wire anemometer at the free-stream reference location at 200m height upwind of the model in the wind tunnel.

The value of $\mathrm{V_{ref,RH}}$ varies with each prevailing wind direction. Wind directions where there is a high probability that a strong wind will occur have a higher directional wind speed than other directions. To determine the directional wind speeds, a probability level must be assigned for each wind direction. These probability levels are set following the approach used in AS/NZS1170.2:2011, which assumes that the major contributions to the combined probability of exceedance of a typical load effect comes from only two 45 degree sectors.

B.2.2 Maximum Gust-Equivalent Mean Wind Speeds

The contribution to the probability of exceedance of a specified wind speed (ie: the desired wind speed for pedestrian comfort, as per the criteria) was calculated for each wind direction. These contributions are then combined over all wind directions to calculate the total probability of exceedance of the specified wind speed. To calculate the probability of exceedance for a specified wind speed a statistical wind climate model was used to describe the relationship between directional wind speeds and the probability of exceedance. A detailed description of the methodology is given by T.V. Lawson (1980).

The criteria used in this study is referenced to a probability of exceedance of 5% of a specified wind speed.

B.3 References relating to Data Acquisition

American Society of Civil Engineers (ASCE), ASCE-7-16, 2016, "Minimum Design Loads for Buildings and Other Structures".

Australasian Wind Engineering Society, QAM-1, 2019, "Quality Assurance Manual: Wind Engineering Studies of Buildings", edited by Rofail A.W., *et al*.

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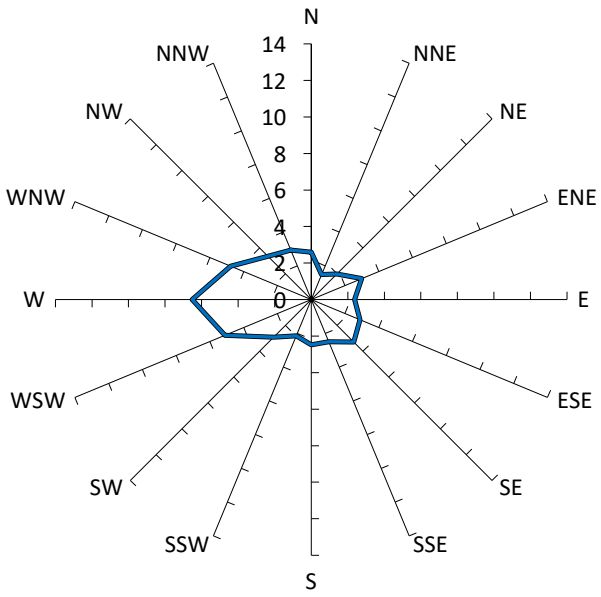
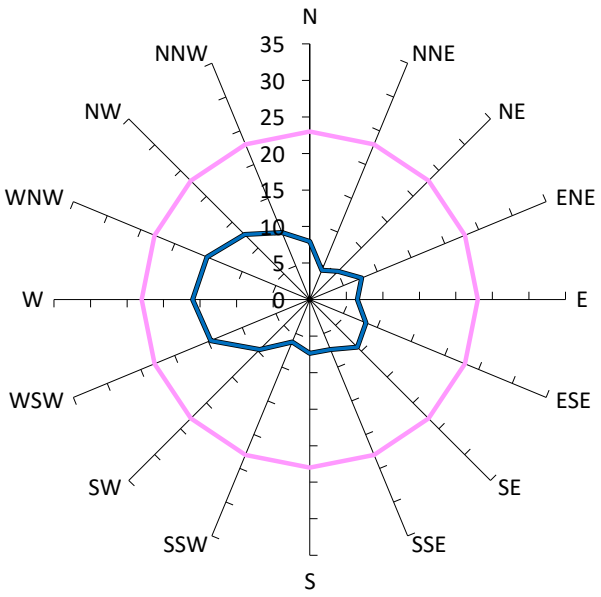
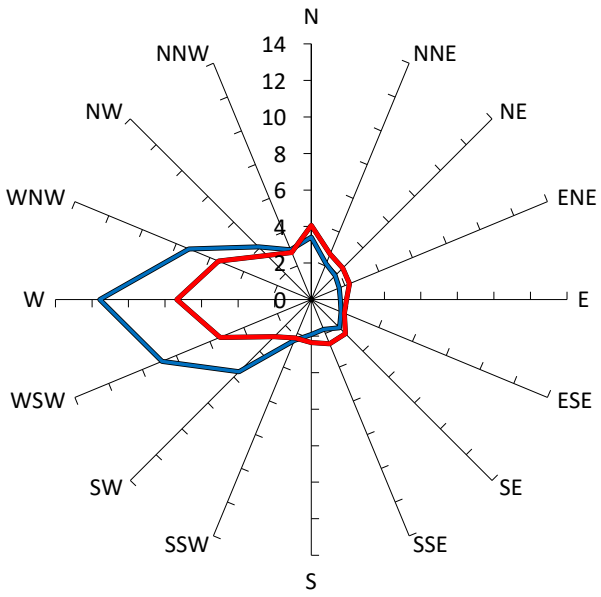
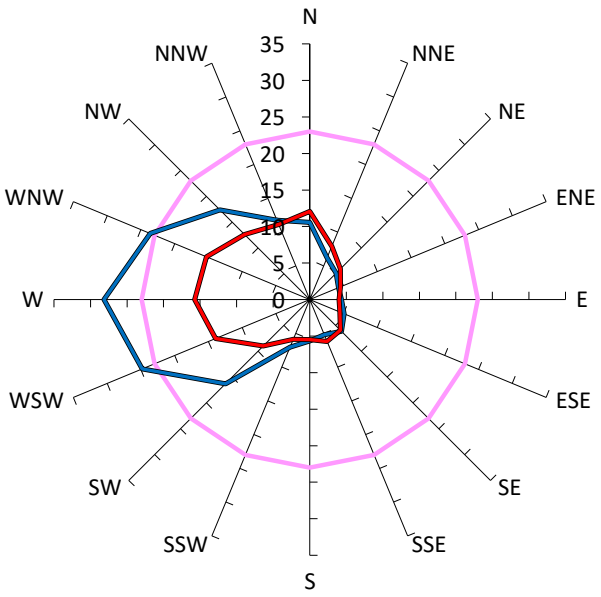
APPENDIX C DIRECTIONAL PLOTS OF WIND TUNNEL RESULTS

Results for Point 01

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	16

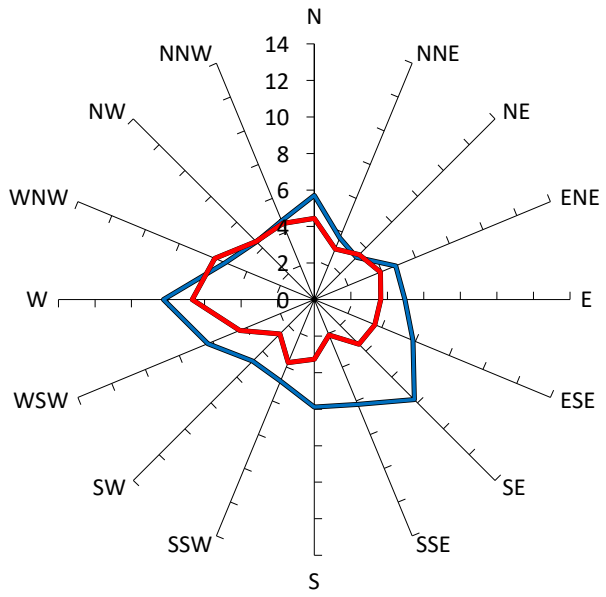
Results for Point 04

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	6%	28
WE759-02F02 - Treatment Testing	3%	16

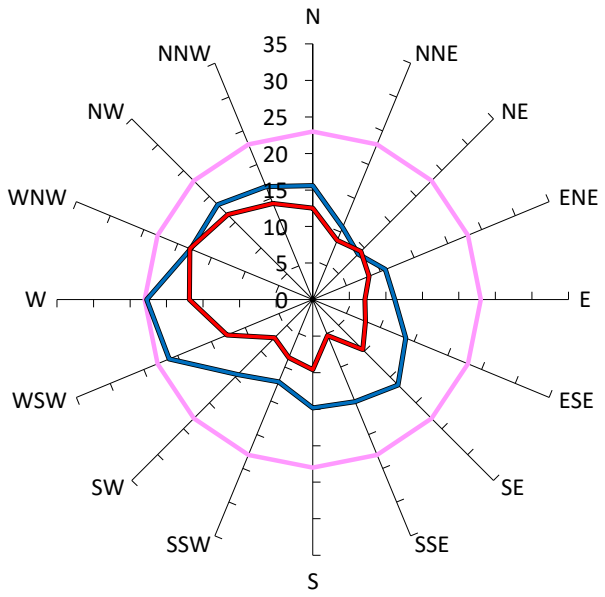
Results for Point 05

Gust Equivalent Mean (m/s)



Comfort Criteria: 7.5m/s with 5% probability of exceedence

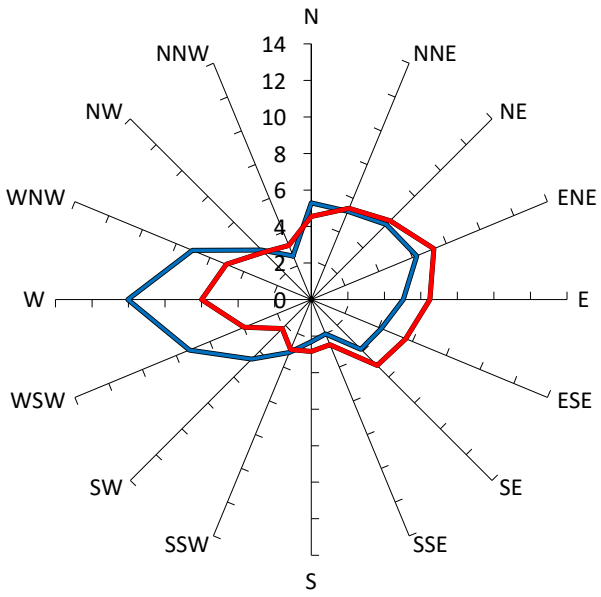
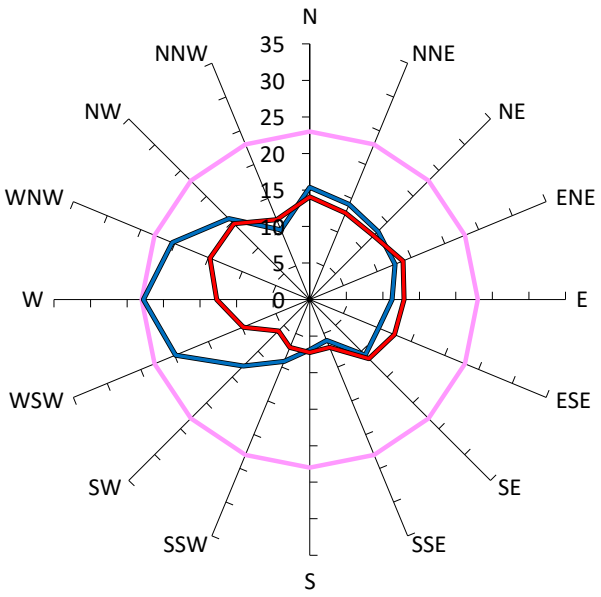
Maximum Gust (m/s)



Safety Limit: 23m/s

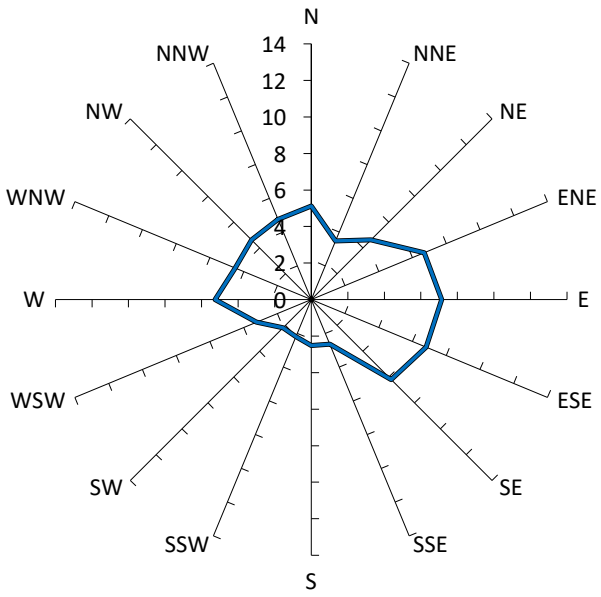
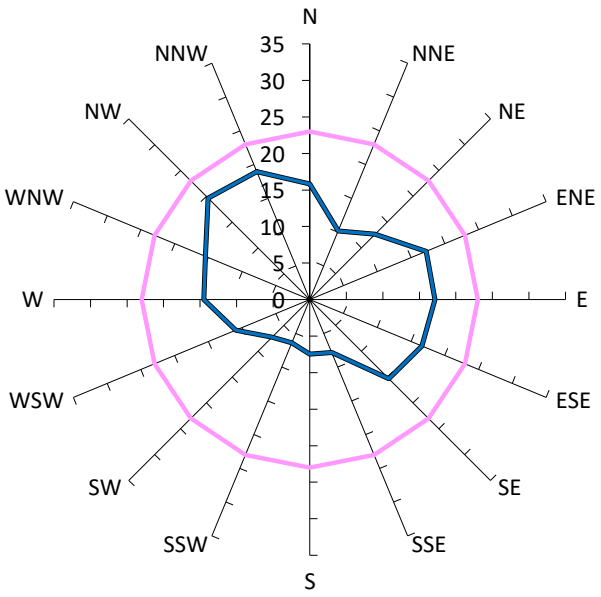
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	7%	23
WE759-02F02 - Treatment Testing	3%	18

Results for Point 06

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

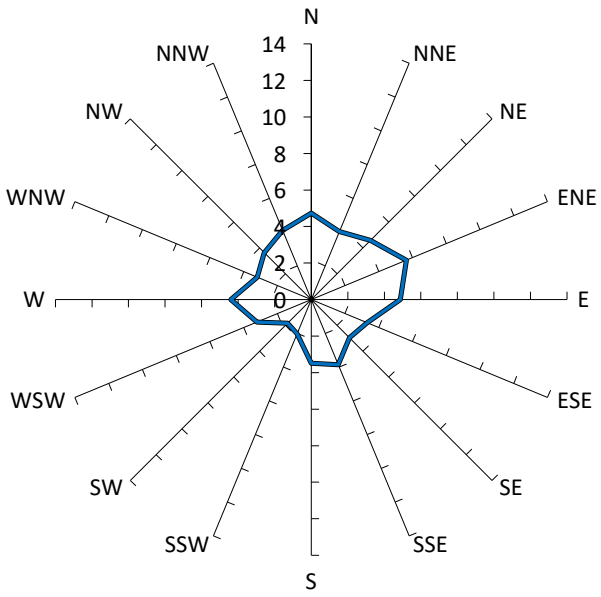
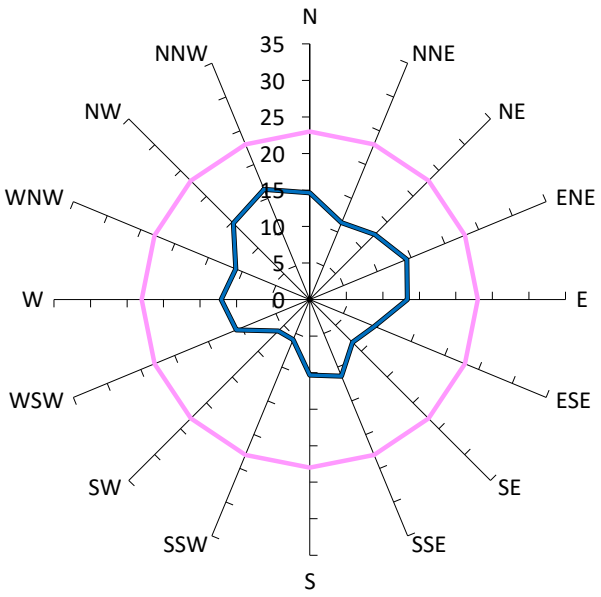
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	6%	23
WE759-02F02 - Treatment Testing	3%	15

Results for Point 07

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

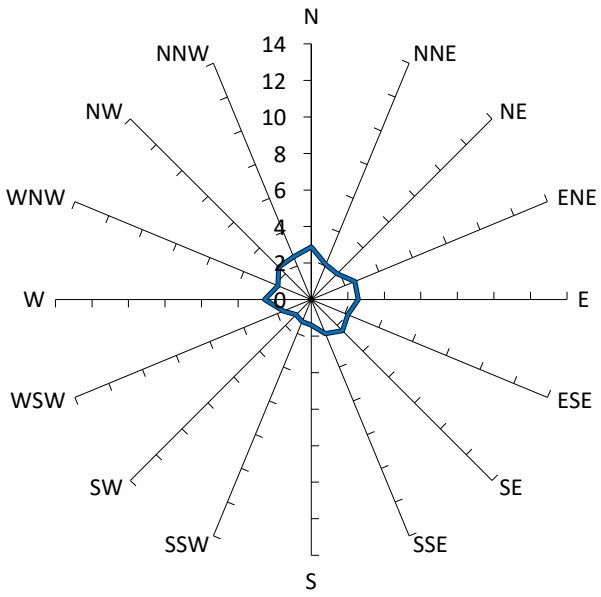
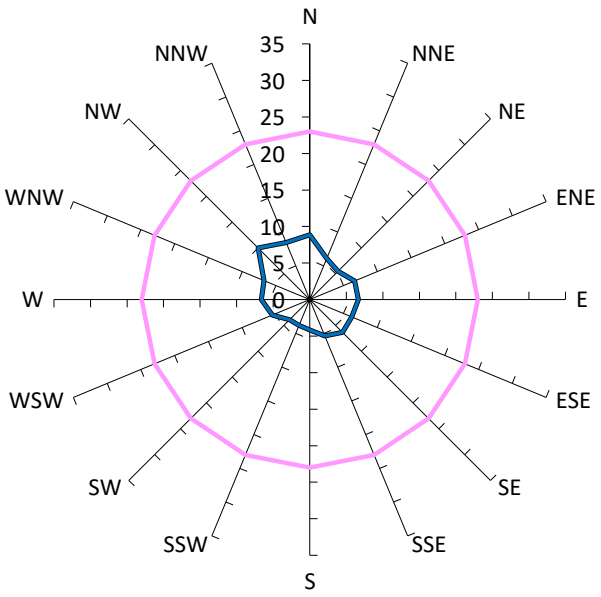
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	20

Results for Point 08

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

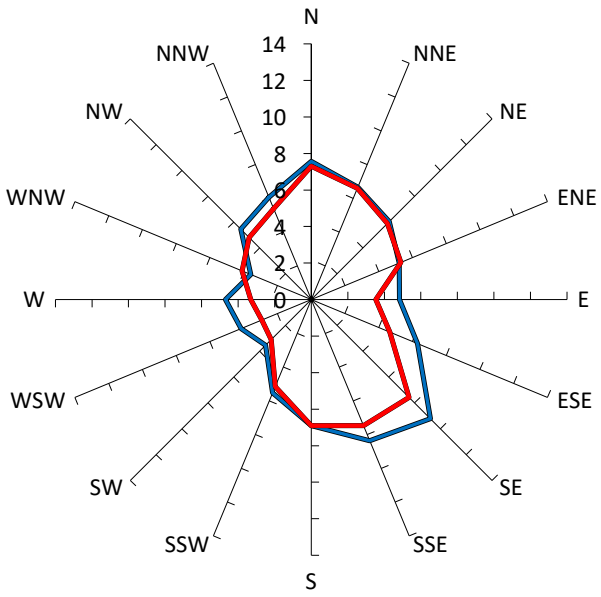
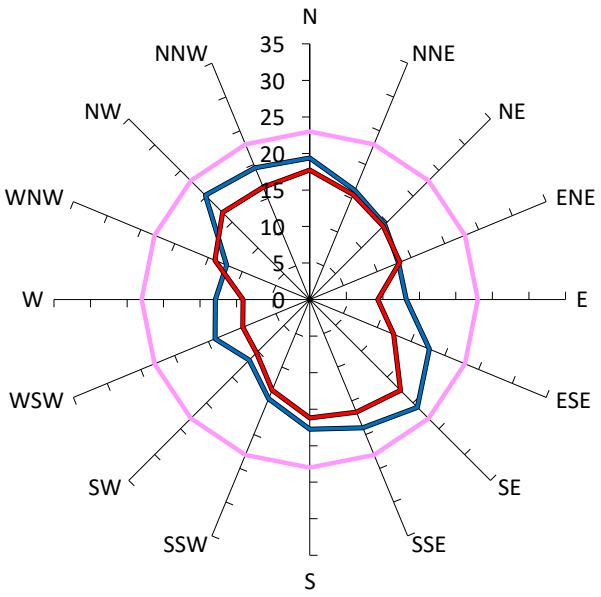
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	16

Results for Point 09

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

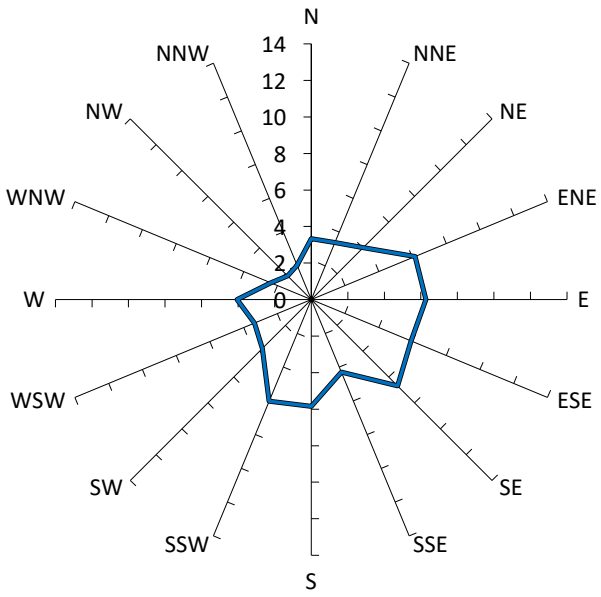
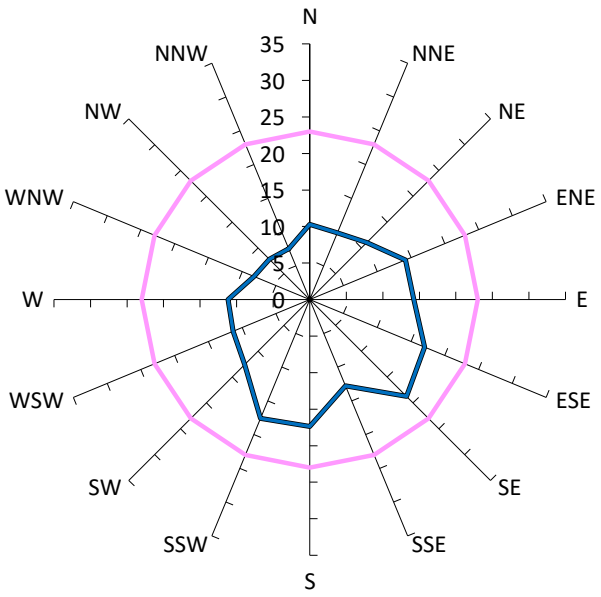
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	10

Results for Point 10

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

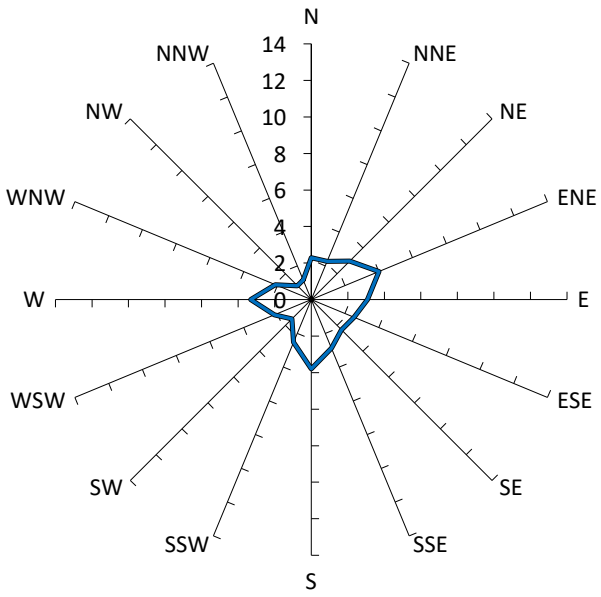
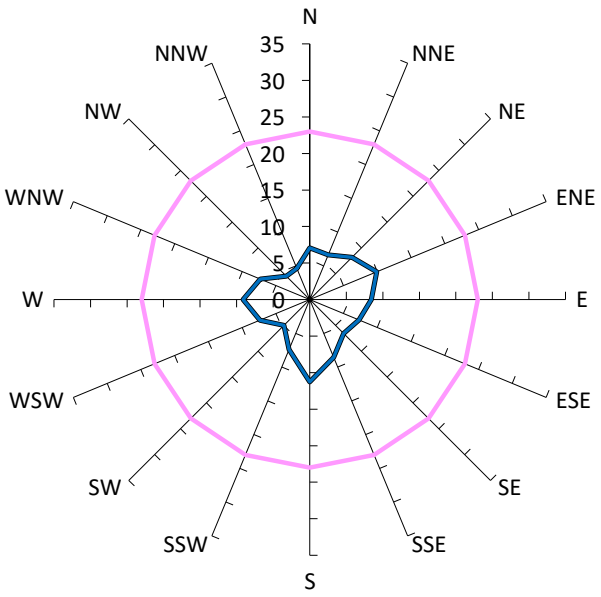
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	9%	21
WE759-02F02 - Treatment Testing	6%	18

Results for Point 11

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

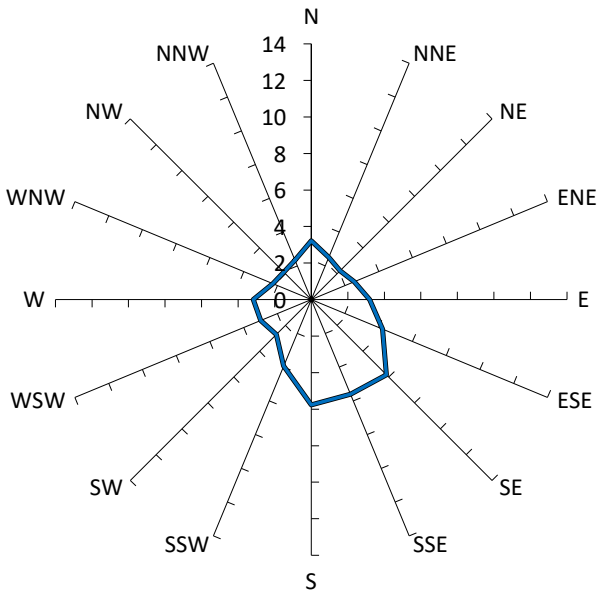
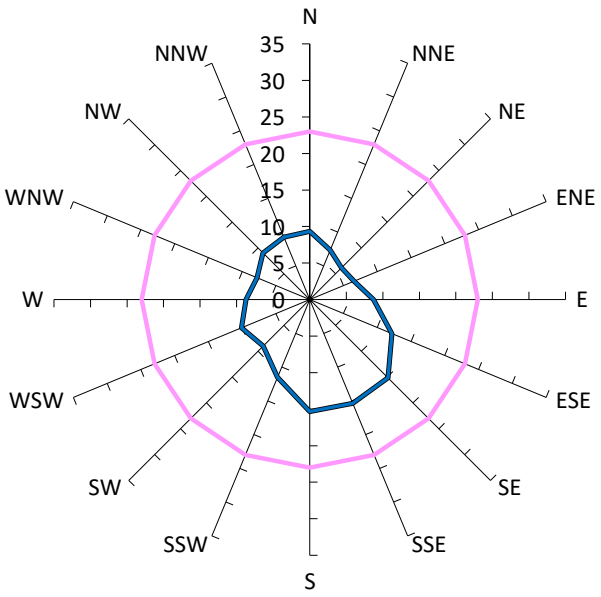
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	2%	19

Results for Point 12

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

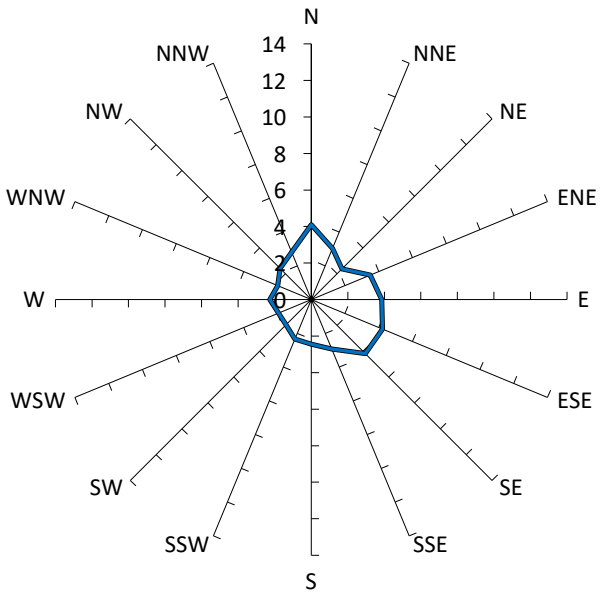
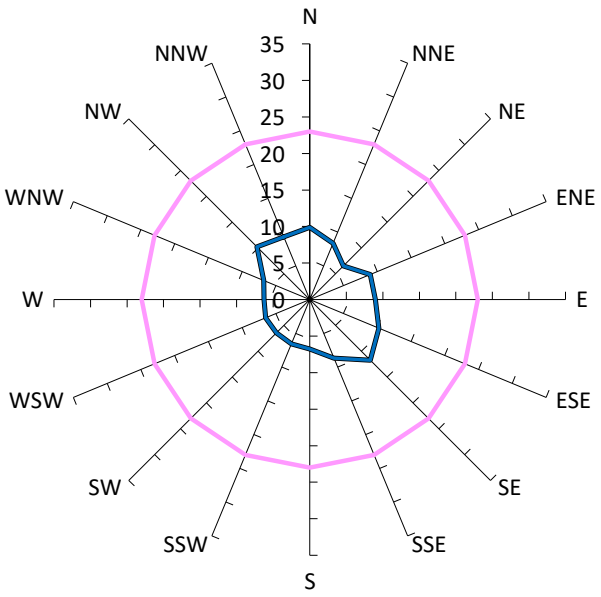
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	11

Results for Point 13

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

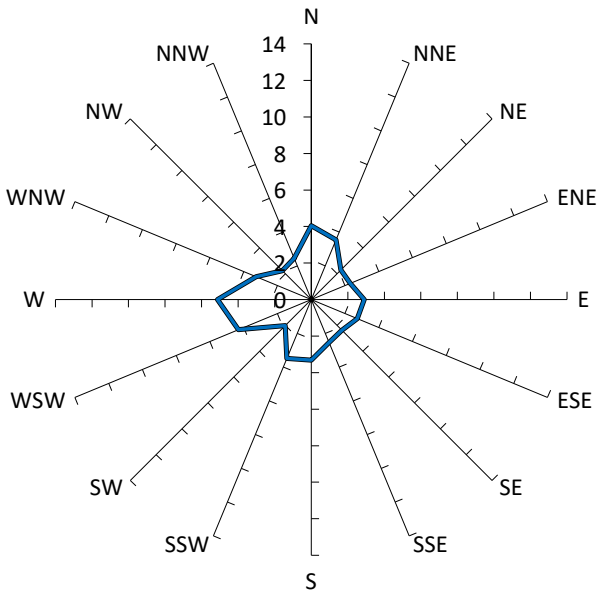
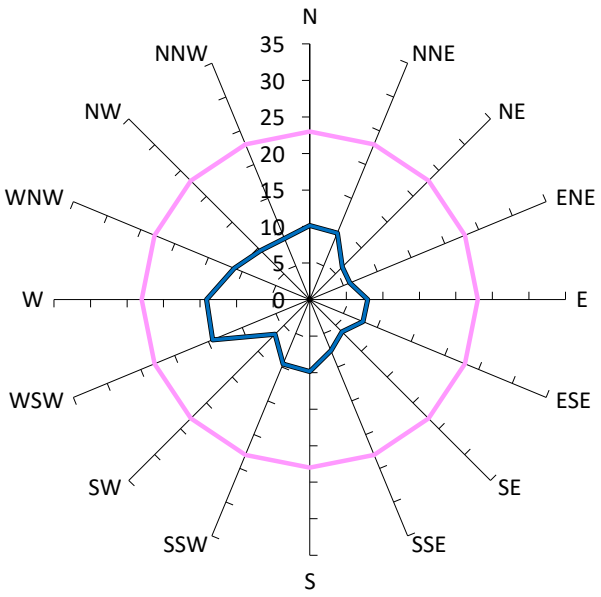
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	15

Results for Point 14

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	12

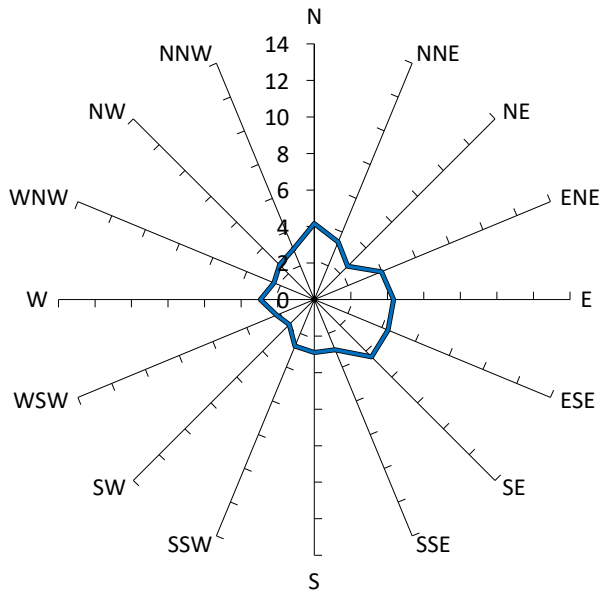
Results for Point 15

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	14

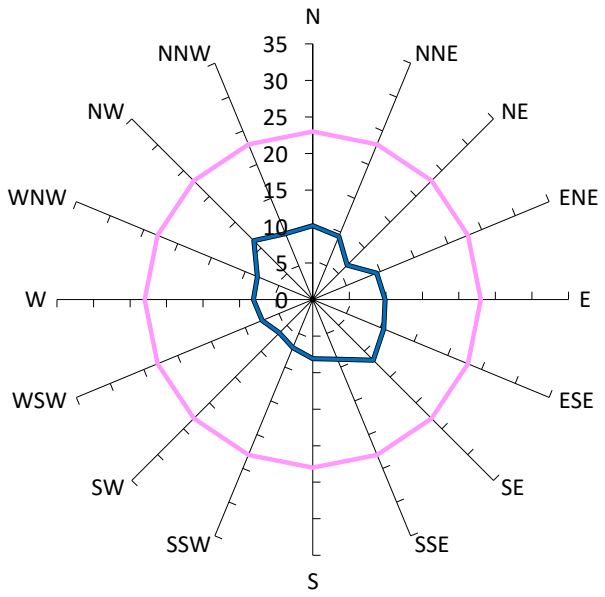
Results for Point 16

Gust Equivalent Mean (m/s)



Comfort Criteria: 5.5m/s with 5% probability of exceedence

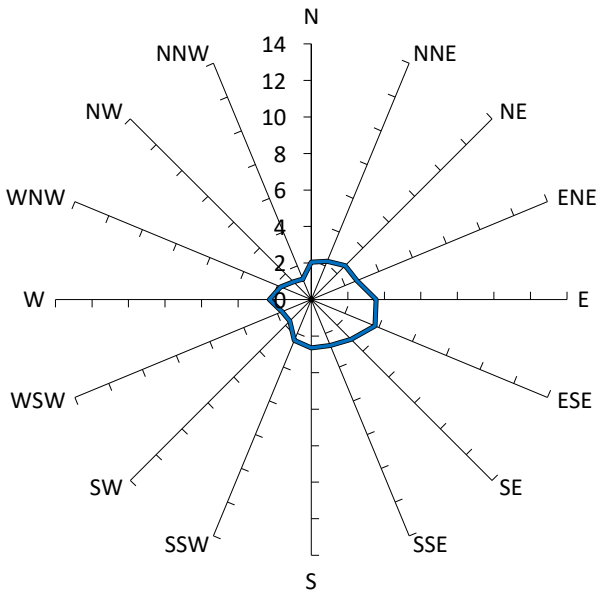
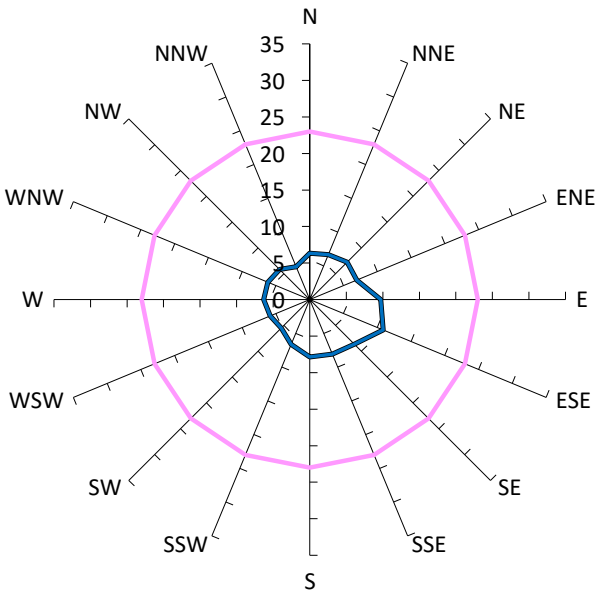
Maximum Gust (m/s)



Safety Limit: 23m/s

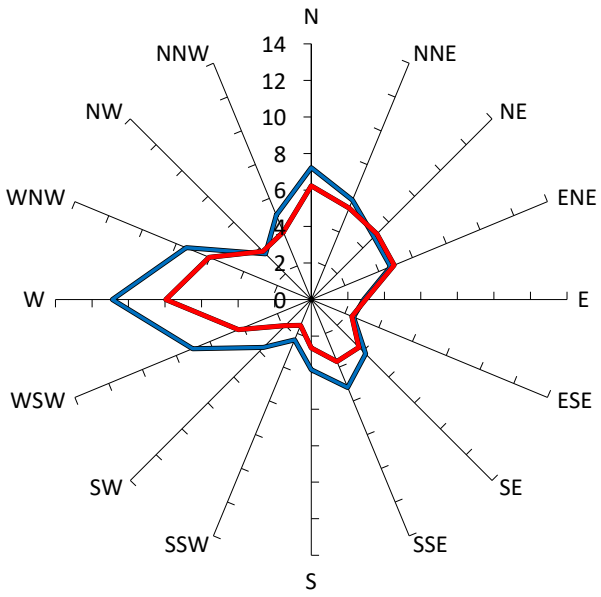
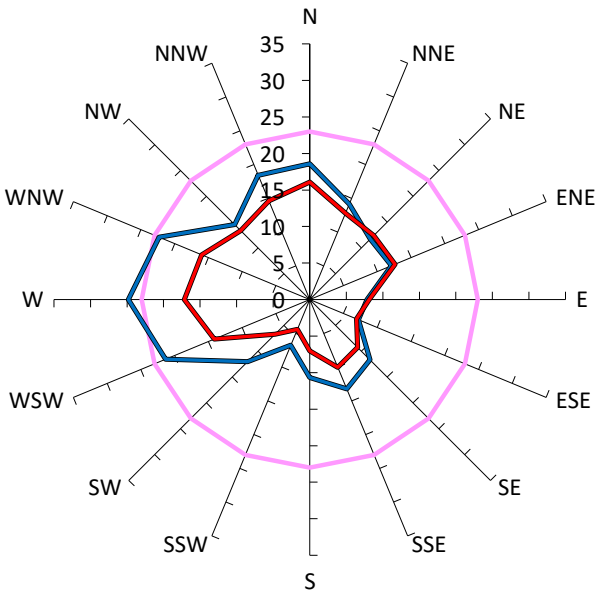
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	2%	12

Results for Point 17

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

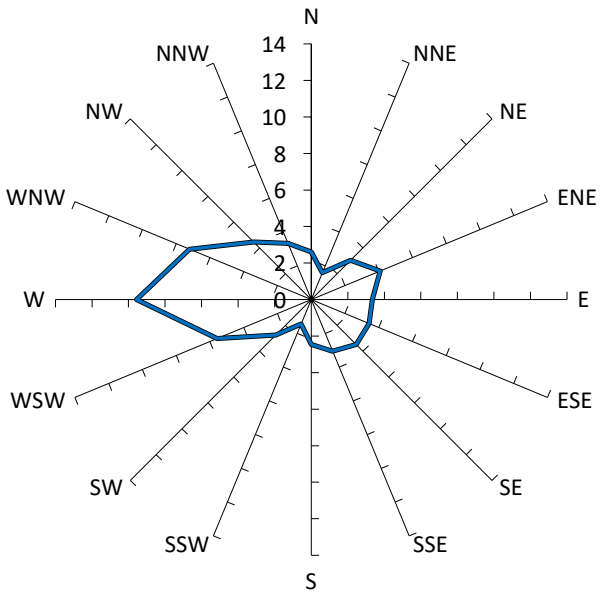
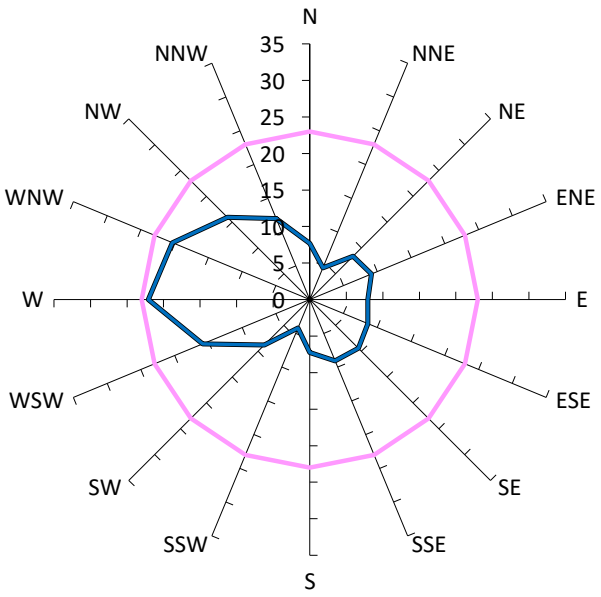
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	11

Results for Point 18

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

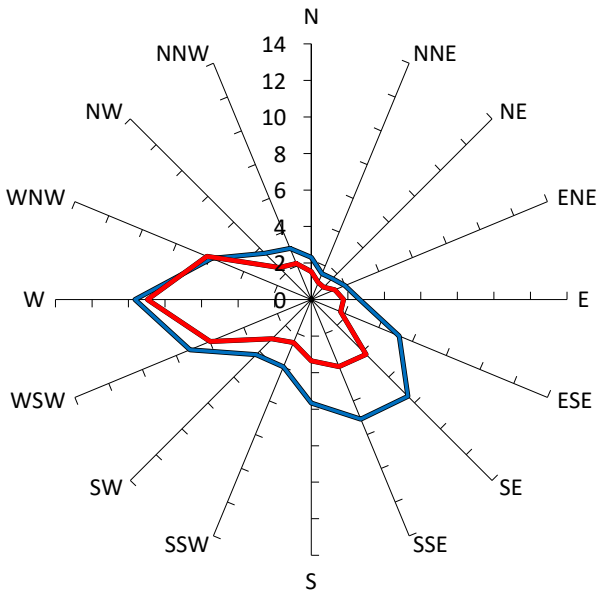
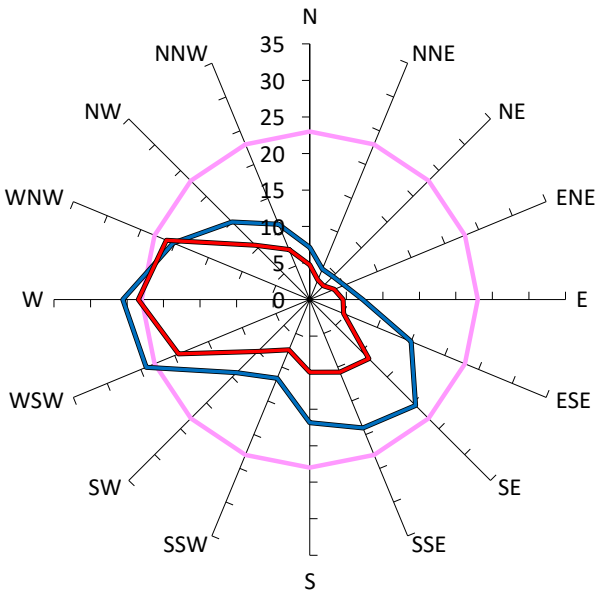
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	7%	25
WE759-02F02 - Treatment Testing	4%	17

Results for Point 19

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

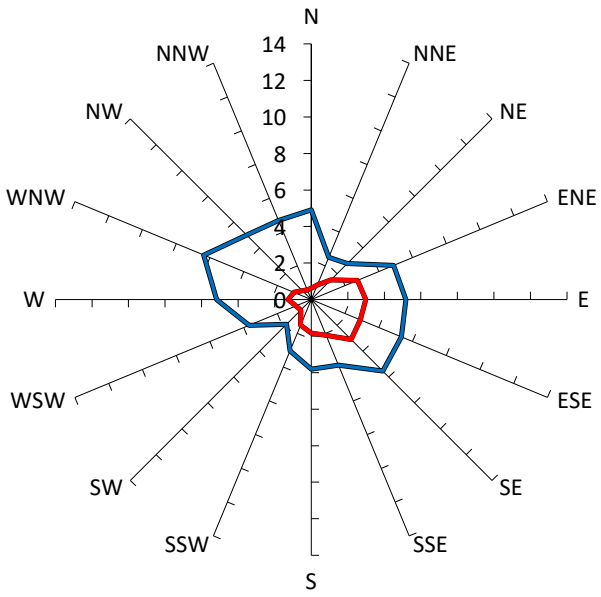
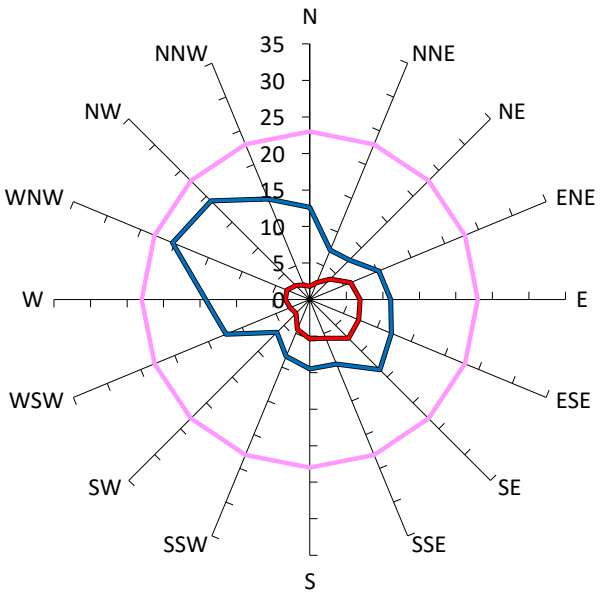
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	22

Results for Point 20

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

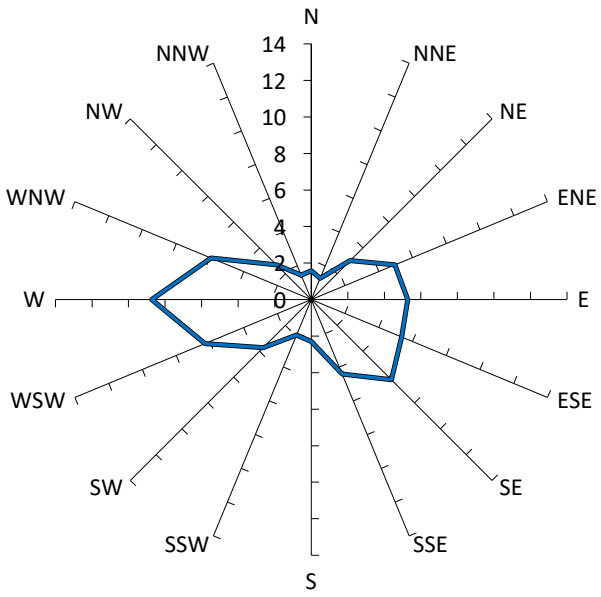
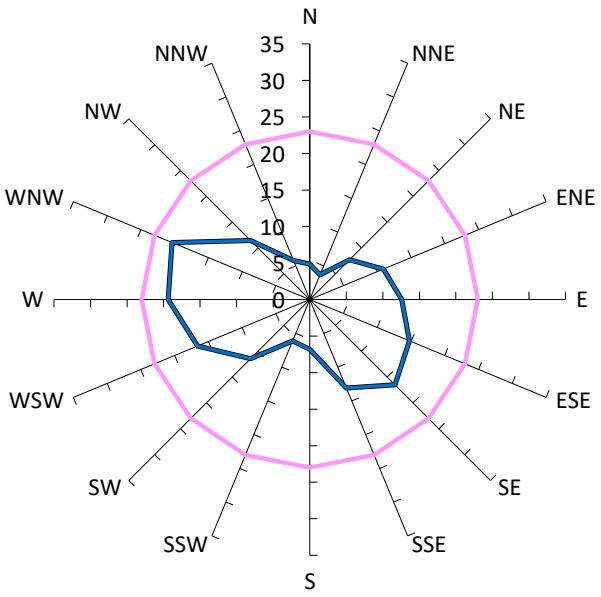
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	7%	26
WE759-02F02 - Treatment Testing	4%	23

Results for Point 21

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

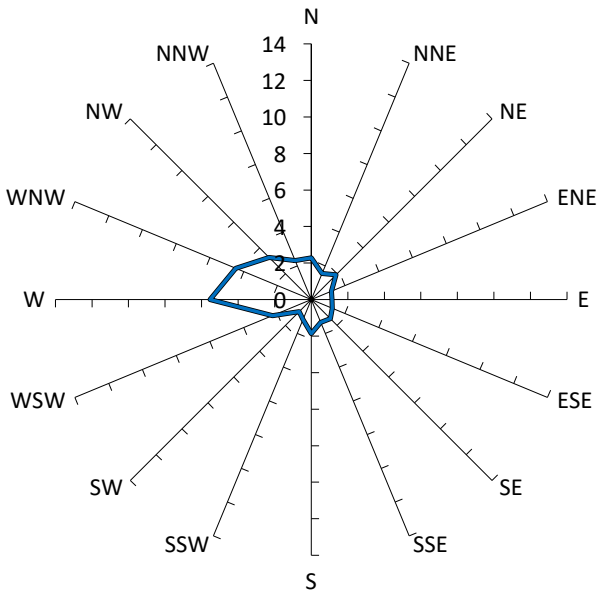
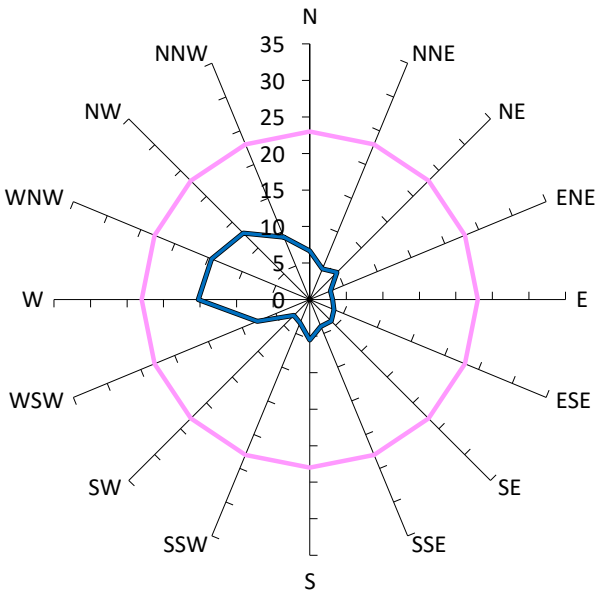
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	9%	20
WE759-02F02 - Treatment Testing	0%	7

Results for Point 22

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

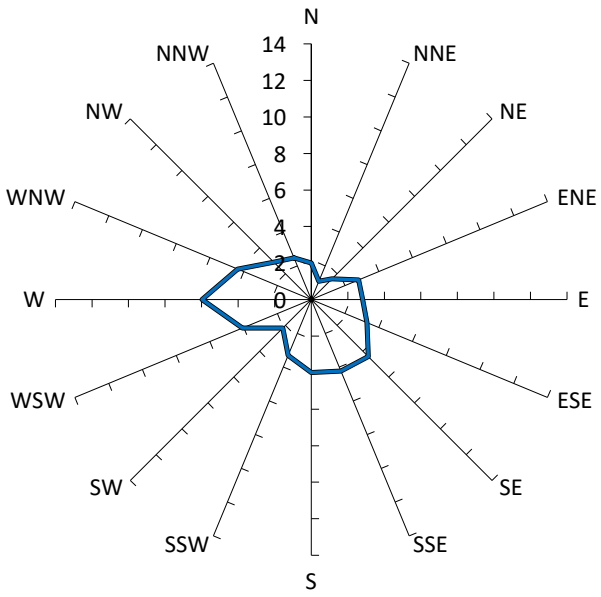
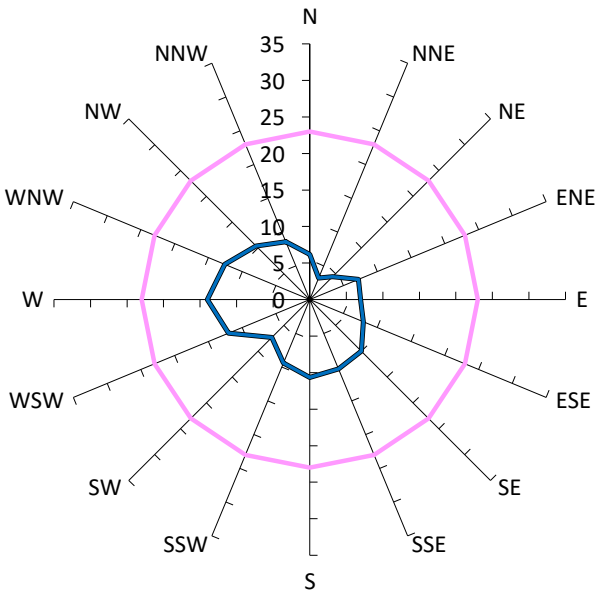
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	20

Results for Point 23

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

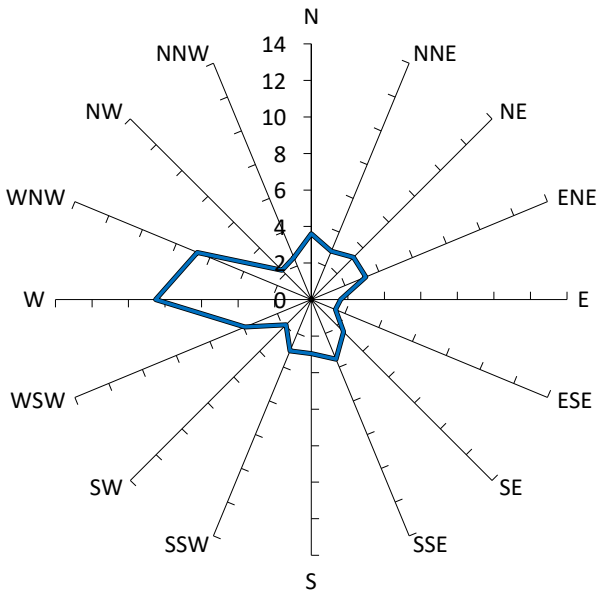
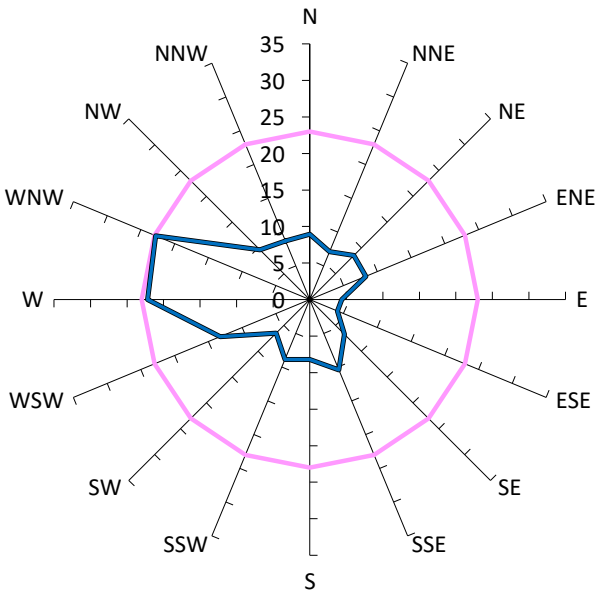
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	15

Results for Point 24

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

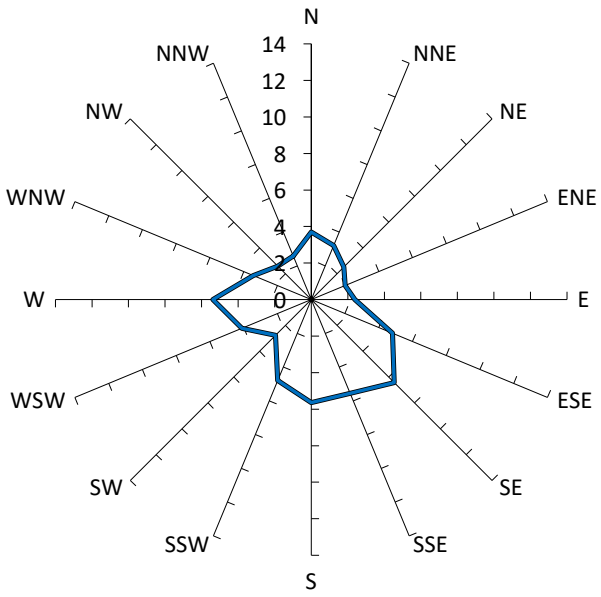
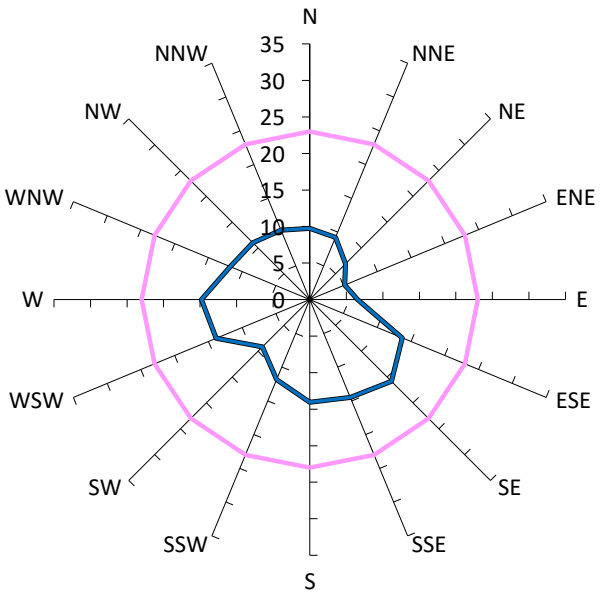
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	14

Results for Point 25

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

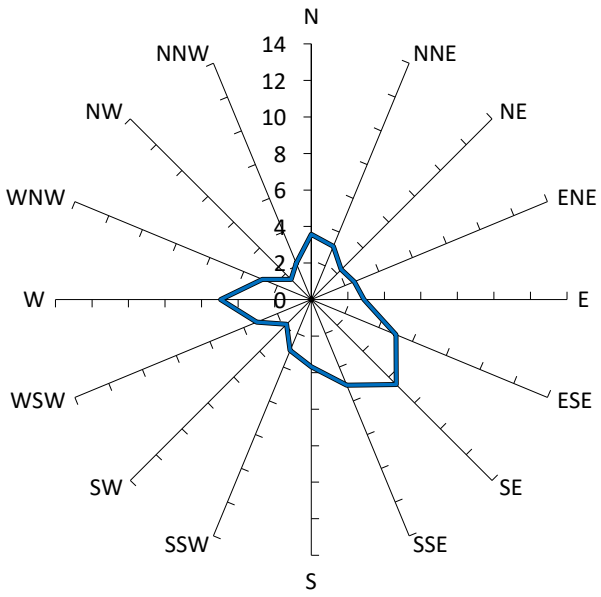
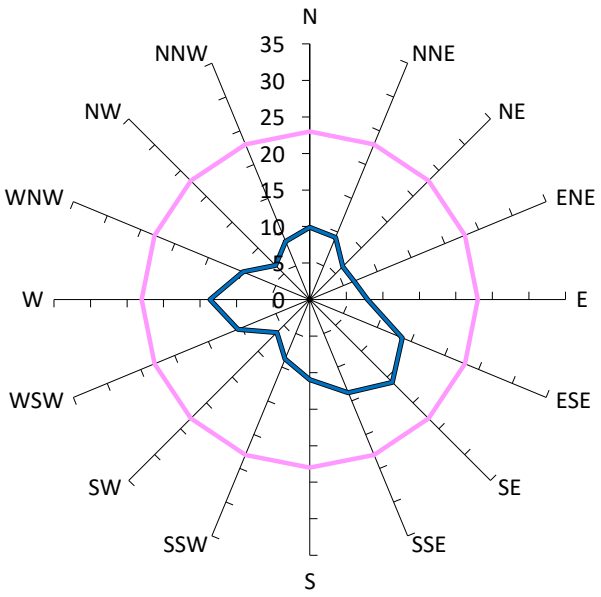
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	3%	23

Results for Point 26

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

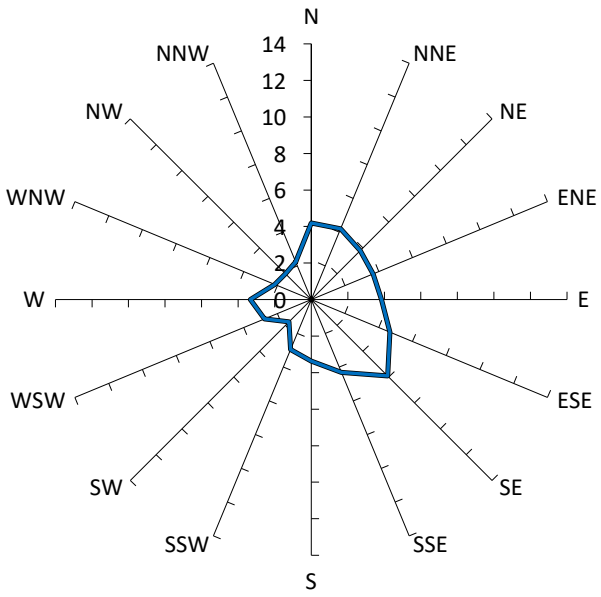
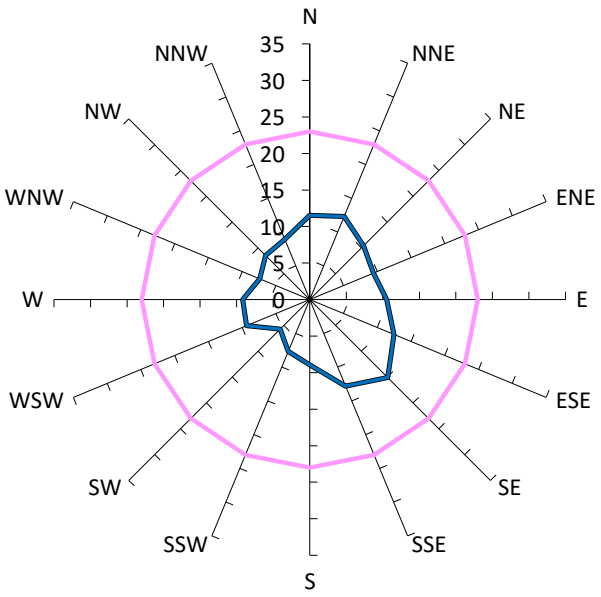
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	2%	16

Results for Point 27

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	16

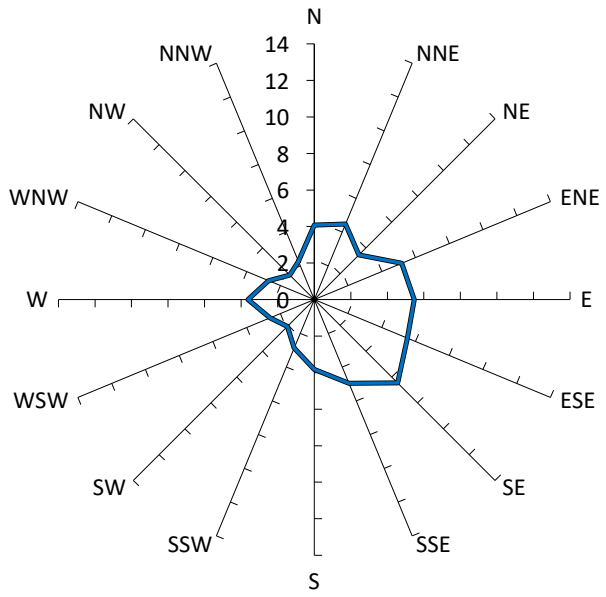
Results for Point 28

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	15

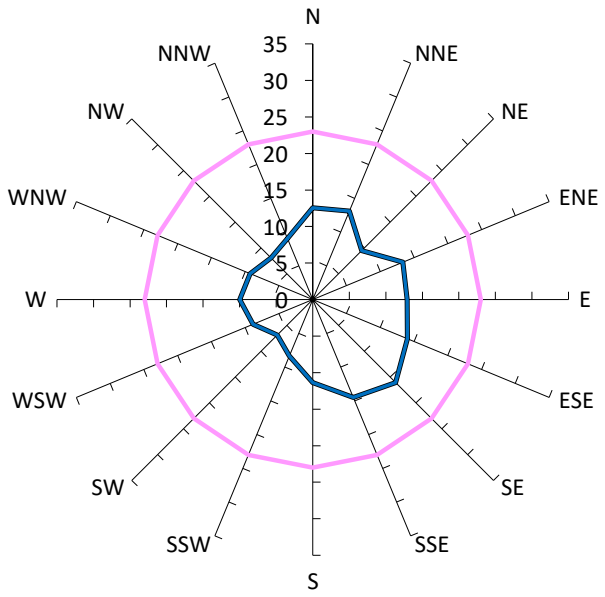
Results for Point 29

Gust Equivalent Mean (m/s)



Comfort Criteria: 7.5m/s with 5% probability of exceedence

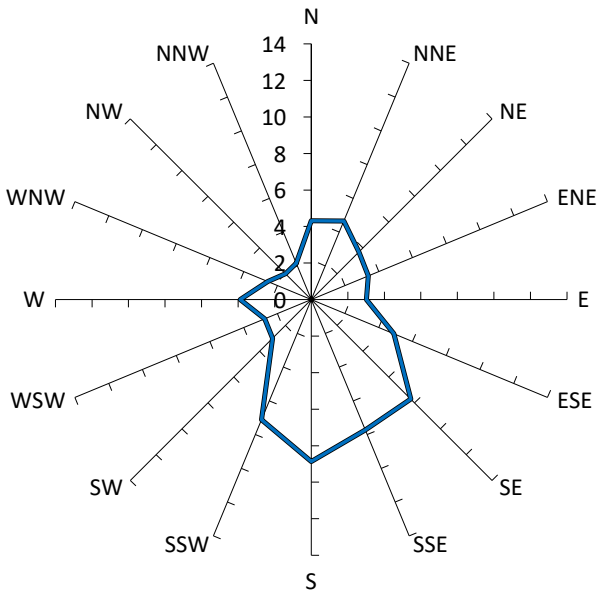
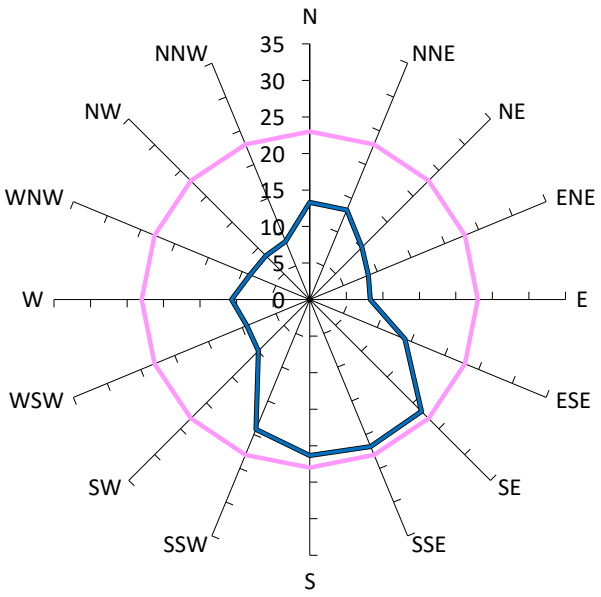
Maximum Gust (m/s)



Safety Limit: 23m/s

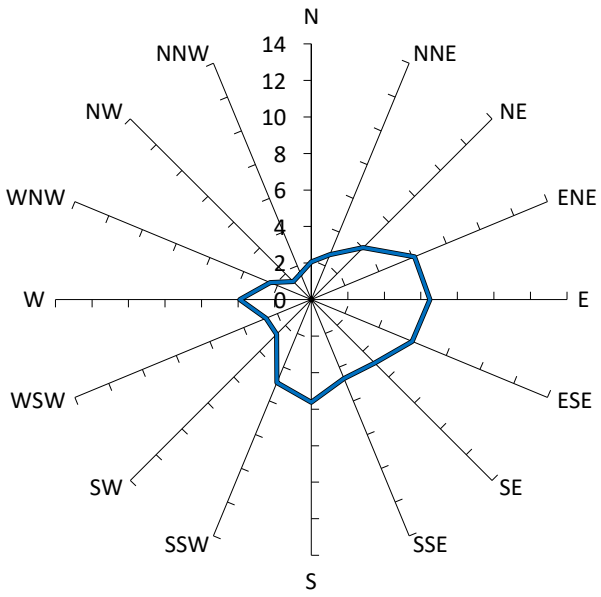
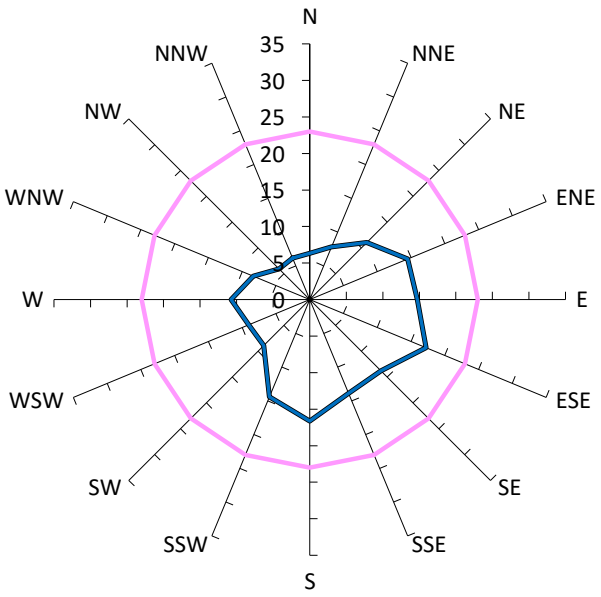
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	16

Results for Point 30

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

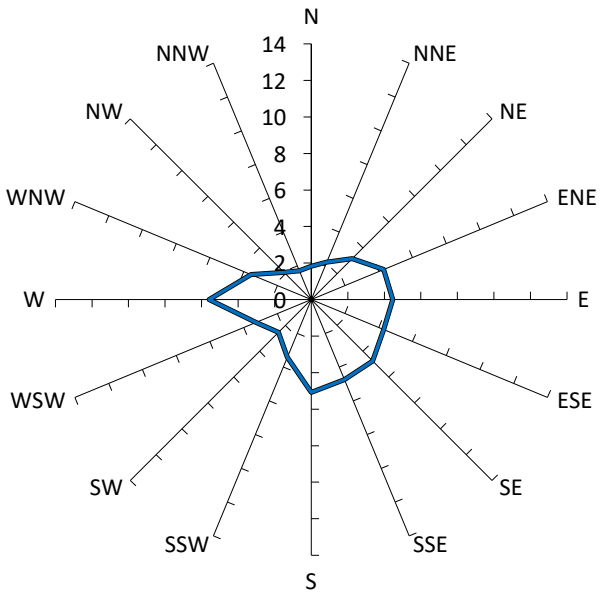
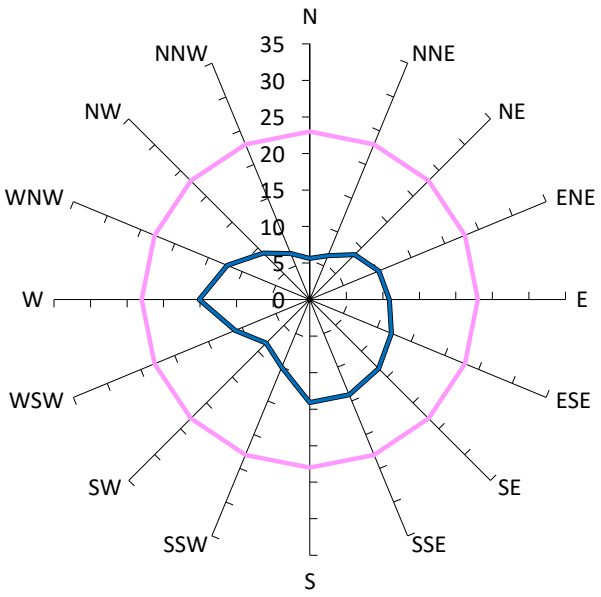
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	22

Results for Point 31

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

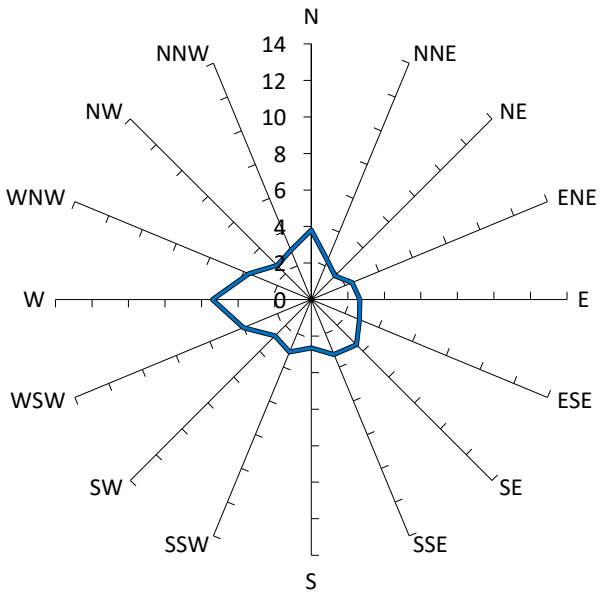
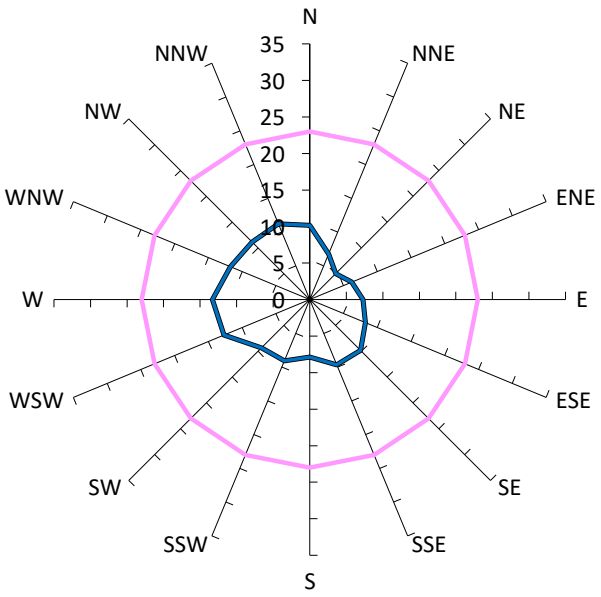
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	2%	17

Results for Point 32

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

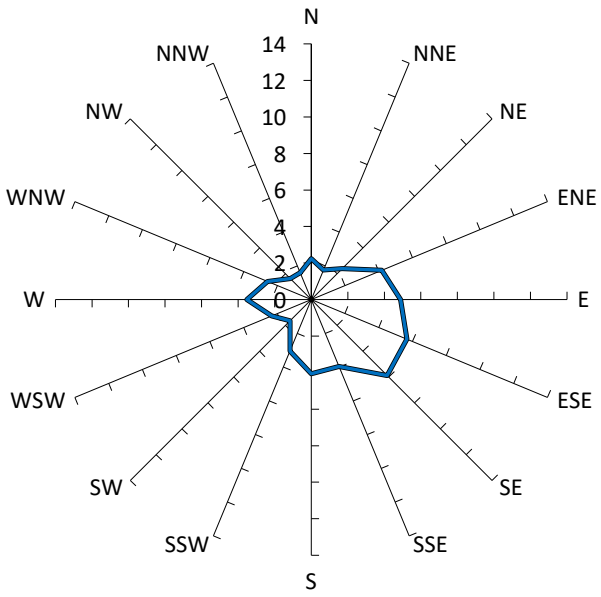
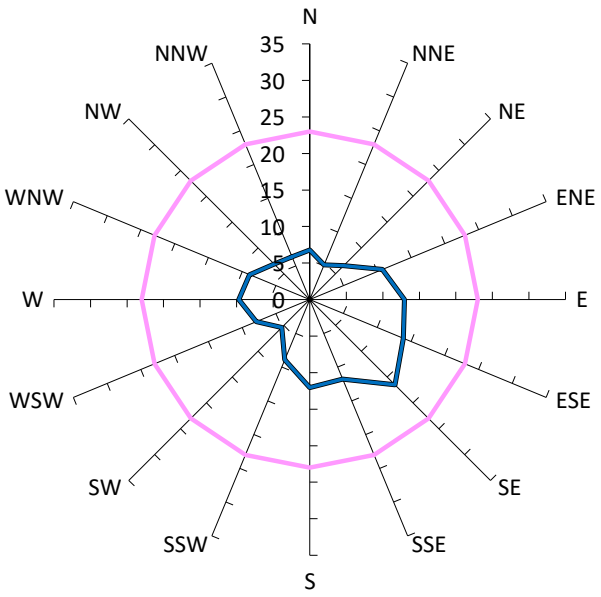
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	15

Results for Point 33

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

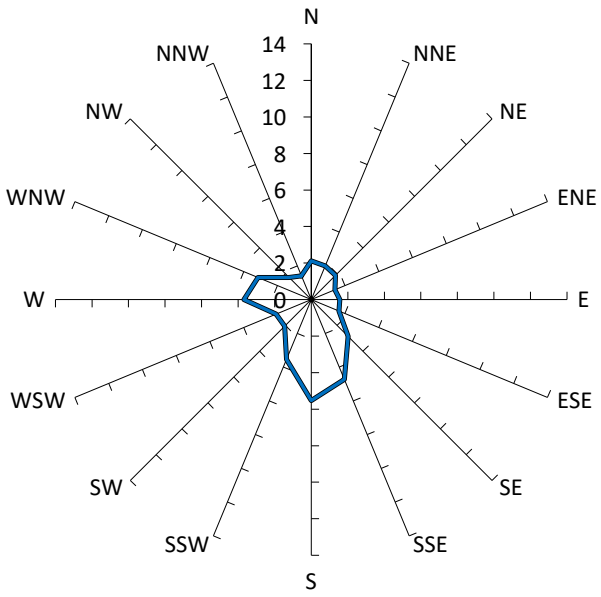
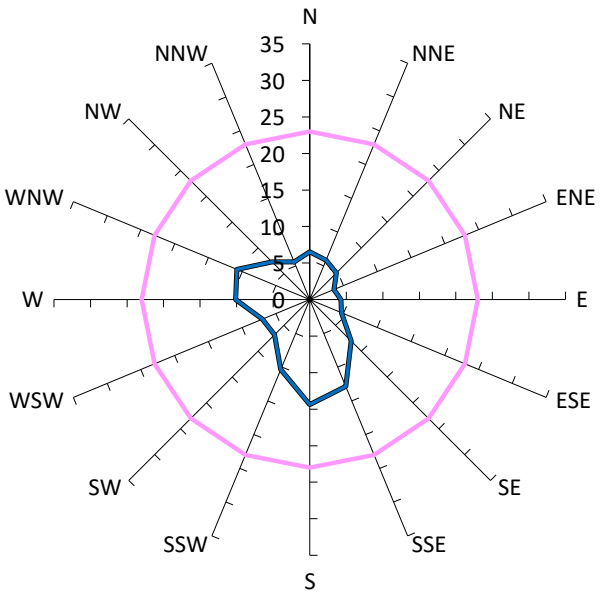
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	13

Results for Point 34

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

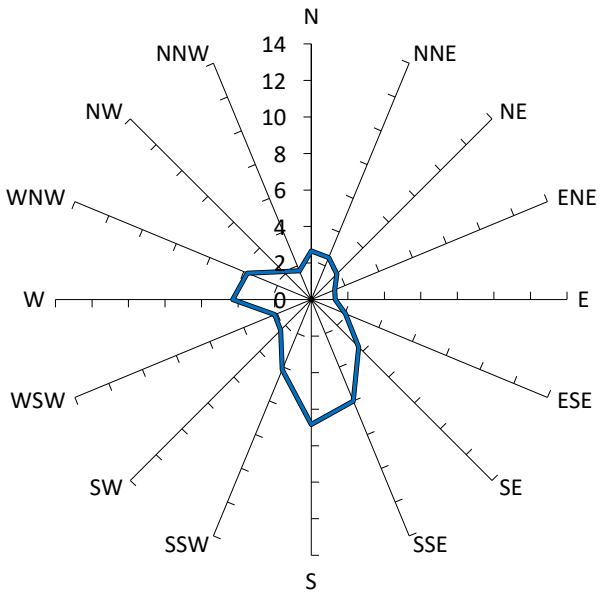
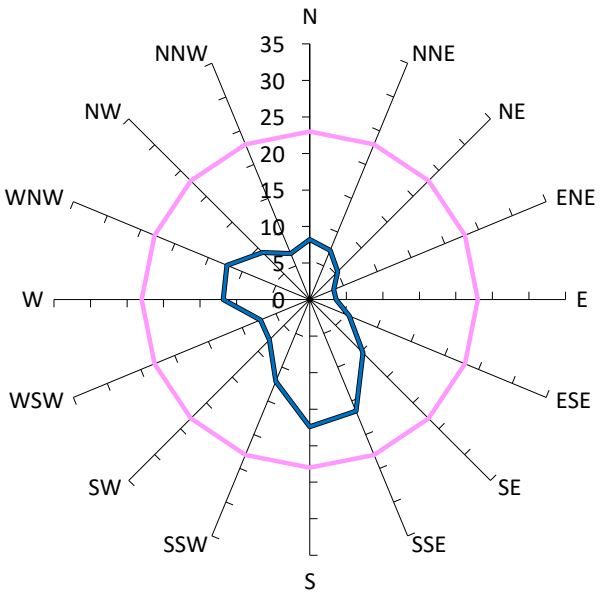
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	17

Results for Point 35

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

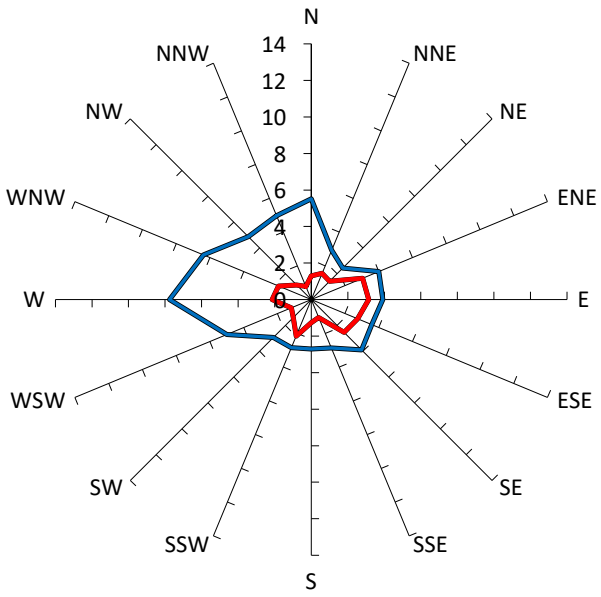
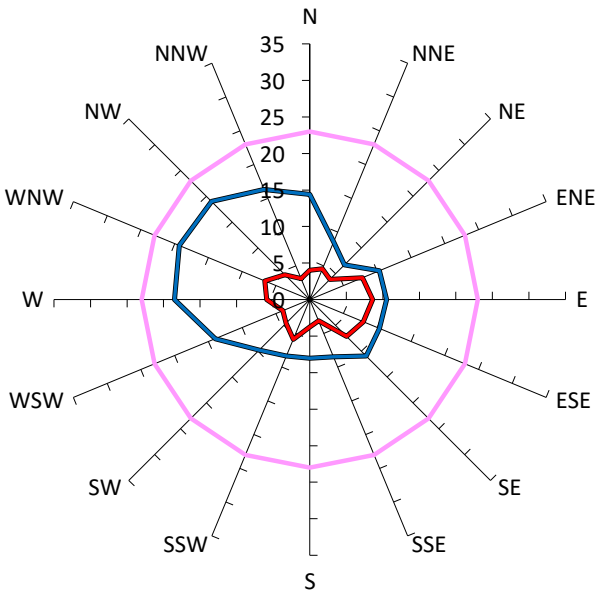
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	14

Results for Point 36

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

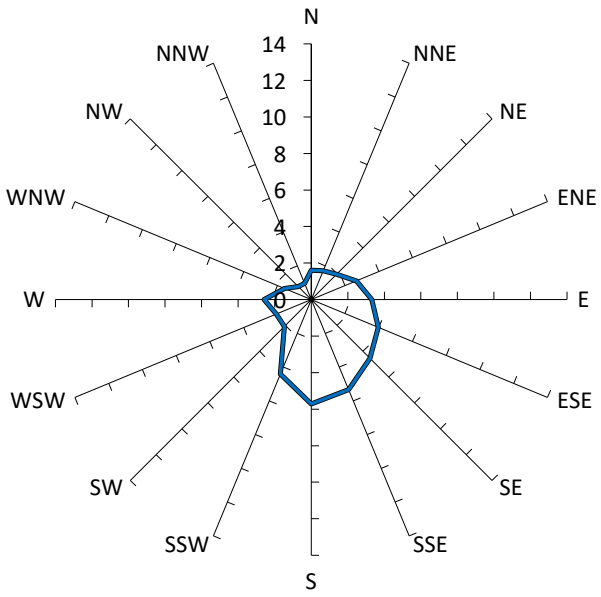
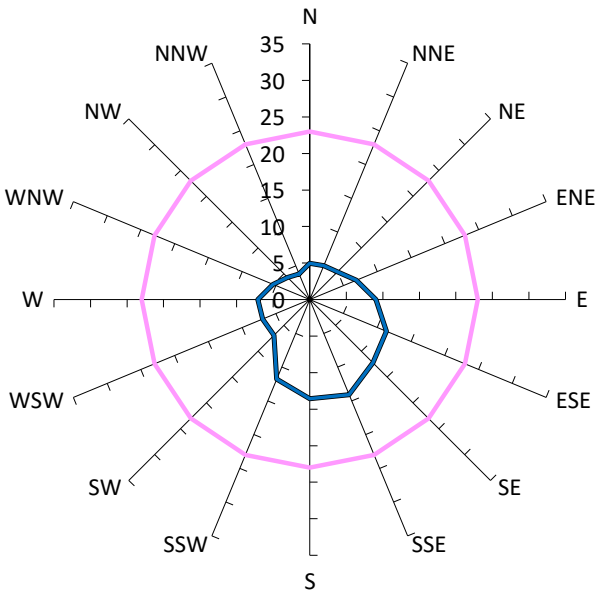
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	17

Results for Point 37

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

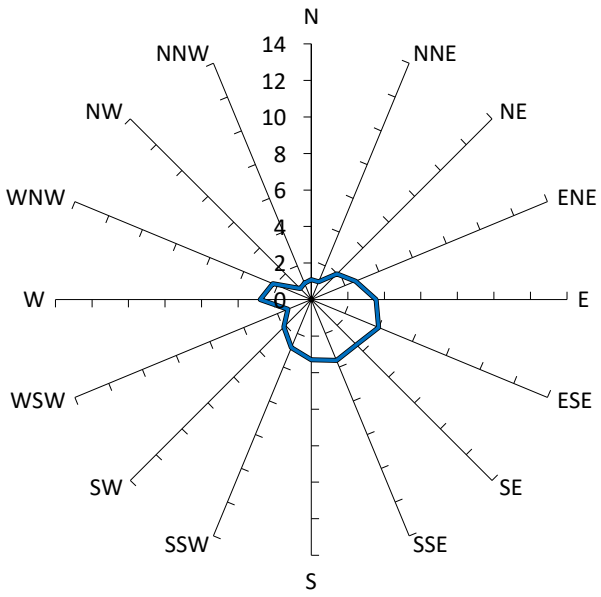
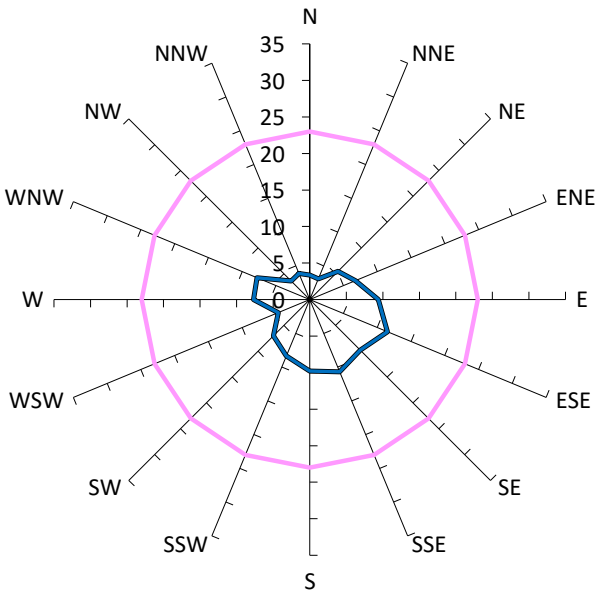
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	9%	19
WE759-02F02 - Treatment Testing	0%	9

Results for Point 38

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

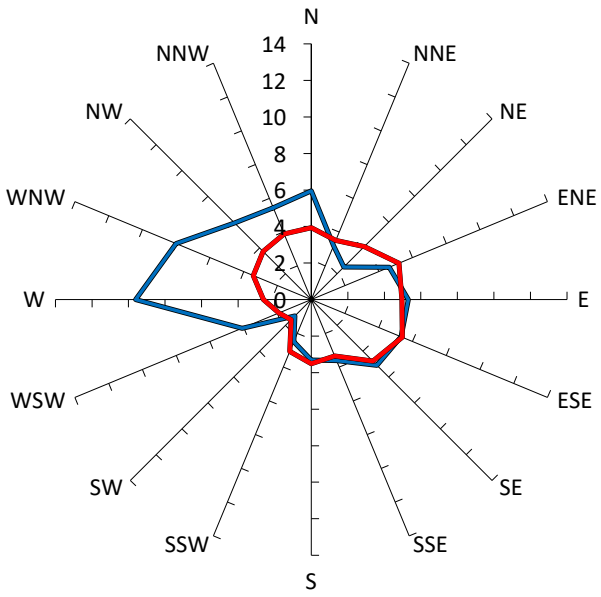
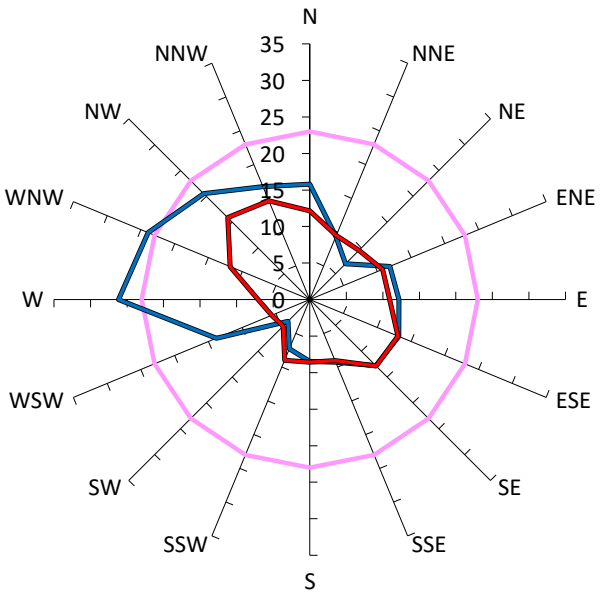
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	14

Results for Point 39

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

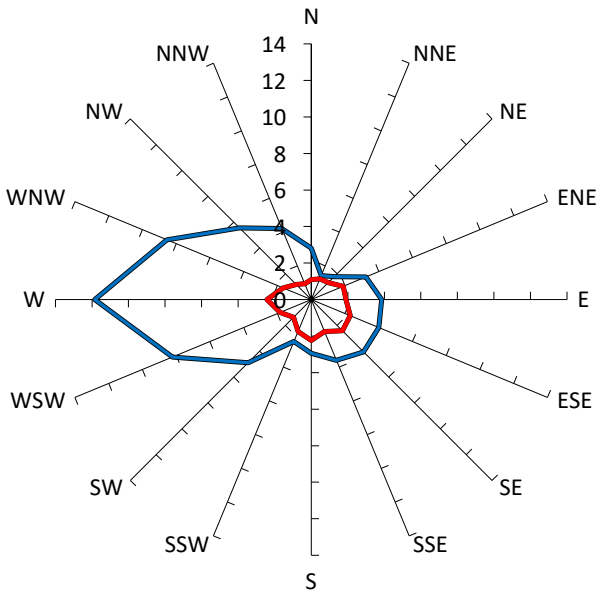
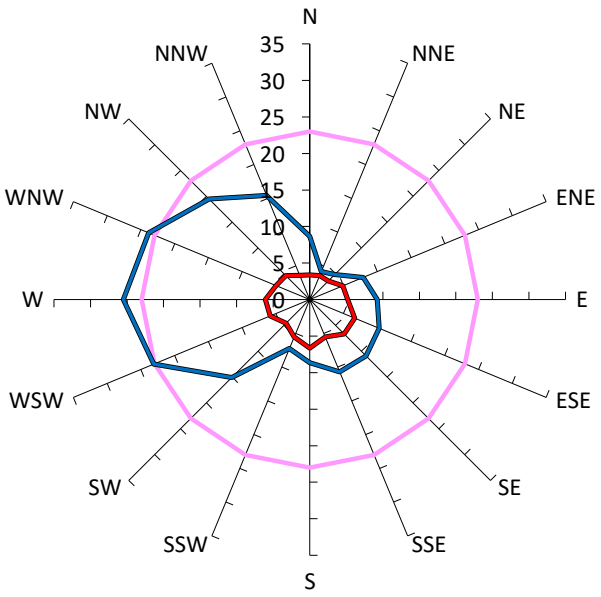
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	12

Results for Point 40

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

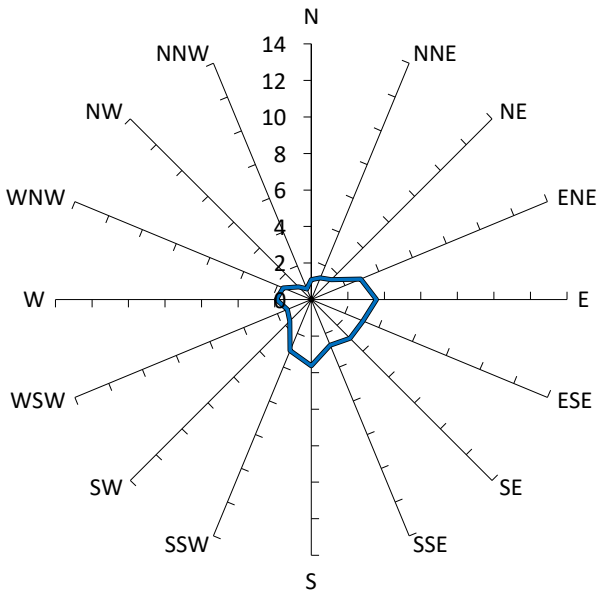
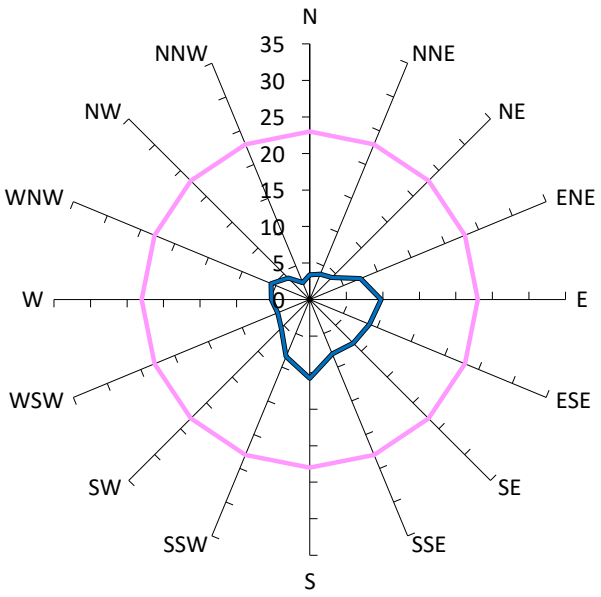
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	12%	26
WE759-02F02 - Treatment Testing	5%	16

Results for Point 41

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

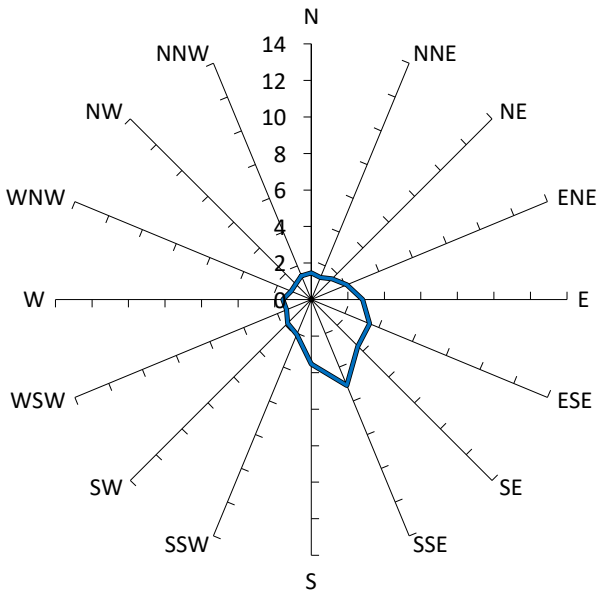
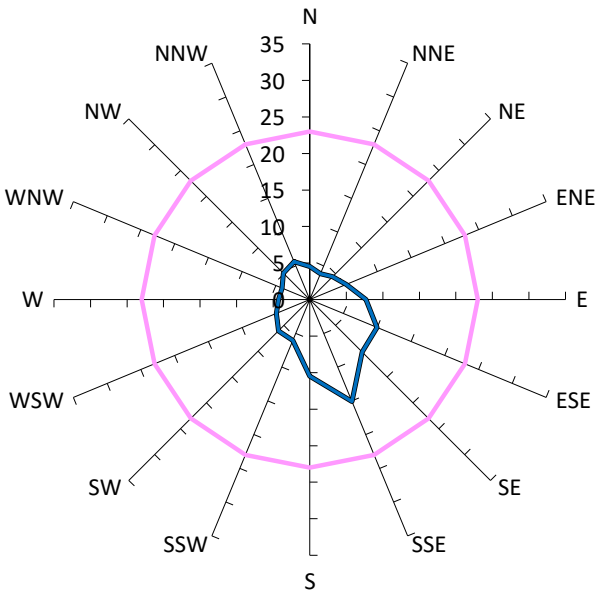
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	6%	26
WE759-02F02 - Treatment Testing	0%	7

Results for Point 42

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

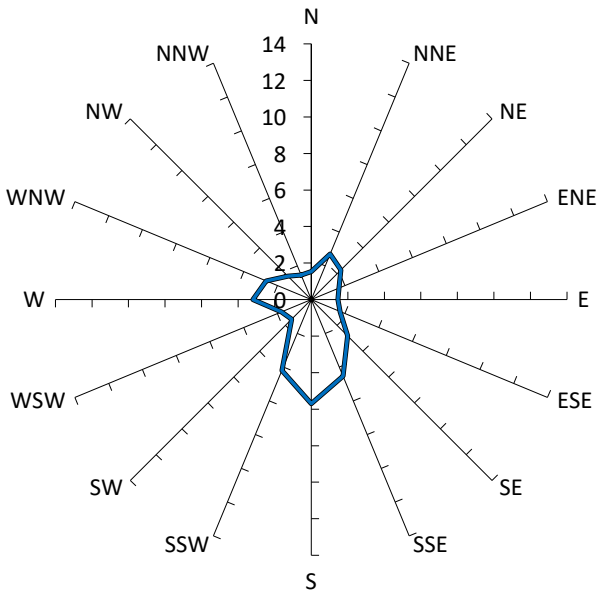
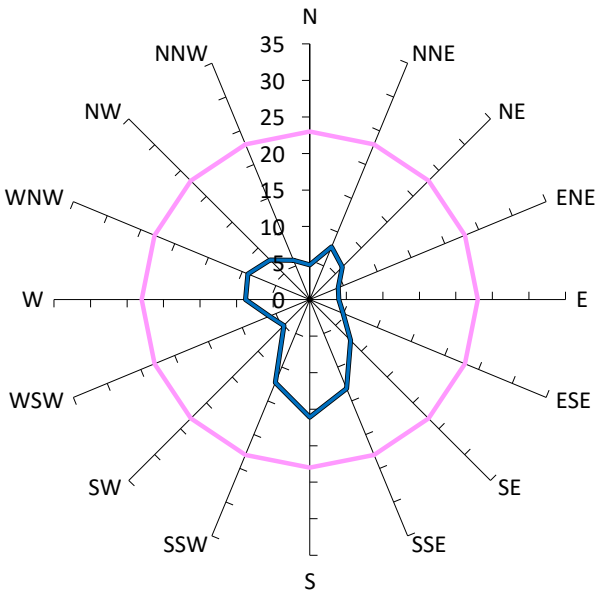
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	11

Results for Point 43

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	15

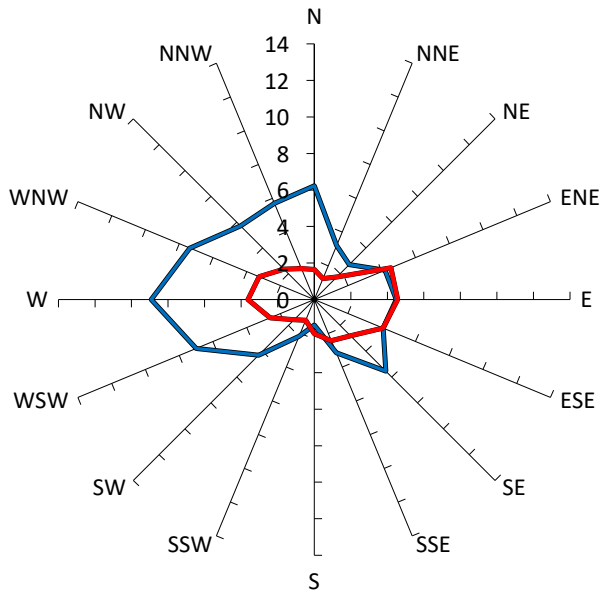
Results for Point 44

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	2%	16

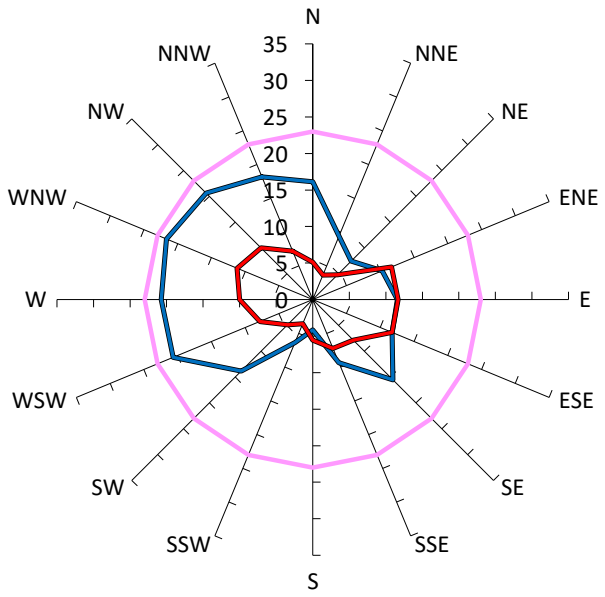
Results for Point 45

Gust Equivalent Mean (m/s)



Comfort Criteria: 5.5m/s with 5% probability of exceedence

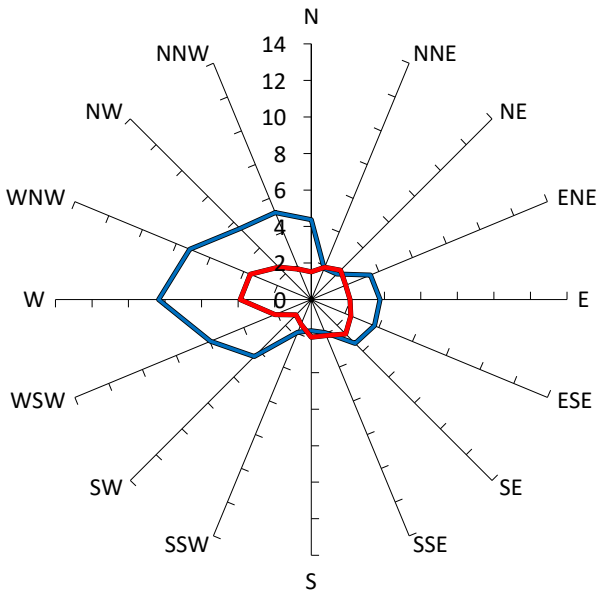
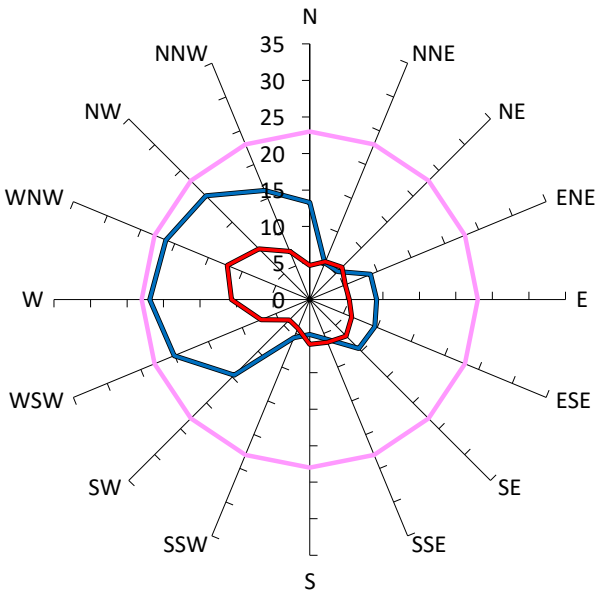
Maximum Gust (m/s)



Safety Limit: 23m/s

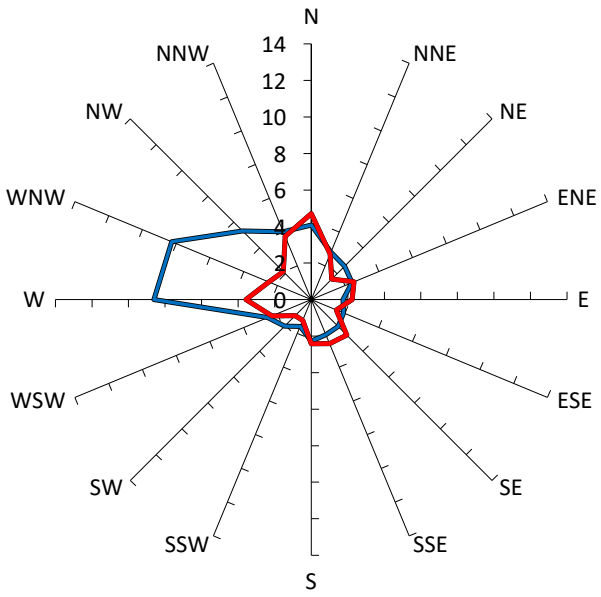
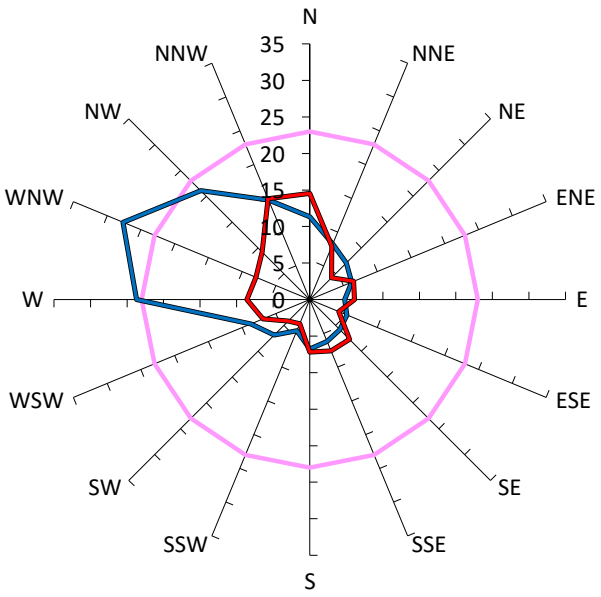
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	13%	22
WE759-02F02 - Treatment Testing	1%	12

Results for Point 46

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

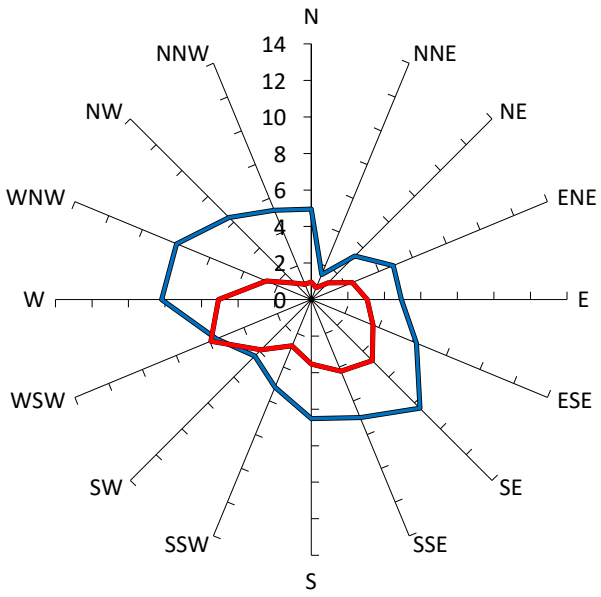
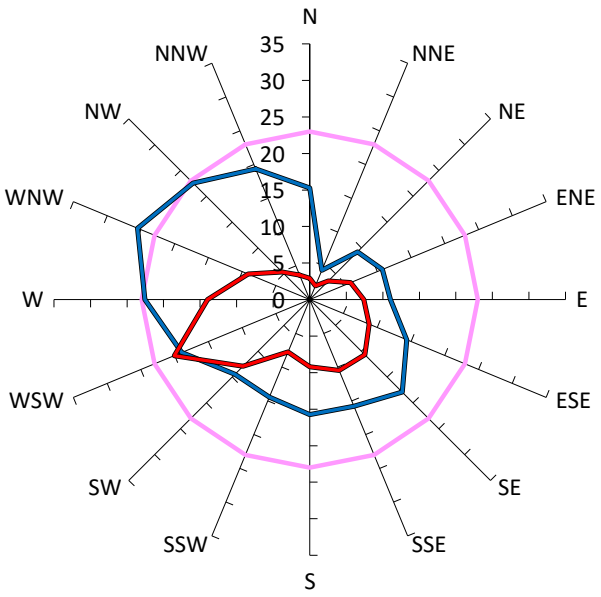
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	9%	22
WE759-02F02 - Treatment Testing	1%	12

Results for Point 47

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

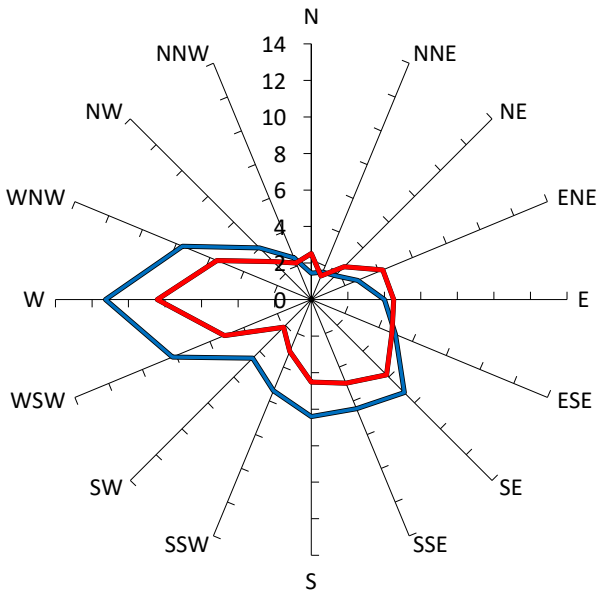
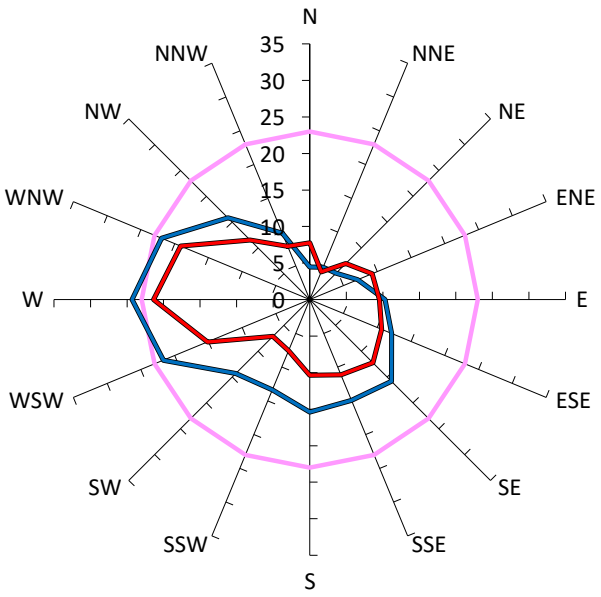
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	28
WE759-02F02 - Treatment Testing	0%	15

Results for Point 48

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

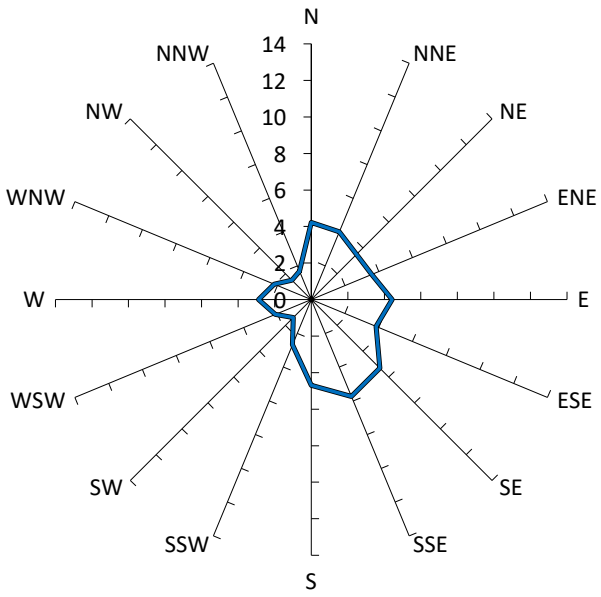
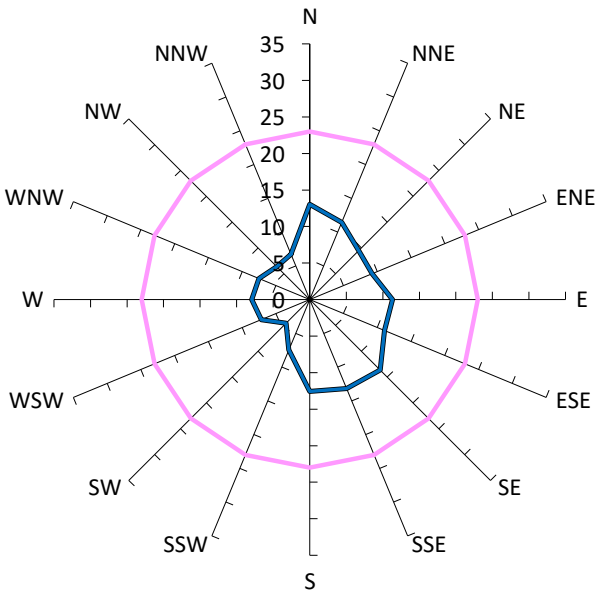
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	20%	26
WE759-02F02 - Treatment Testing	4%	20

Results for Point 49

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

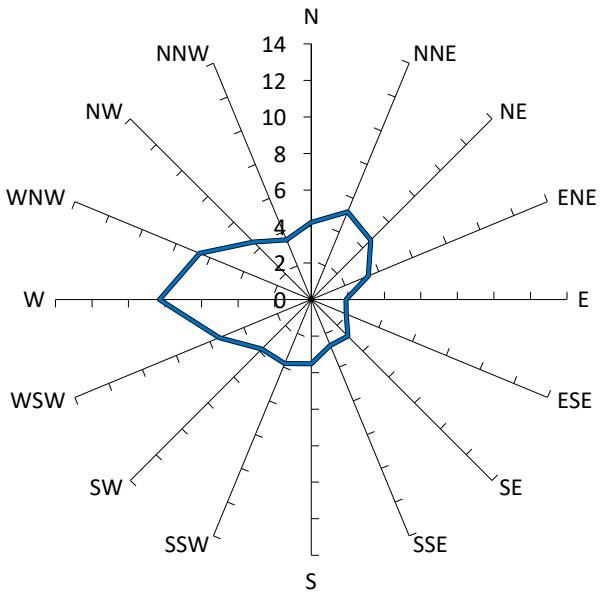
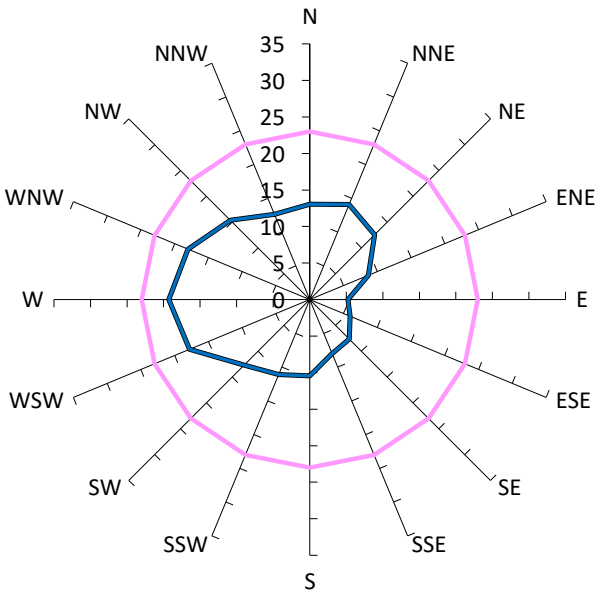
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	16%	24
WE759-02F02 - Treatment Testing	8%	21

Results for Point 50

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

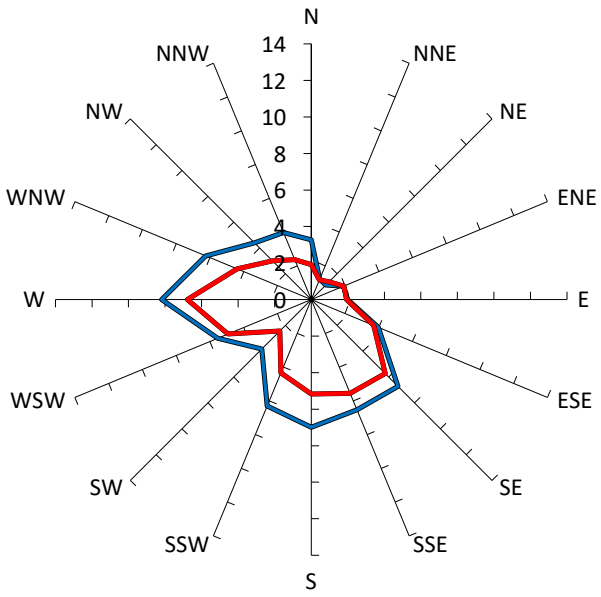
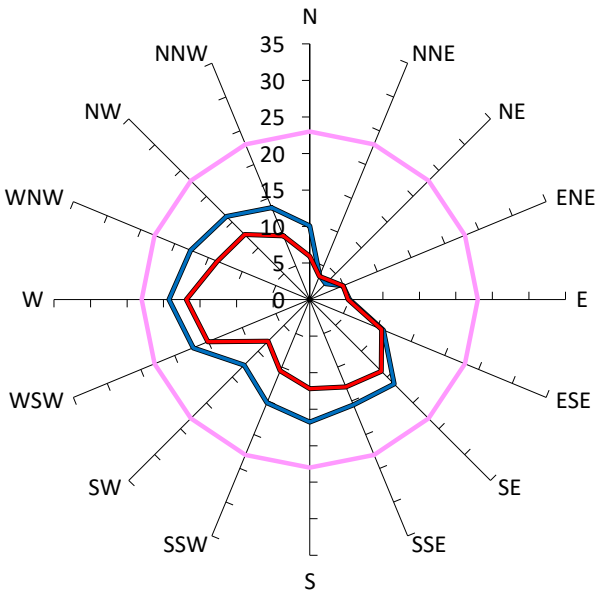
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	14

Results for Point 51

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

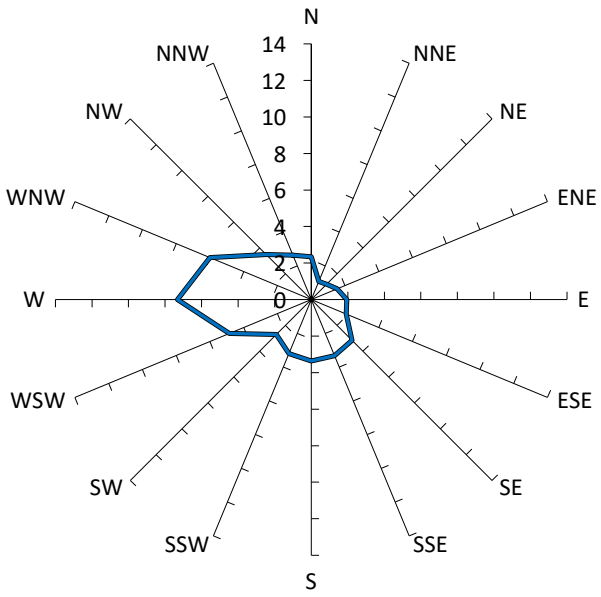
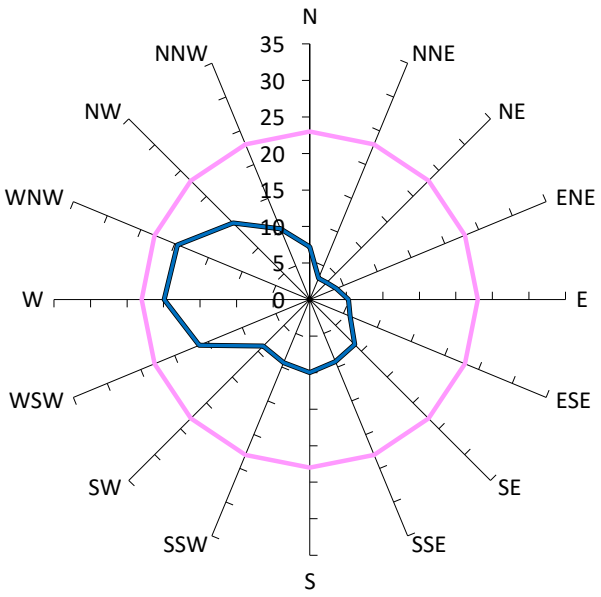
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	19

Results for Point 52

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

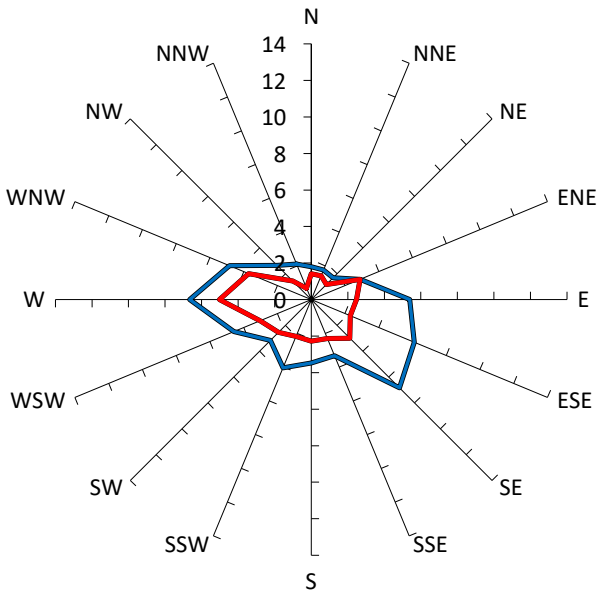
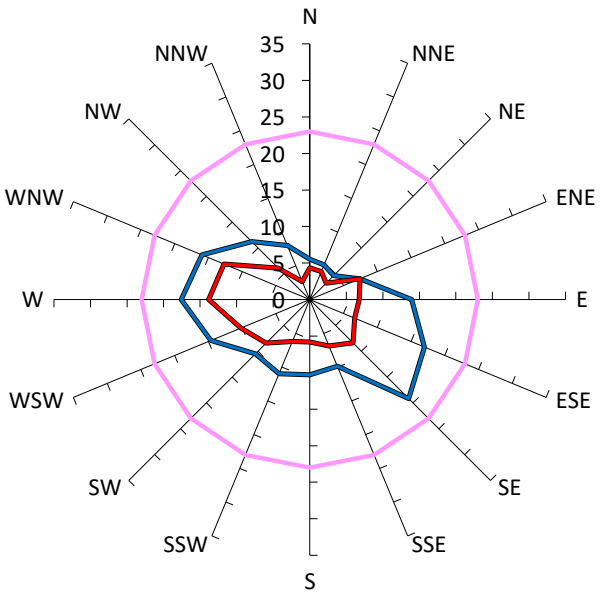
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	6%	19
WE759-02F02 - Treatment Testing	2%	17

Results for Point 53

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

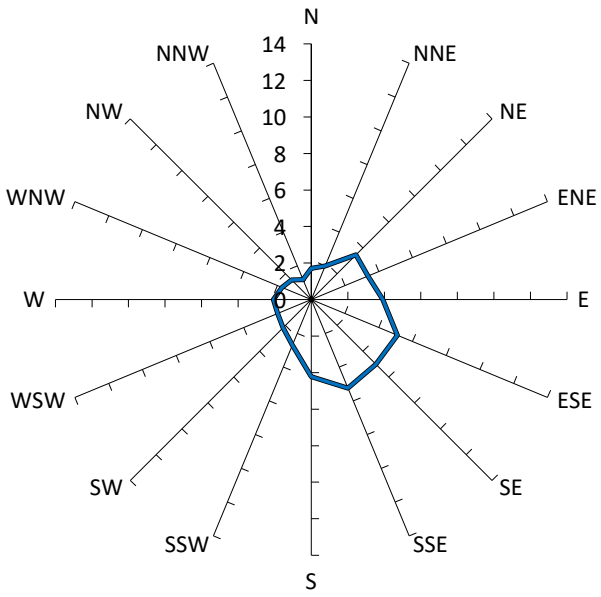
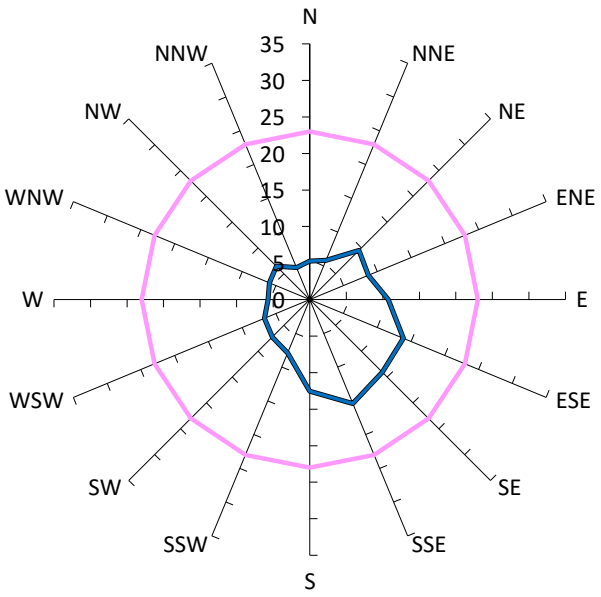
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	20

Results for Point 54

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

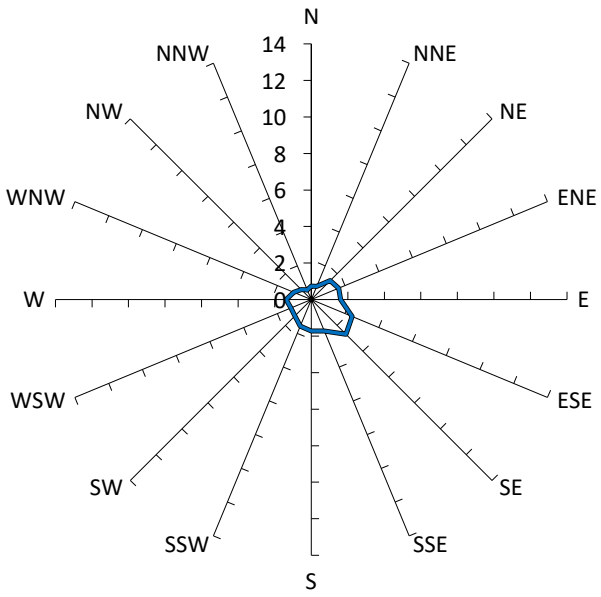
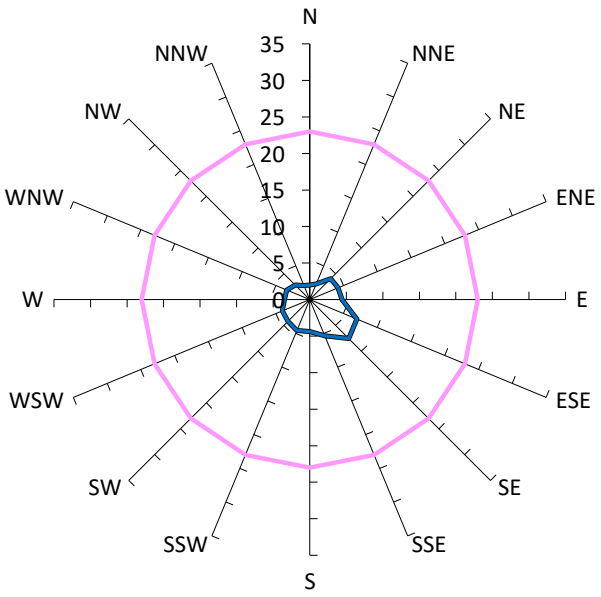
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	9%	19
WE759-02F02 - Treatment Testing	1%	14

Results for Point 55

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

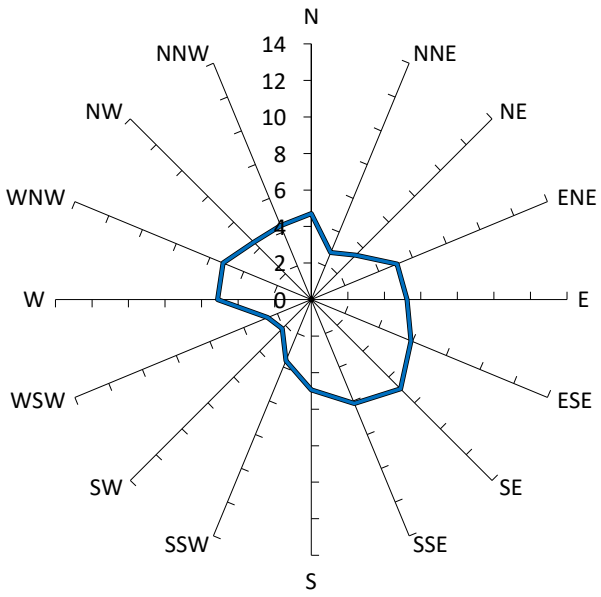
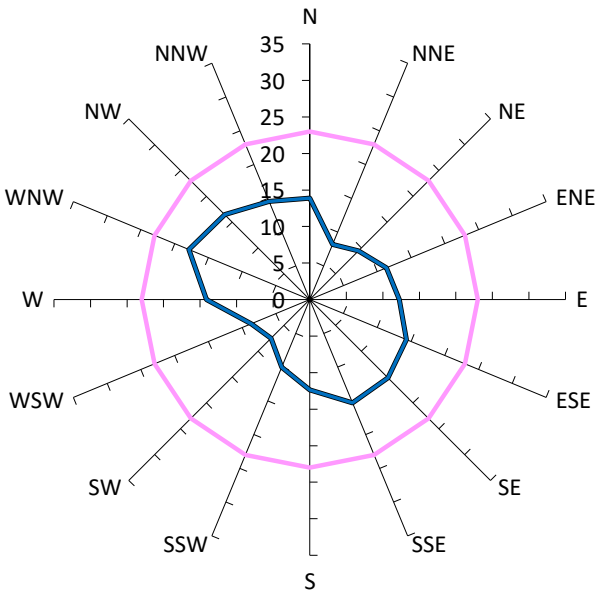
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	15

Results for Point 56

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

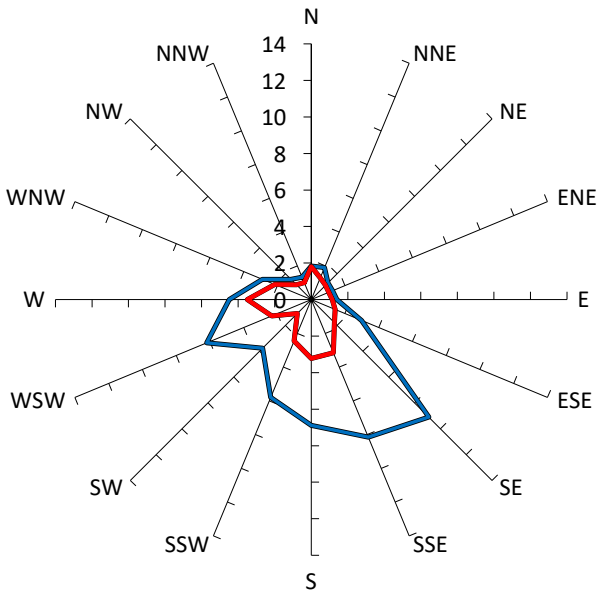
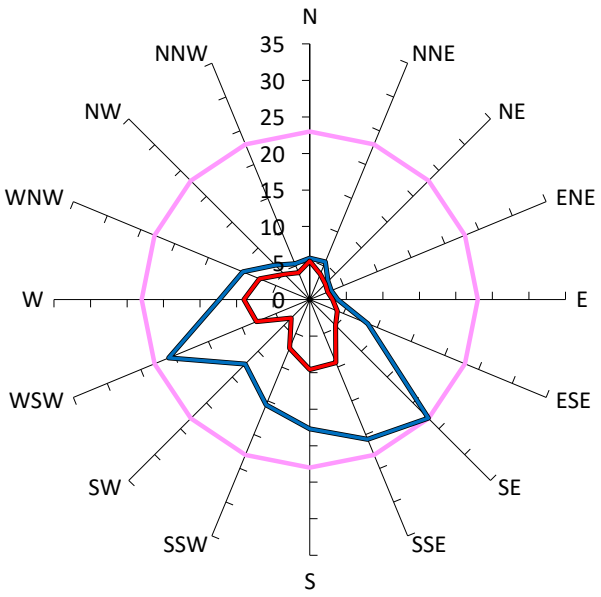
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	8

Results for Point 57

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

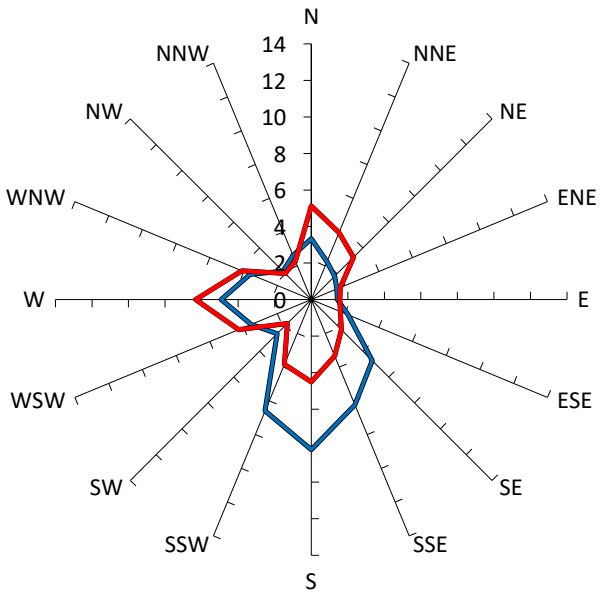
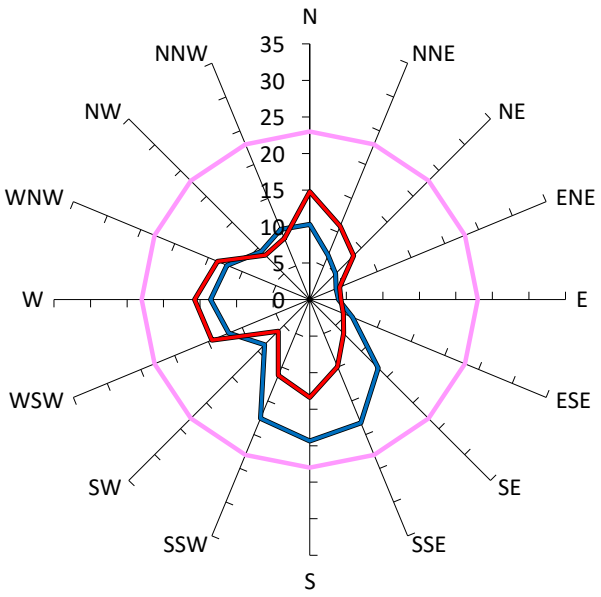
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	3%	18

Results for Point 58

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

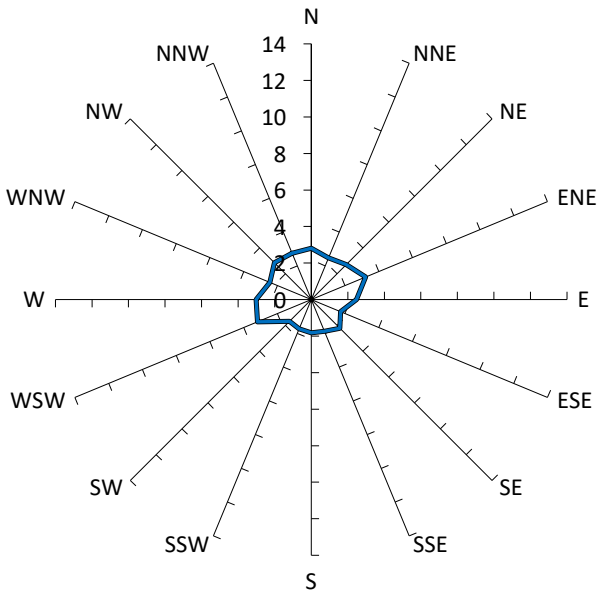
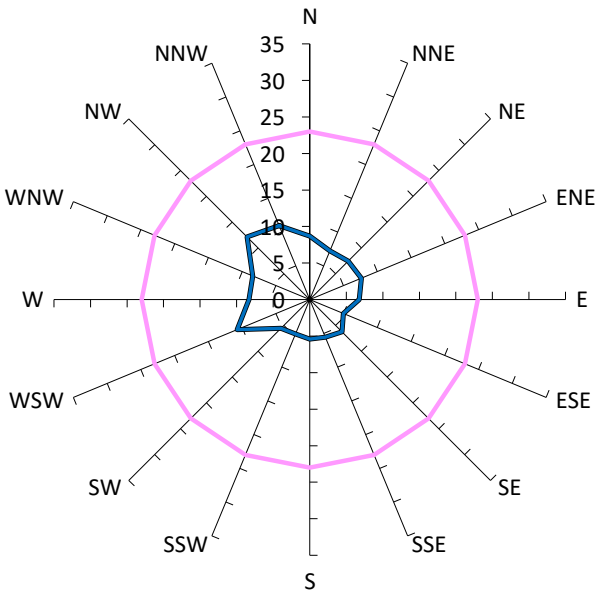
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	12%	23
WE759-02F02 - Treatment Testing	0%	10

Results for Point 59

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

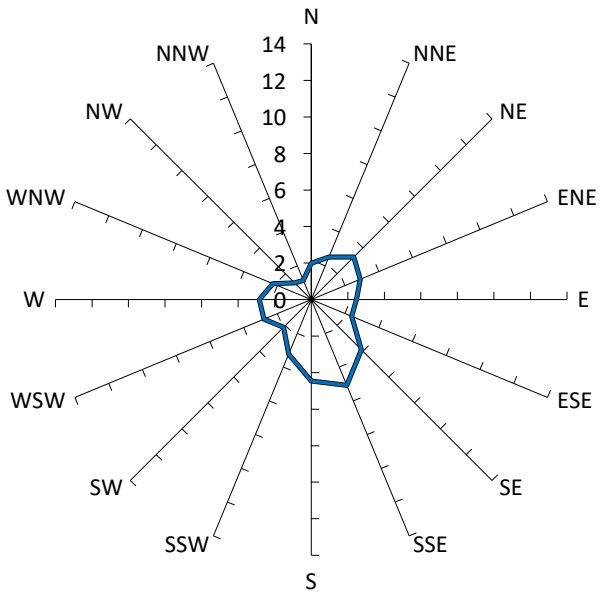
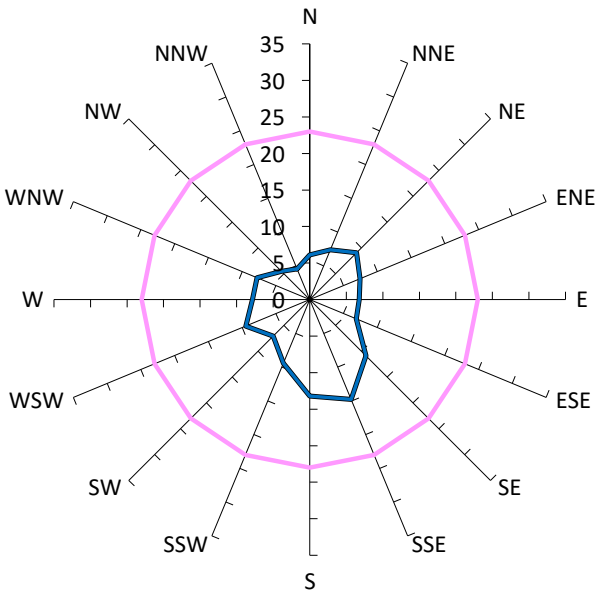
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	10%	19
WE759-02F02 - Treatment Testing	5%	16

Results for Point 60

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

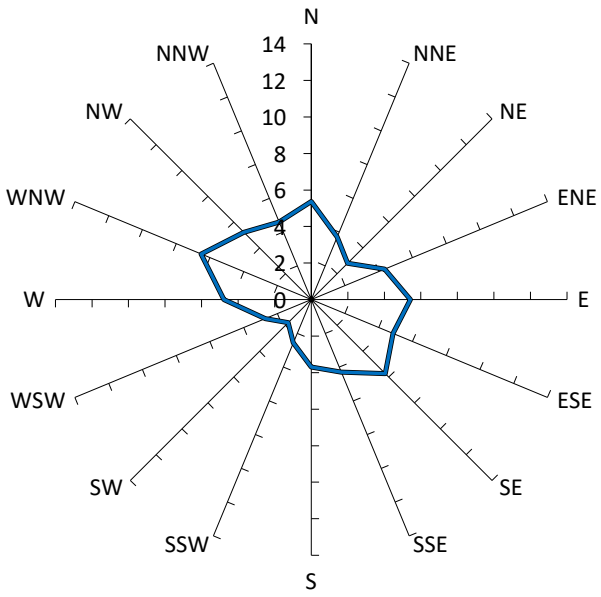
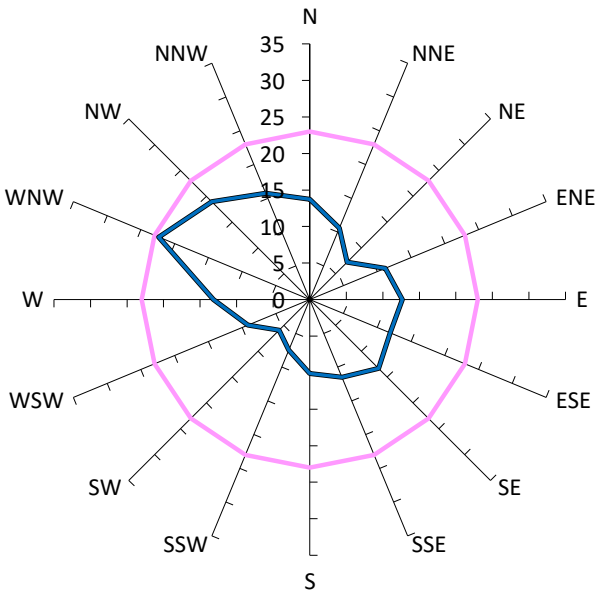
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	12

Results for Point 61

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

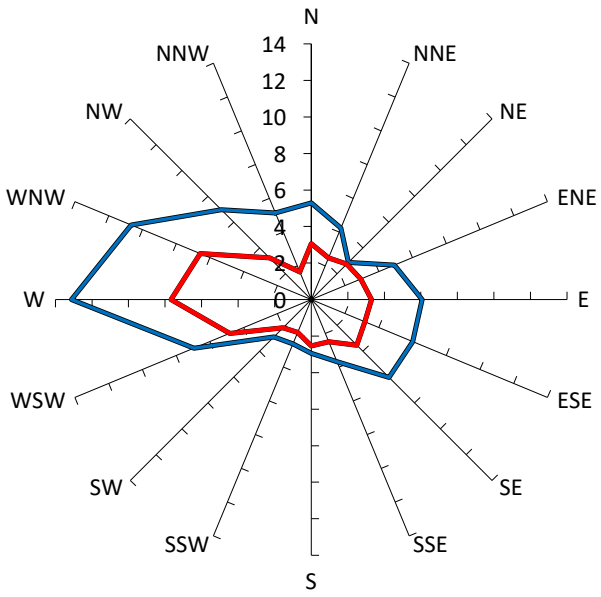
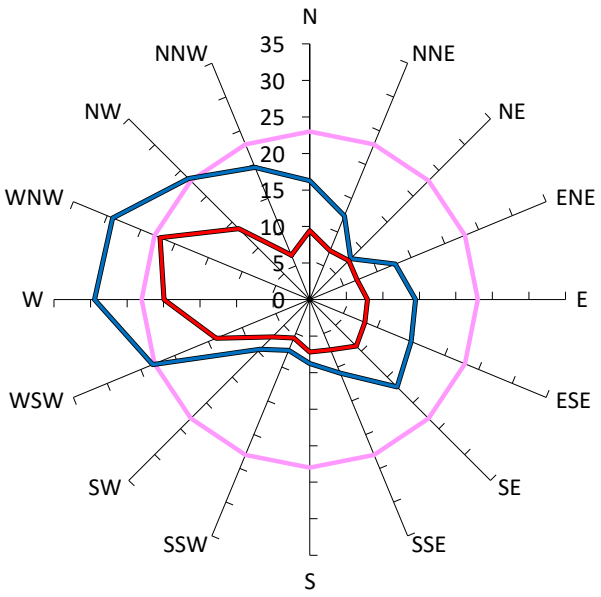
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	15

Results for Point 62

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

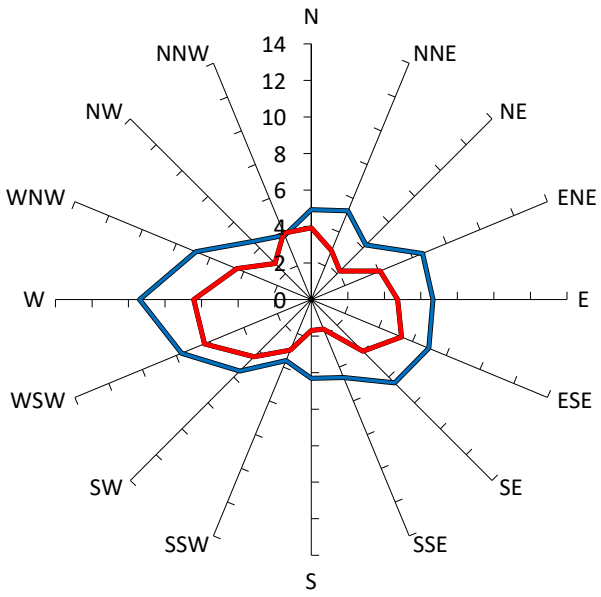
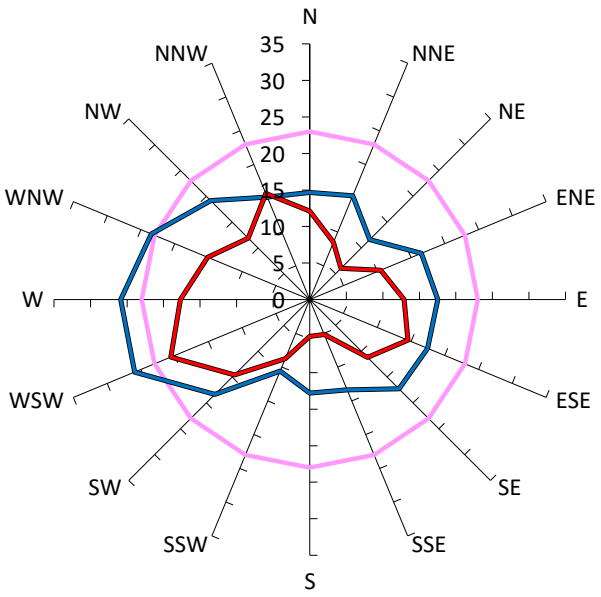
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	3%	22

Results for Point 63

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

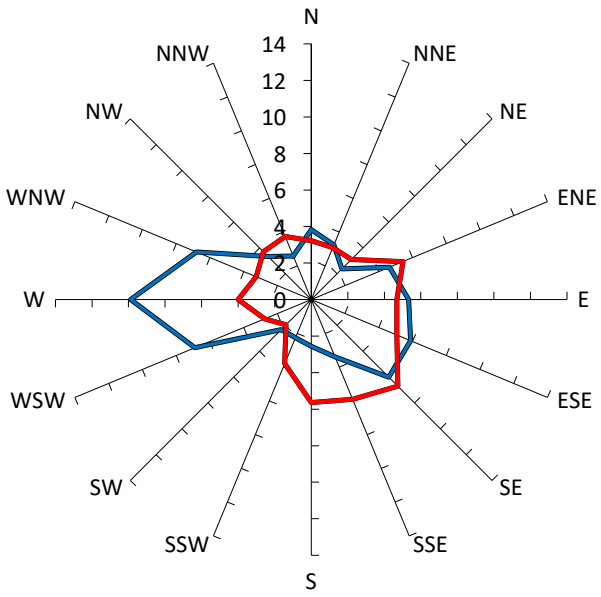
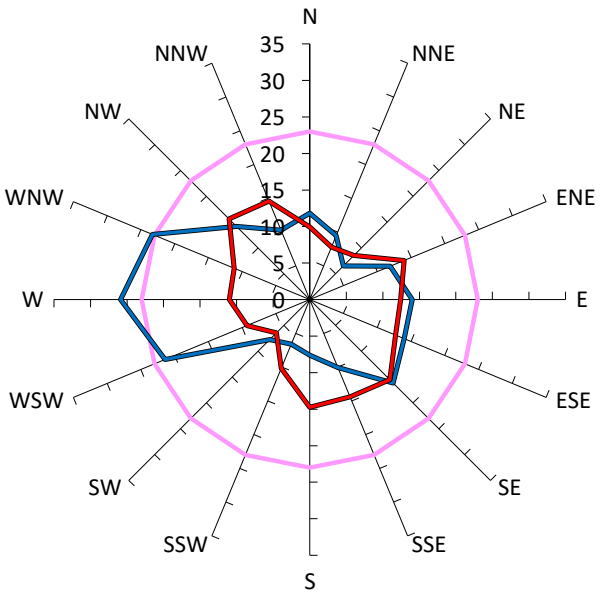
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	8%	29
WE759-02F02 - Treatment Testing	3%	22

Results for Point 64

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

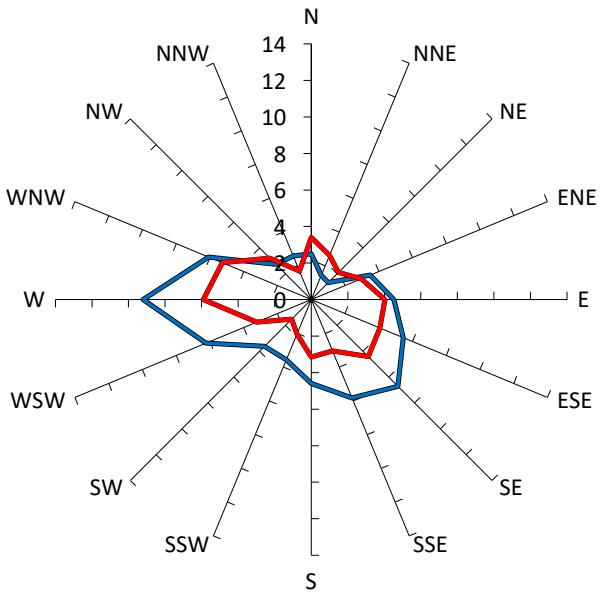
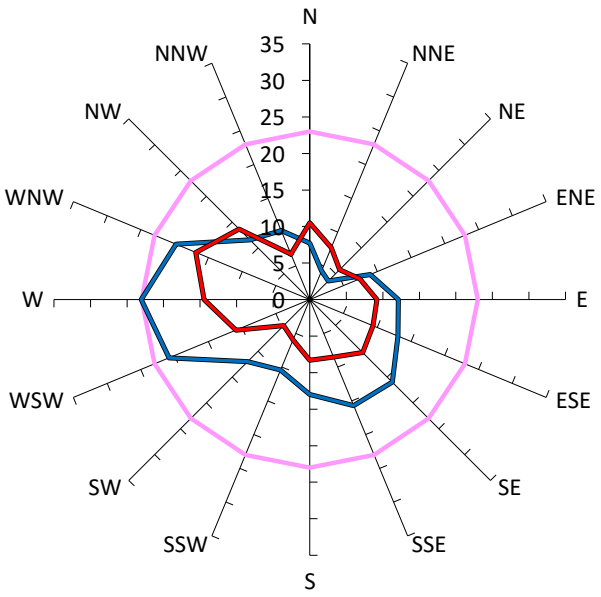
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	8%	26
WE759-02F02 - Treatment Testing	2%	21

Results for Point 65

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

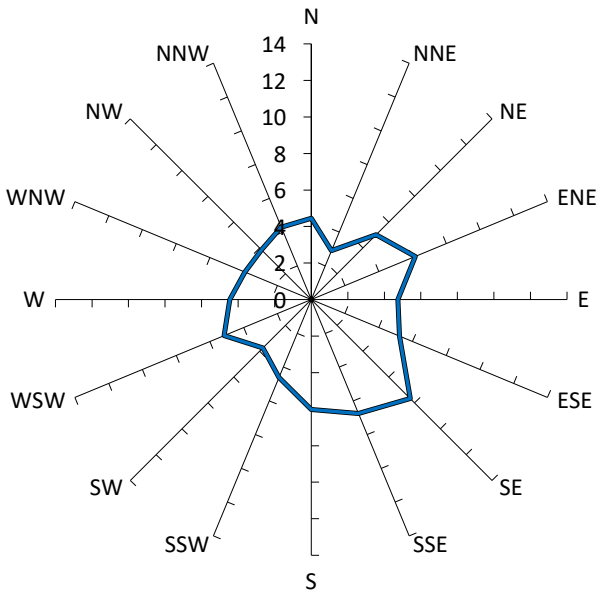
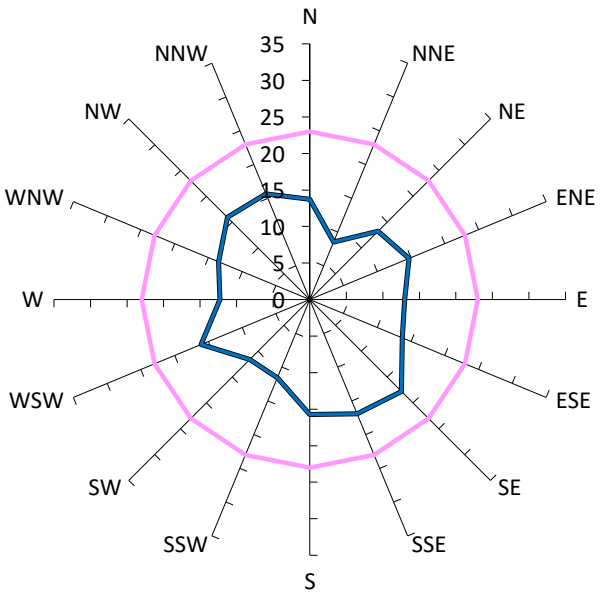
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	26
WE759-02F02 - Treatment Testing	2%	16

Results for Point 66

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

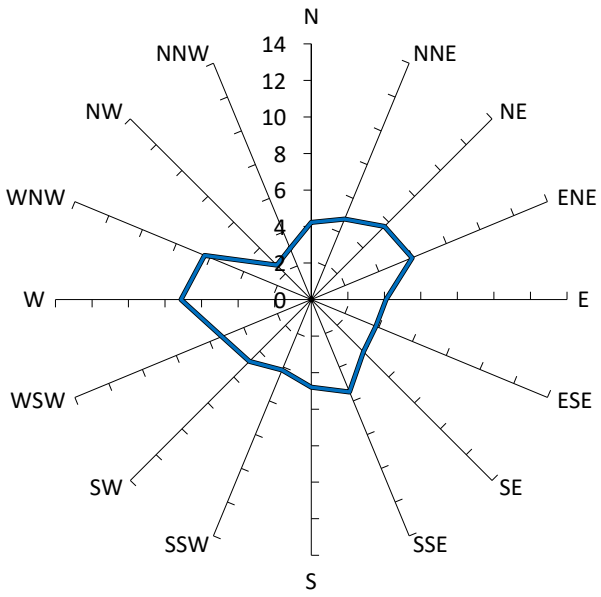
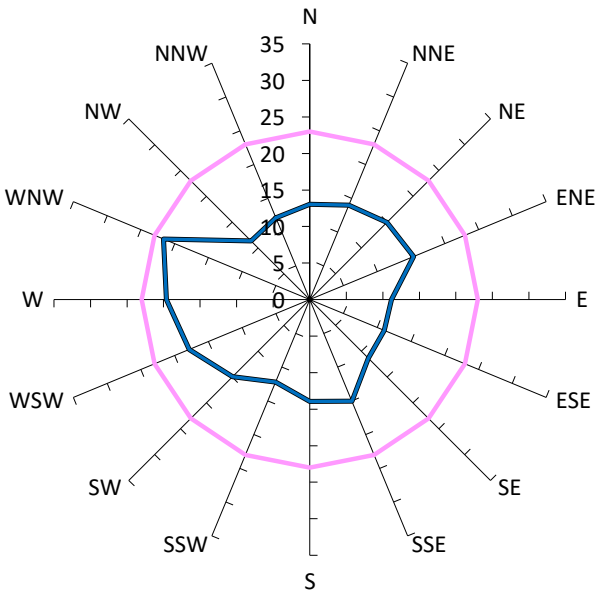
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	11%	23
WE759-02F02 - Treatment Testing	5%	17

Results for Point 67

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

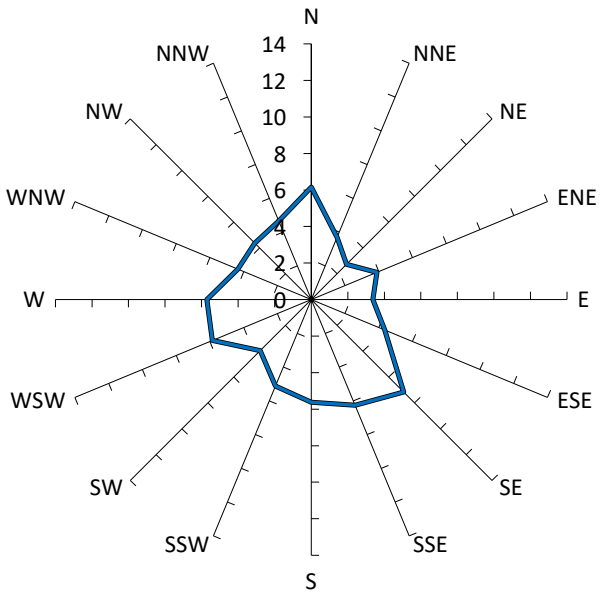
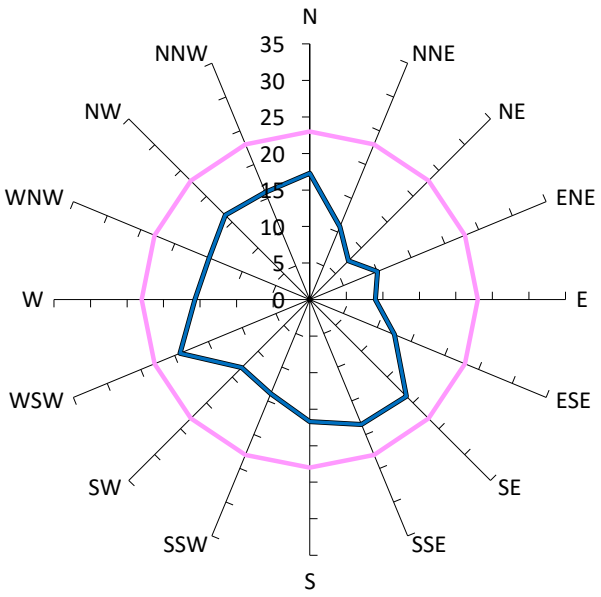
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	18

Results for Point 68

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

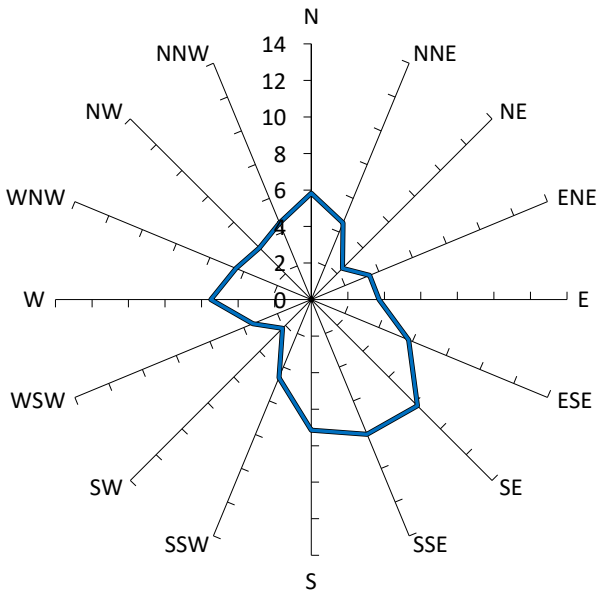
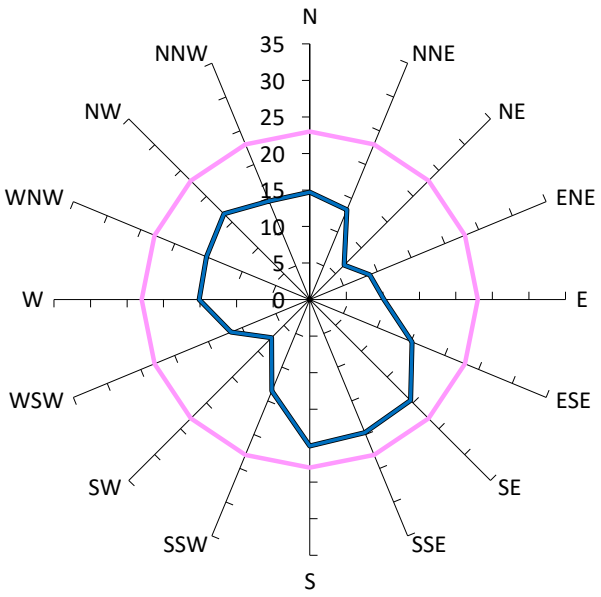
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	22

Results for Point 69

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

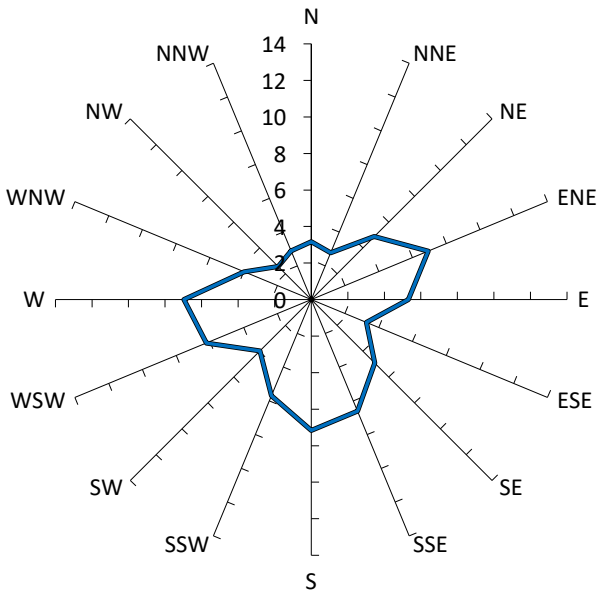
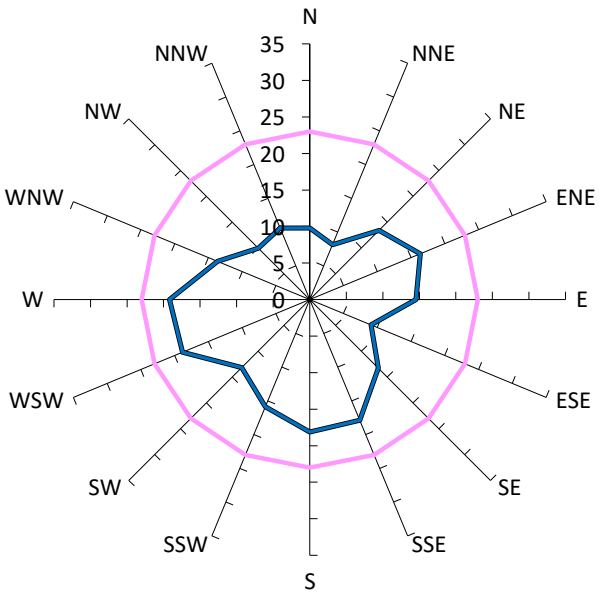
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	19

Results for Point 70

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

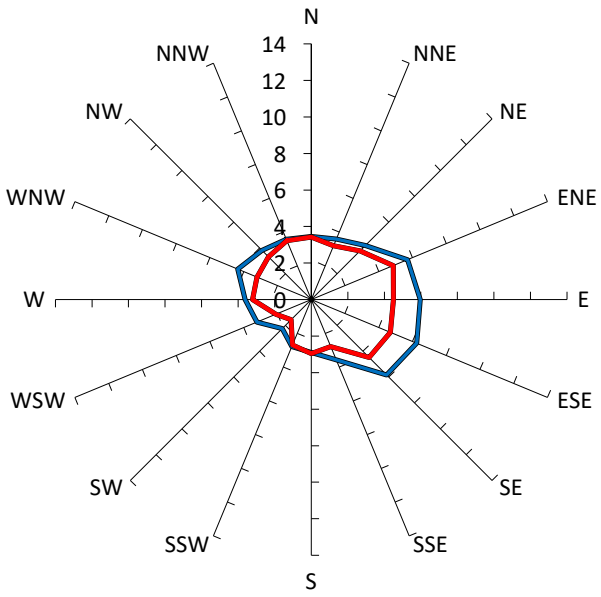
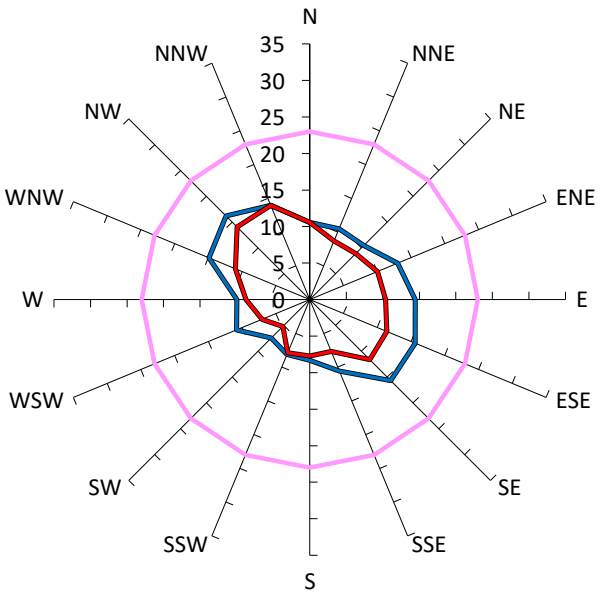
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	20

Results for Point 71

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

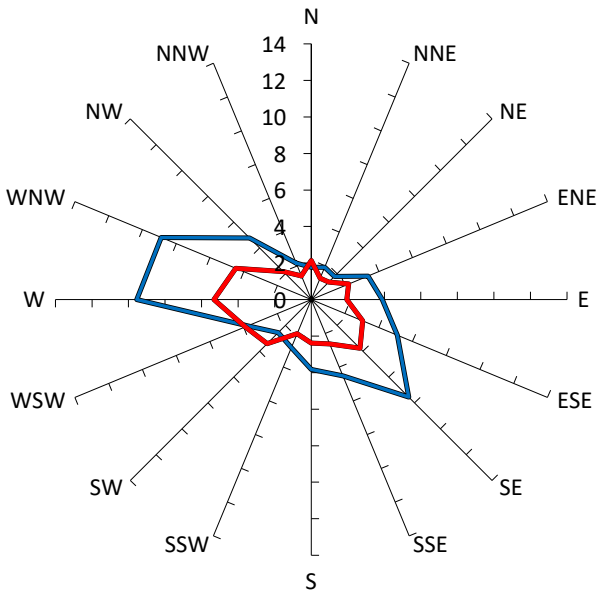
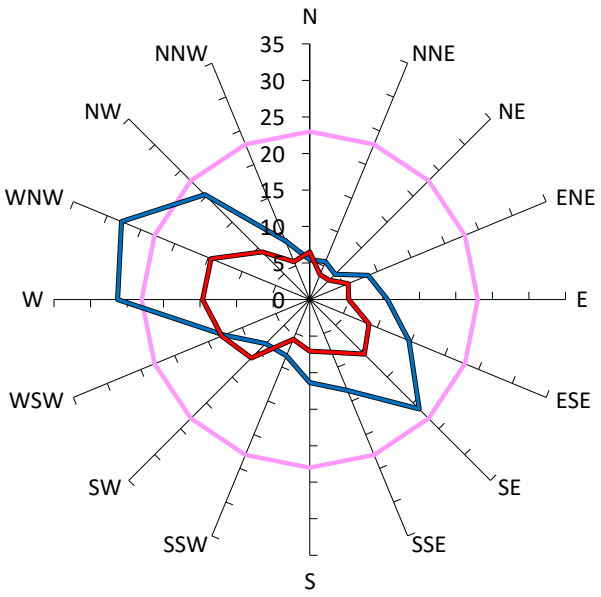
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	4%	19

Results for Point 72

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

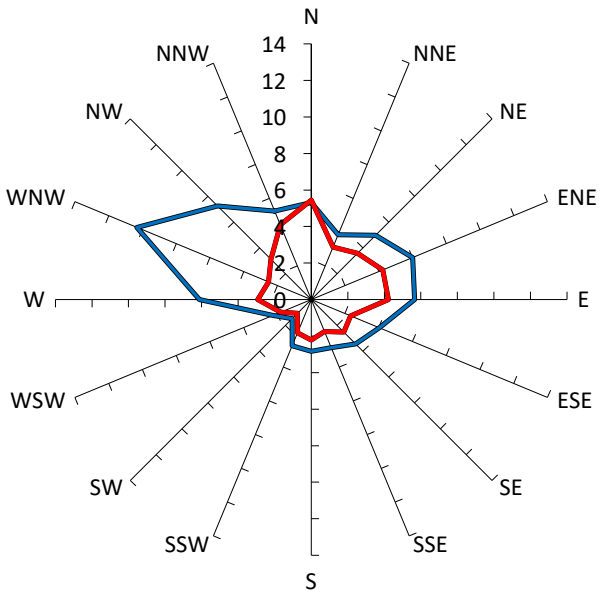
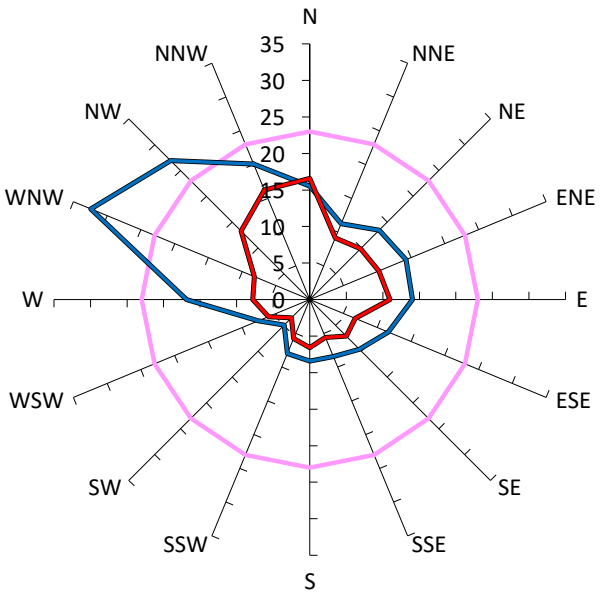
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	9%	16
WE759-02F02 - Treatment Testing	3%	14

Results for Point 73

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

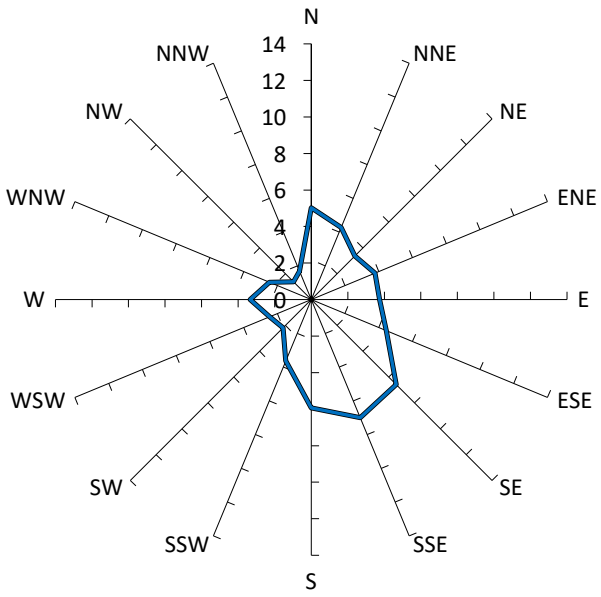
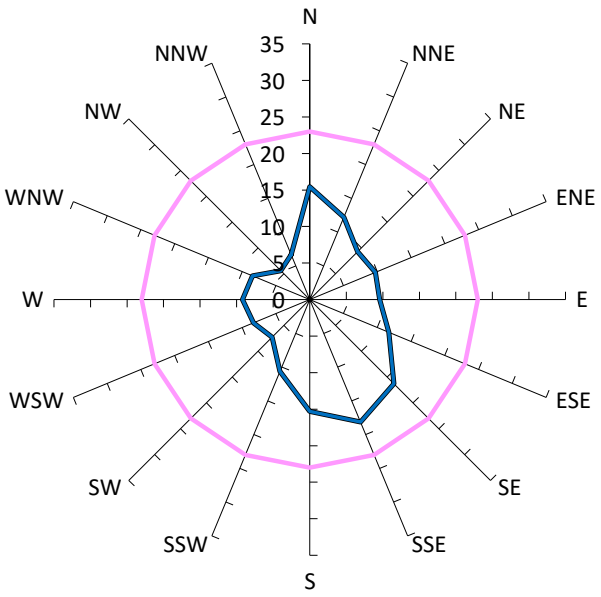
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	28
WE759-02F02 - Treatment Testing	0%	15

Results for Point 74

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

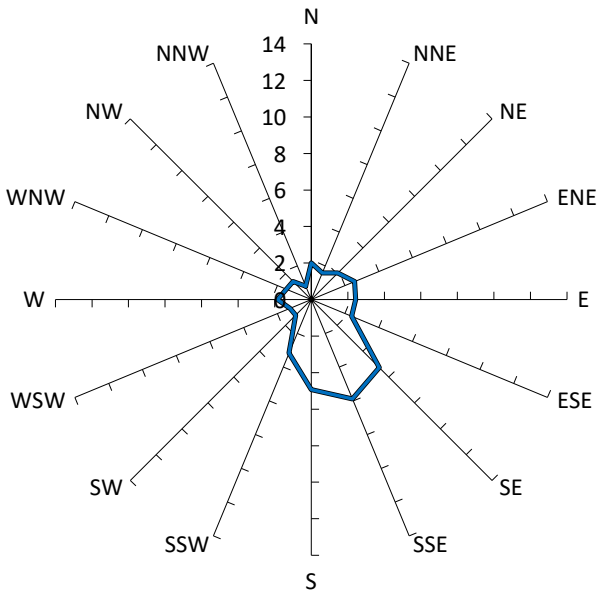
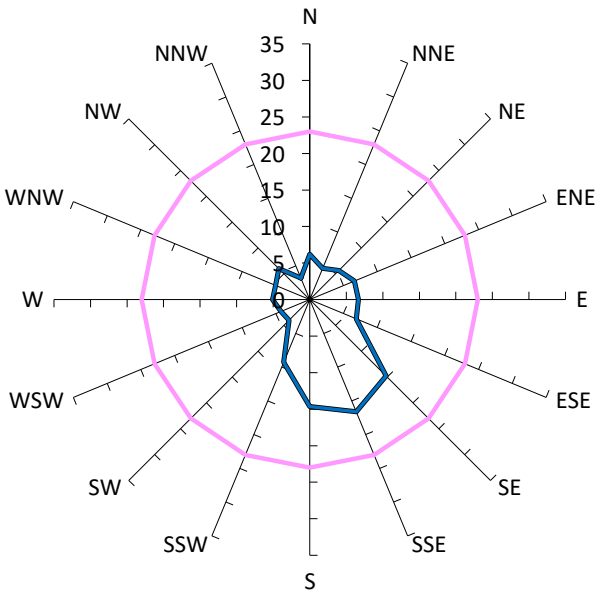
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	5%	32
WE759-02F02 - Treatment Testing	1%	17

Results for Point 75

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

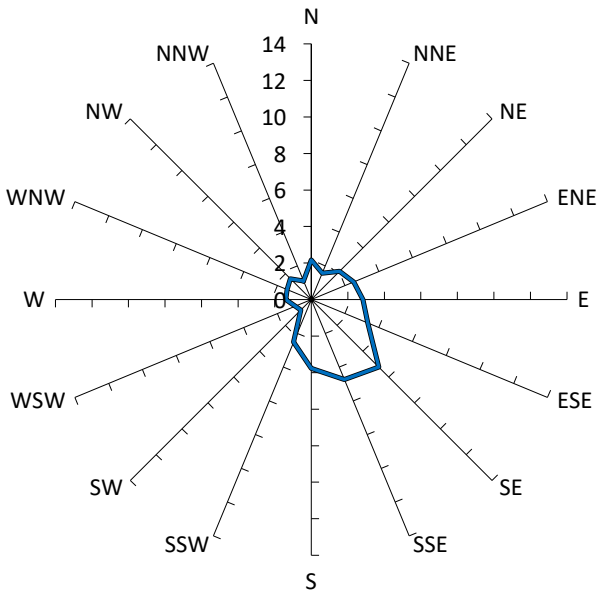
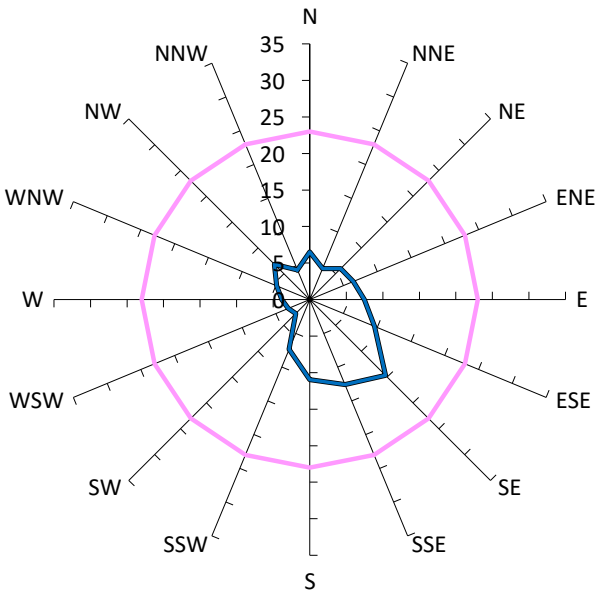
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	2%	18

Results for Point 76

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

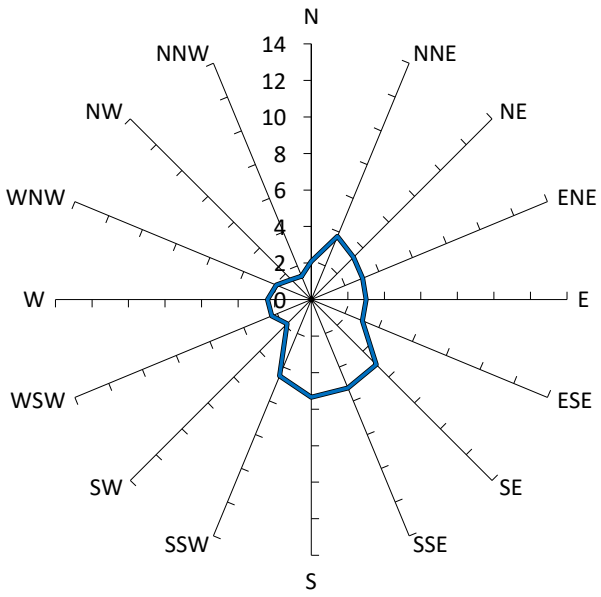
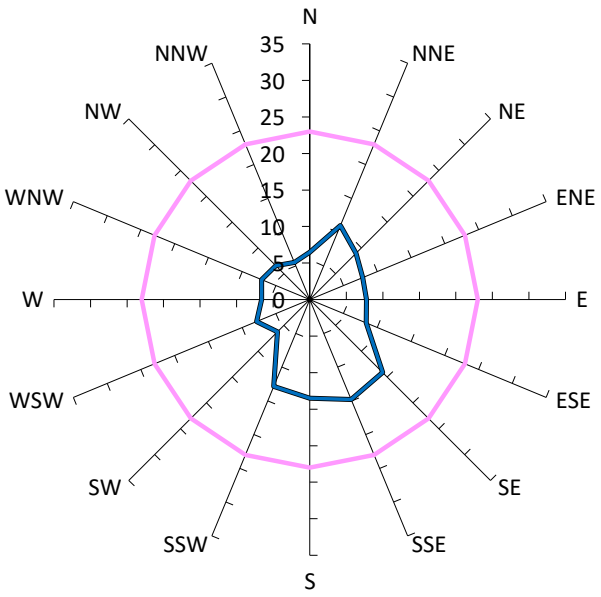
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	3%	17

Results for Point 77

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

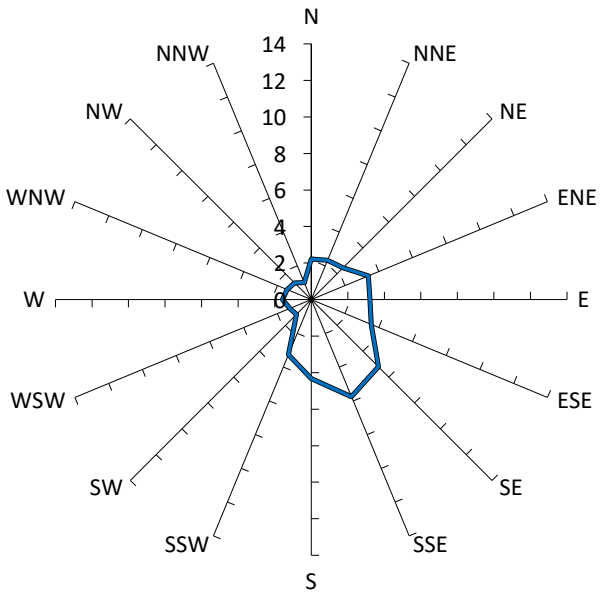
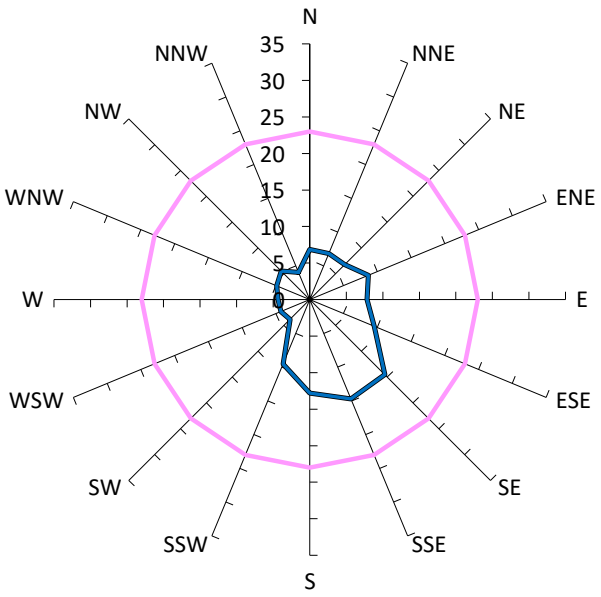
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	2%	15

Results for Point 78

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	15

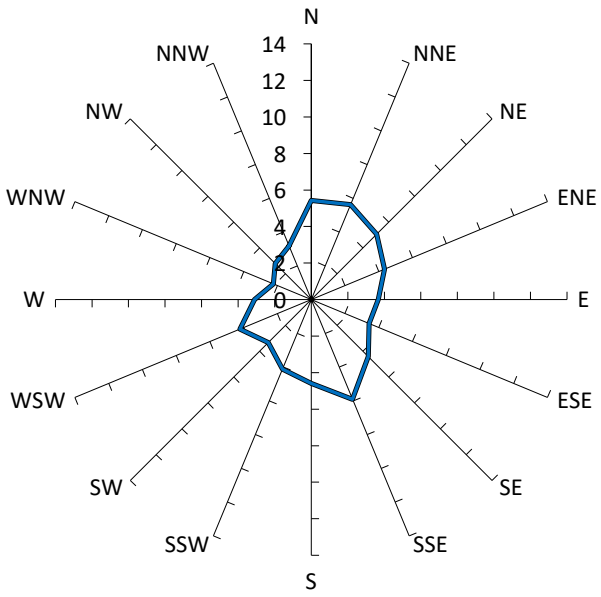
Results for Point 79

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	15

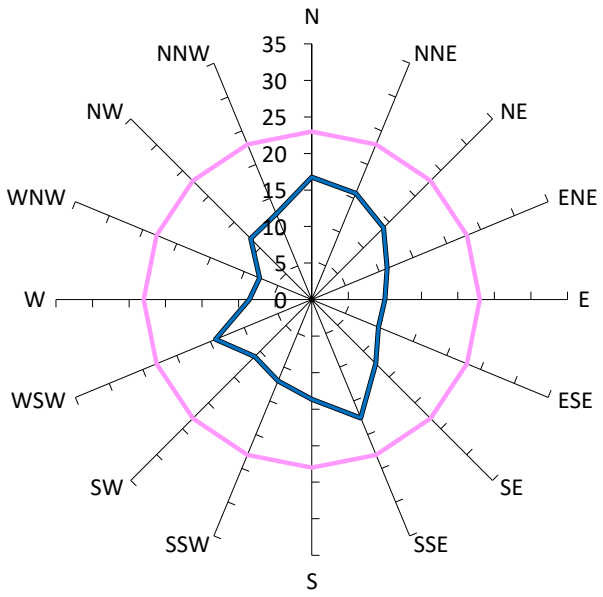
Results for Point 80

Gust Equivalent Mean (m/s)



Comfort Criteria: 7.5m/s with 5% probability of exceedence

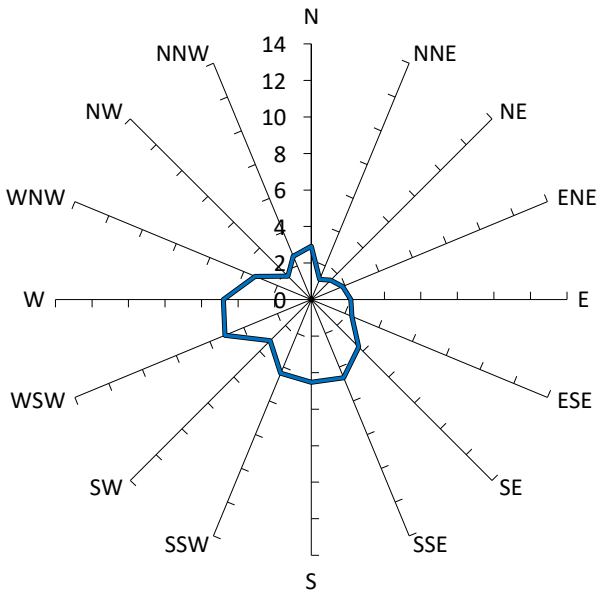
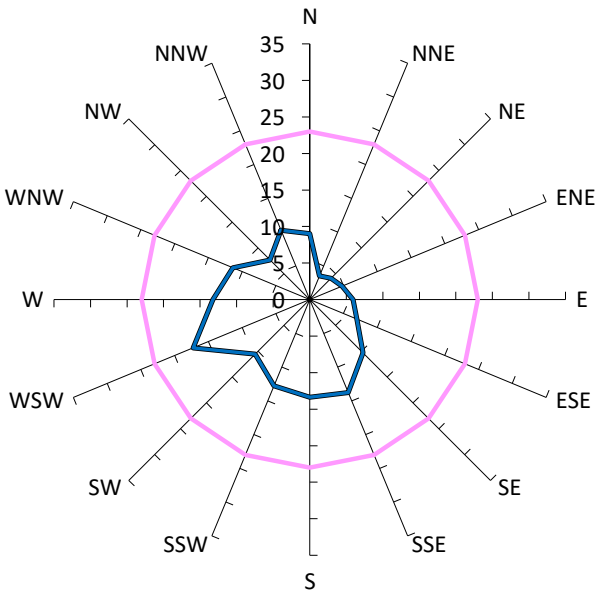
Maximum Gust (m/s)



Safety Limit: 23m/s

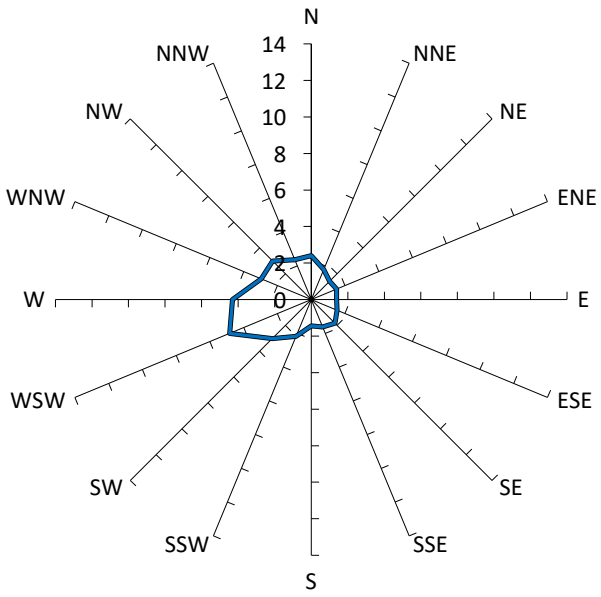
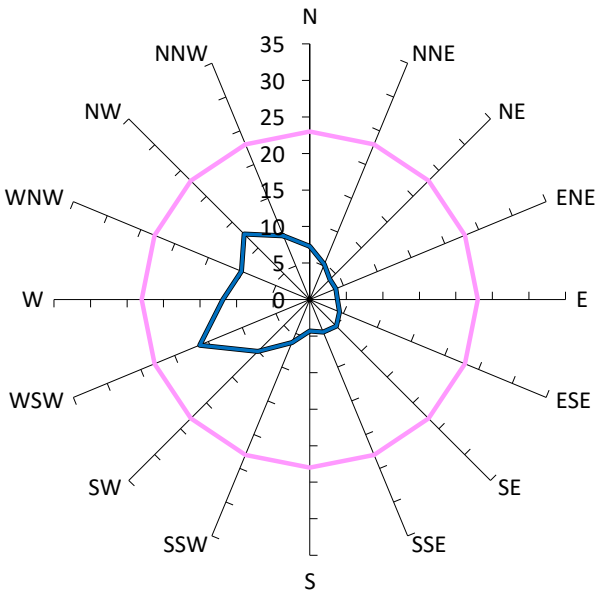
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	18

Results for Point 81

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

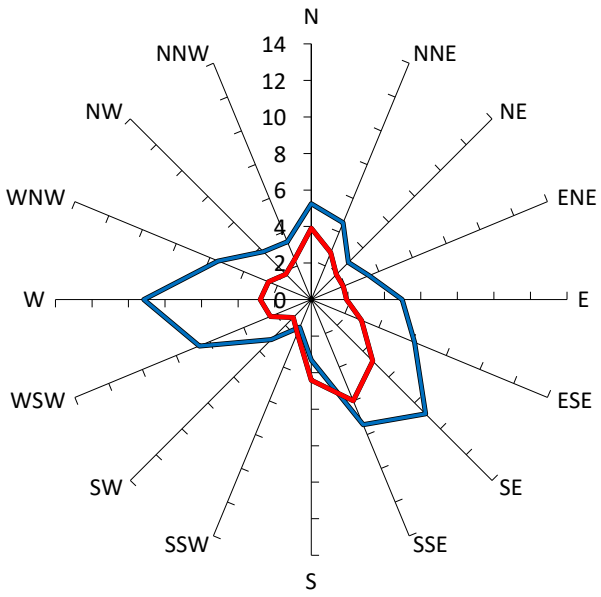
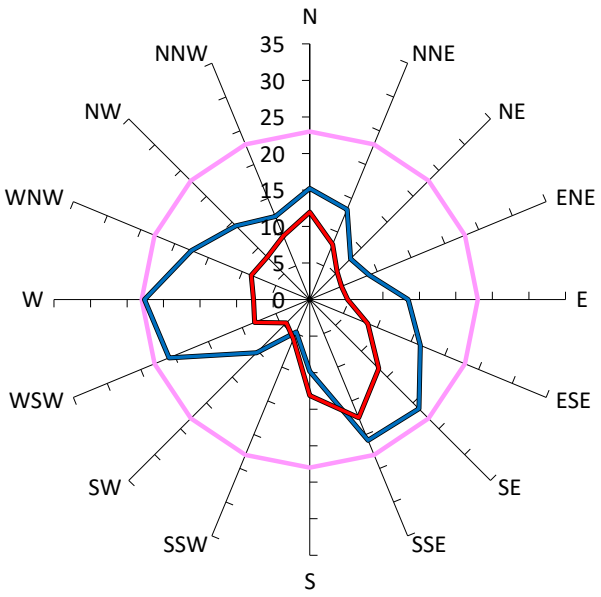
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	1%	17

Results for Point 82

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

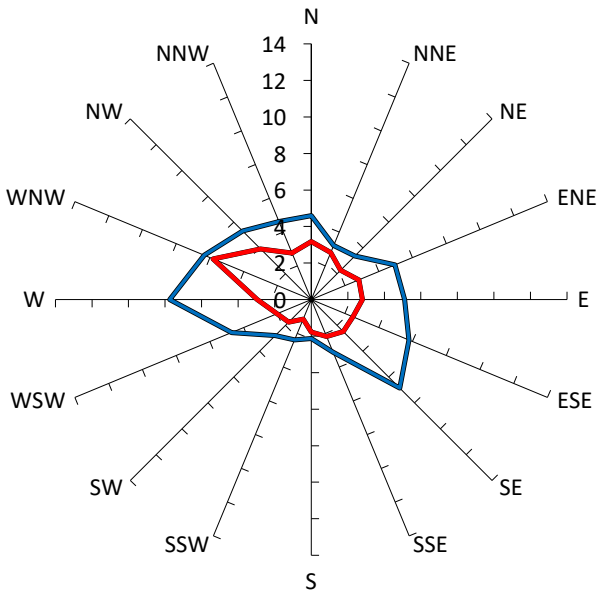
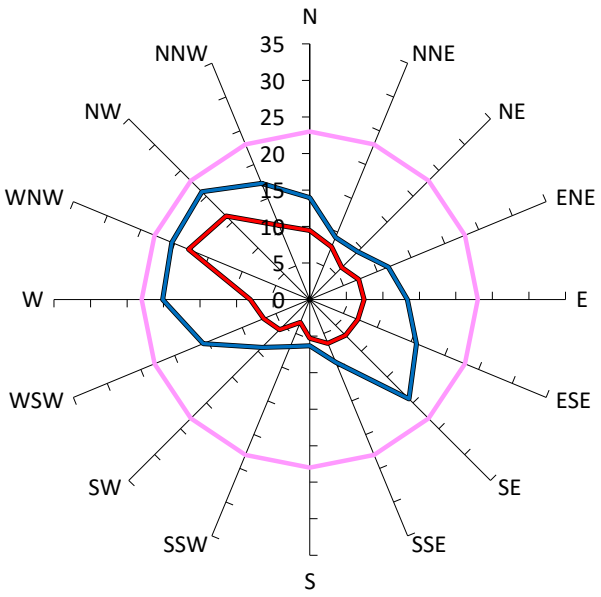
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	0%	16

Results for Point 83

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

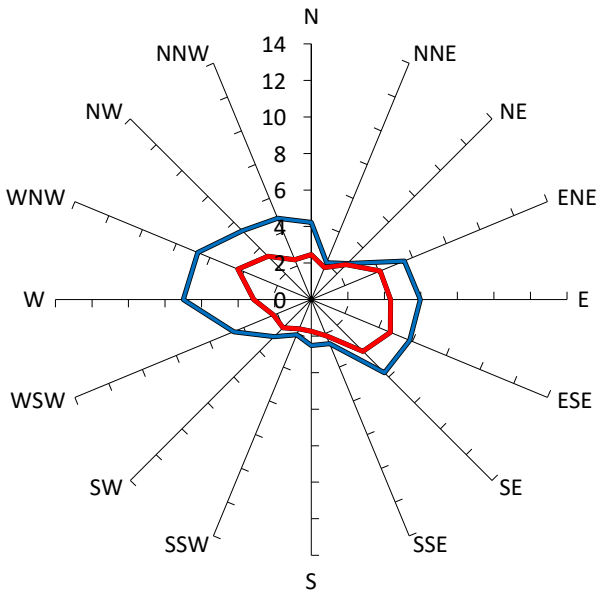
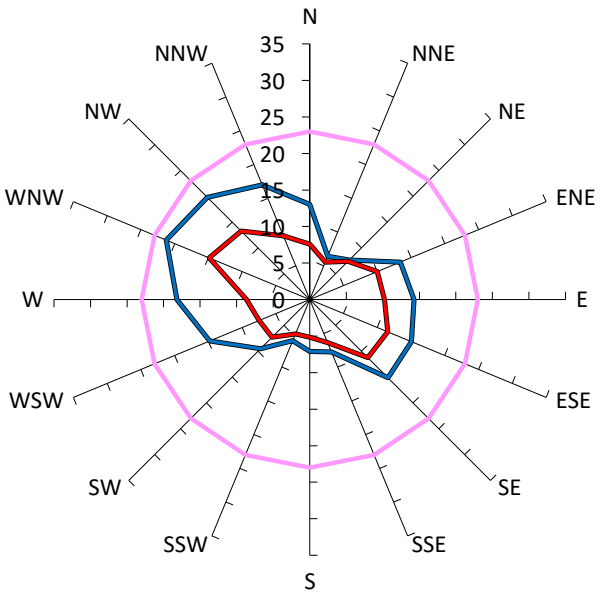
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	7%	23
WE759-02F02 - Treatment Testing	1%	17

Results for Point 84

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

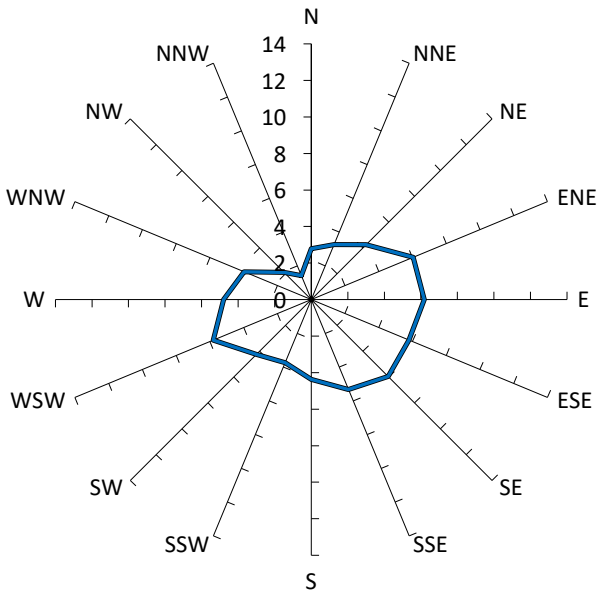
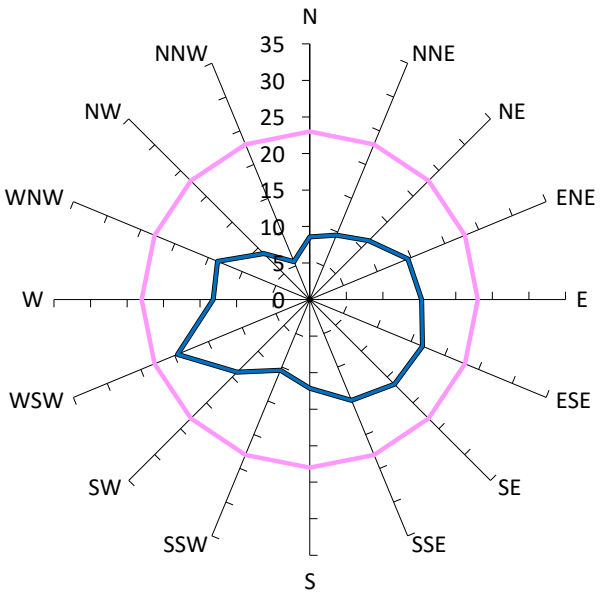
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	12%	21
WE759-02F02 - Treatment Testing	2%	18

Results for Point 85

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

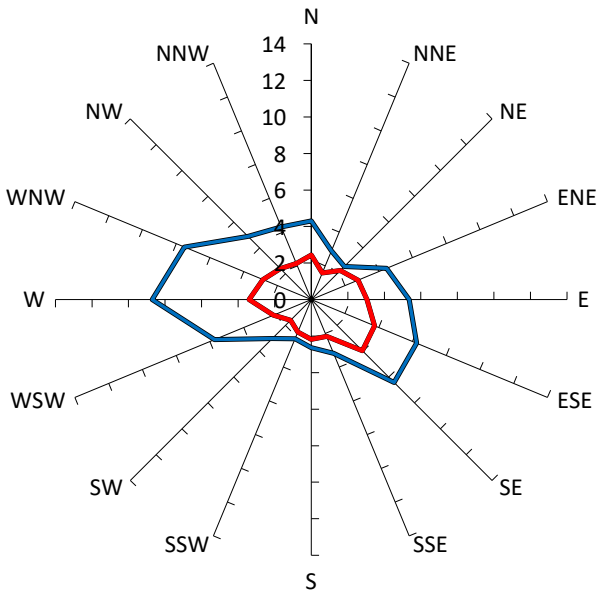
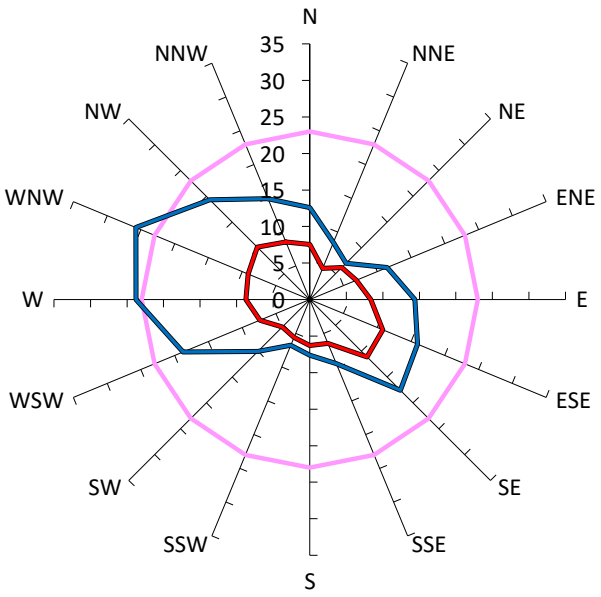
Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	12%	21
WE759-02F02 - Treatment Testing	3%	15

Results for Point 86

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 7.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Comfortable Walking Activities (7.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	2%	20

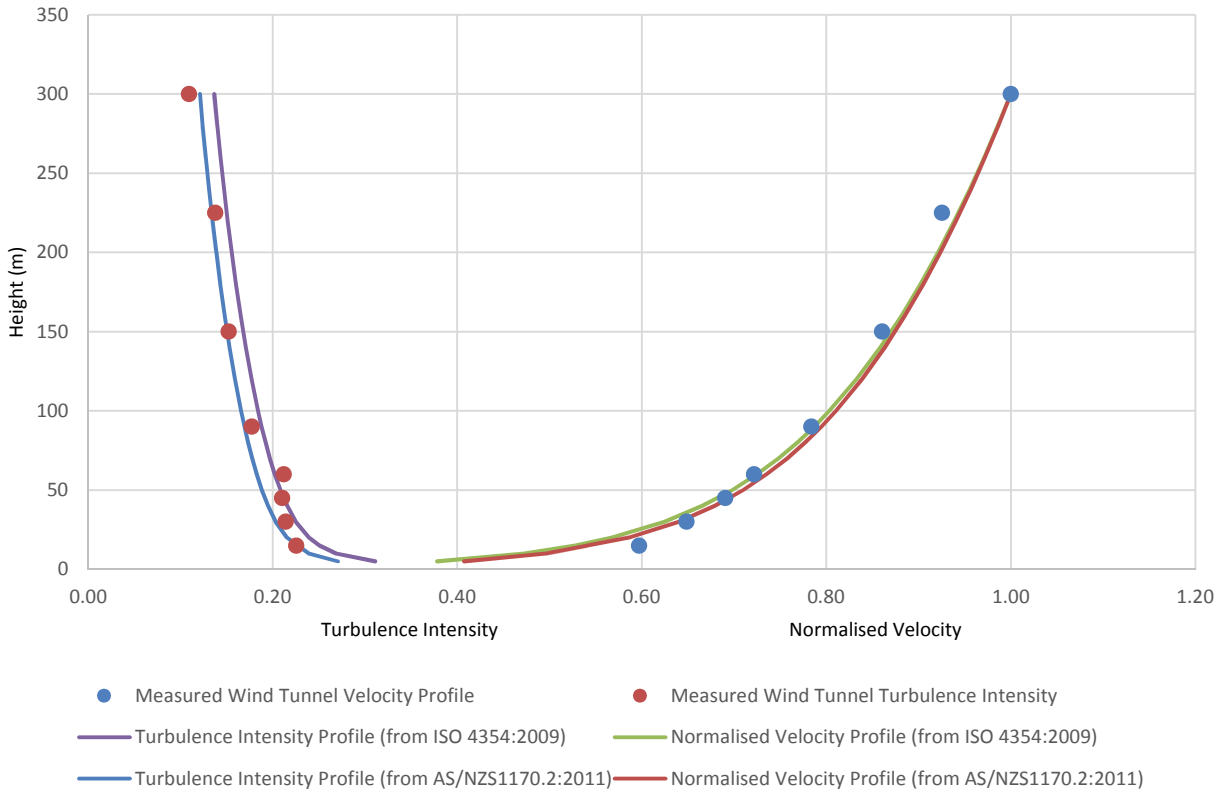
Results for Point 87

Gust Equivalent Mean (m/s)	Maximum Gust (m/s)
	
Comfort Criteria: 5.5m/s with 5% probability of exceedence	Safety Limit: 23m/s

Description	GEM Prob of Exceed %	Peak Gust m/s
Criterion: Short Exposure Activities (5.5m/s). Safety Limit (23m/s).	5%	23
WE759-02F02 Initial Testing	12%	26
WE759-02F02 - Treatment Testing	1%	11

APPENDIX D VELOCITY AND TURBULENCE INTENSITY PROFILES

Mean Velocity and Turbulence Intensity for Suburban/Forest Terrain (0.2m < z0 < 0.3m) (TC3) at a 1:300 Scale



Longitudinal Spectra Density for Suburban/Forest Terrain (0.2m < z0 < 0.3m) (TC3) at a 1:300 Scale