



# PEDESTRIAN WIND ENVIRONMENT STUDY

881-893 BOURKE STREET & 207-229 YOUNG STREET,  
WATERLOO

WJ346-02F02(REV0)- WE REPORT

SEPTEMBER 11, 2025

Prepared for:

CORONATION

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# DOCUMENT CONTROL

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# EXECUTIVE SUMMARY

This report presents the results of a detailed investigation into the wind environment impact of the proposed 881-893 Bourke Street and 207-229 Young Street development site located in Waterloo, Sydney. 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, which was fabricated based on the architectural drawings received on August 21, 2025. 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 approved scheme and existing site conditions were also tested, for comparison. In-principle treatments have been recommended for any area exposed to strong winds.

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. However, some areas will experience strong winds which will exceed the relevant criteria for comfort. Suggested treatments are described as follows:

- Retention of the proposed densely foliated evergreen trees along the connecting corridor between Danks Street and New Street, along New Street itself, and at the corner of Danks Street and Young Street. These trees should have a minimum height of 3m and a minimum canopy width of 3m.
- Retention of the proposed 2.4m high impermeable screen at the outdoor seating area located at the eastern end of the New street.
- Inclusion of densely foliating evergreen trees with a height of 3-4m and a canopy width of 3m at the communal park located south of New street.
- Inclusion of awnings with a minimum depth of 2.5m along the connecting corridor between Danks Street and New Street, at the corner of Danks Street and Young Street, and at the communal area located in the north-western part of the site.
- Inclusion of 1m high planter boxes with 0.5-1m high densely foliated vegetation at the communal area located in the north-western part of the site.

With the inclusion of these 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.

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# INTRODUCTION

This pedestrian wind environment report has been prepared by Windtech Consultants on behalf of Waterloo Property Pty Ltd as trustee for the Waterloo Property Unit Trust (the Applicant) in support of a Housing Delivery Authority (HDA) nominated State Significant Development Application (SSDA) for a proposed mixed-use development at 881-885 Bourke Street, Waterloo, with concurrent rezoning (SSD-80441462). The report is submitted to the NSW Department of Planning, Housing, and Infrastructure (DPHI).

This application is preceded by a separate SSDA for Early Works that prepare the Site for the proposed development (SSD-80911502).

Specifically, consent is sought for the following Main Works for the Waterloo Mixed Use Development:

- Site establishment and enabling works (that were not included in the preceding Early Works SSDA);
- Construction of residential and mixed-use buildings across four development parcels, inclusive of;
  - build to rent apartments and associated amenities;
  - affordable apartments;
  - non residential floor space including commercial premises and creative industry;
- Construction of a consolidated basement with below-ground links between development parcels, comprising car parking, plant and storage area;
- Landscaping and publicly accessible open space;
- Works to site frontages; and
- Extension and augmentation of infrastructure and services (that were not included in the preceding early Works SSDA) as required.

Development on the site was declared State Significant Development (SSD) pursuant to State Significant Declaration Order 2025 (Order) dated 17 February 2025. The Order declares development specified in EOI application 229420 dated 8 January 2025, including development for the purposes of mixed-use development (Build to Rent including affordable housing) with ground floor non-residential uses at 881-885 Bourke Street, as identified in Schedule 3, is SSD.

On 5 March 2025, the Department of Planning, Housing and Infrastructure (the Department) issued SEARs and concurrent rezoning requirements for the project.

The site is subject to an existing Voluntary Planning Agreement (VPA) that sets out dedication of public domain between four development parcels. The public domain includes a new east-west street, a through site link and public open space area (comprising future shared zones and park). The development parcels and public domain as set out in the VPA will be delivered notwithstanding the works proposed in this SSDA.

## 1.1 Site Context and Description

The site is legally described as Lot 1 DP1308636 and Lot 2 DP1308636 and is located at 881-885 Bourke Street, Waterloo. The site has an area of 21,554m<sup>2</sup>. It has an irregular shape, is generally flat and has been cleared of all light industrial and large format commercial buildings. The site currently has vehicle access from Young Street and Bourke Street.

The site is located within Gadigal Land, in the Sydney Local Government Area (LGA) and is approximately 4km south of the Sydney CBD. The site is approximately 950m walking distance east of an entrance to the Waterloo

Metro Station, approximately 1.1km northeast of the Green Square Train Station and approximately 1.5km southeast of Redfern Train Station. The site is also immediately adjacent to a bus stop on Bourke Street

There are a number of trees along the Danks and Young Street frontages. Additional trees on these frontages are located outside the site boundary. There are commercial and business premises to the west, high-density residential and business premises to the north, primarily high-density residential to the east and high density residential under construction to the south.

An aerial of the site is provided in Figure 1 below.



Figure 1: Site Aerial (Source: Nearmap, Ethos Urban)

## 1.2 SEARs Reporting Requirements

This pedestrian wind environment report has been prepared to address the *Planning Secretary's Environmental Assessment Requirements* (SEARs) issued by the Department of Planning, Housing and Infrastructure (DPHI) for the subject SSDA, with specific SEAR(s) identified in the table below.

| SEAR                     | SEAR description                                                                                                                                                                                                                                                                                                                 | Report name or report section                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| Environmental<br>Amenity | Assess amenity impacts on the surrounding locality, including lighting impacts, reflectivity, solar access, visual privacy, visual amenity, view loss and view sharing, overshadowing and wind impacts. A high level of environmental amenity for any surrounding residential or other sensitive land uses must be demonstrated. | Pedestrian Wind Environment<br>Assessment, Section 5 |

| SEAR         | SEAR description                                                                                                                                                                                                                                                                                                                                                                                                                                   | Report name or report section                     |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
|              | Demonstrate how the development:                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                   |
| Public Space | <ul style="list-style-type: none"> <li>Ensures that public space is welcoming, attractive and accessible for all.</li> <li>Maximises permeability and connectivity.</li> <li>Maximises the amenity of public spaces in line with their intended use, such as through adequate facilities, solar access, shade and wind protection.</li> <li>Maximises street activation.</li> </ul> Minimises potential vehicle, bicycle and pedestrian conflicts. | Pedestrian Wind Environment Assessment, Section 5 |

### 1.3 Wind Tunnel Study

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 either Dantec hot-wire probe anemometers or pressure-based wind speed sensors, 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.

A list of the architectural drawings referenced for this assessment is provided in Table 1 below.

Table 1: List of Architectural Drawings Referenced for this Assessment

| Drawing Title                                     | Revision No. | Received Date |
|---------------------------------------------------|--------------|---------------|
| 250815_Coronation Waterloo_Precinct Plans.pdf     | -            | 21/08/2025    |
| 250821_SJB Massing Updates Isolated.dwg           | -            | 21/08/2025    |
| 250821_SJB Massing Updates Isolated.skp           | -            | 21/08/2025    |
| WL-AR-SSDA-PR-0300 - PRECINCT PLAN - LEVEL 00.dwg | -            | 21/08/2025    |
| WL-AR-SSDA-PR-0300 - PRECINCT PLAN - LEVEL 00.pdf | -            | 21/08/2025    |

## 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 study model was fabricated based on the architectural drawings received on August 21, 2025. 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 2 and Figures 3. A plan of the proximity model is provided in Figure 4.

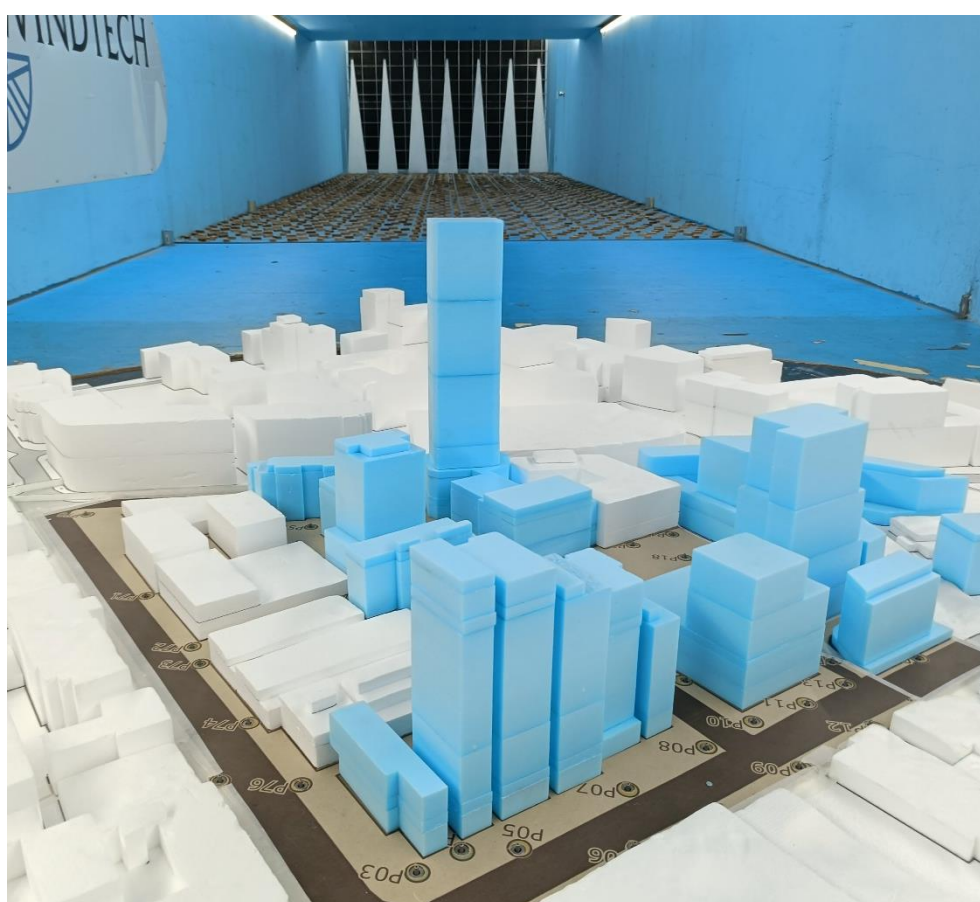


Figure 2a: Photograph of the Wind Tunnel Model (view from the north-west) – Proposed Site

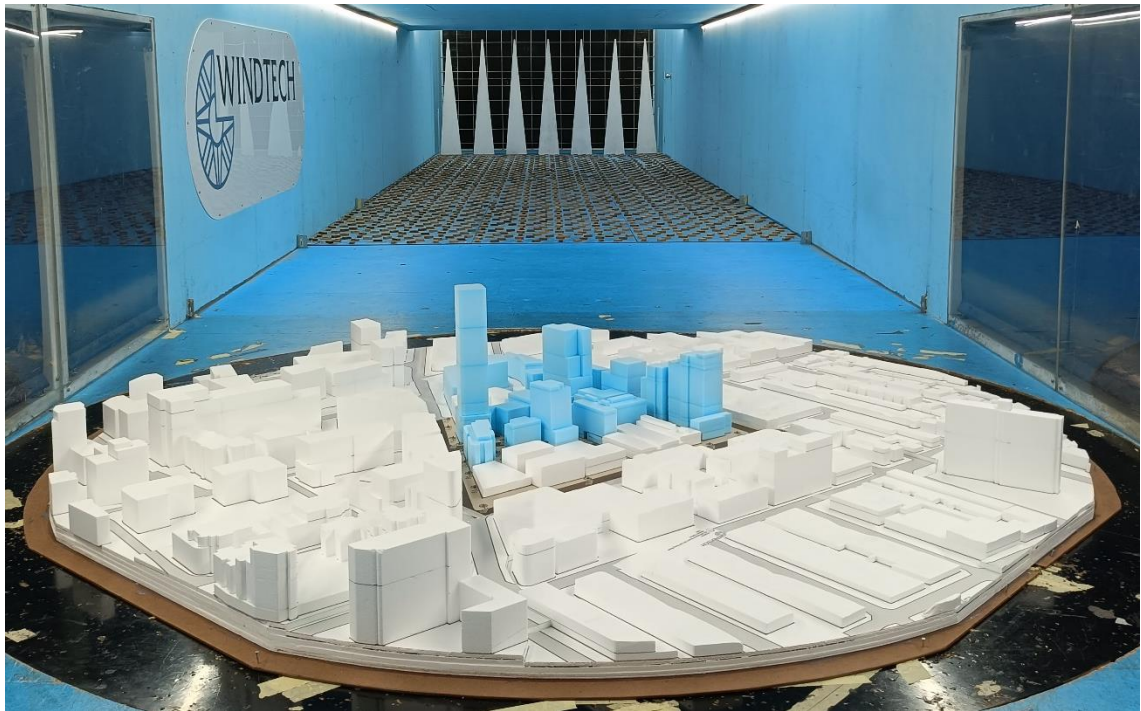


Figure 2b: Photograph of the Wind Tunnel Model (view from the north-east) - Proposed Site



Figure 2c: Photograph of the Wind Tunnel Model (view from the south-east) - Proposed Site

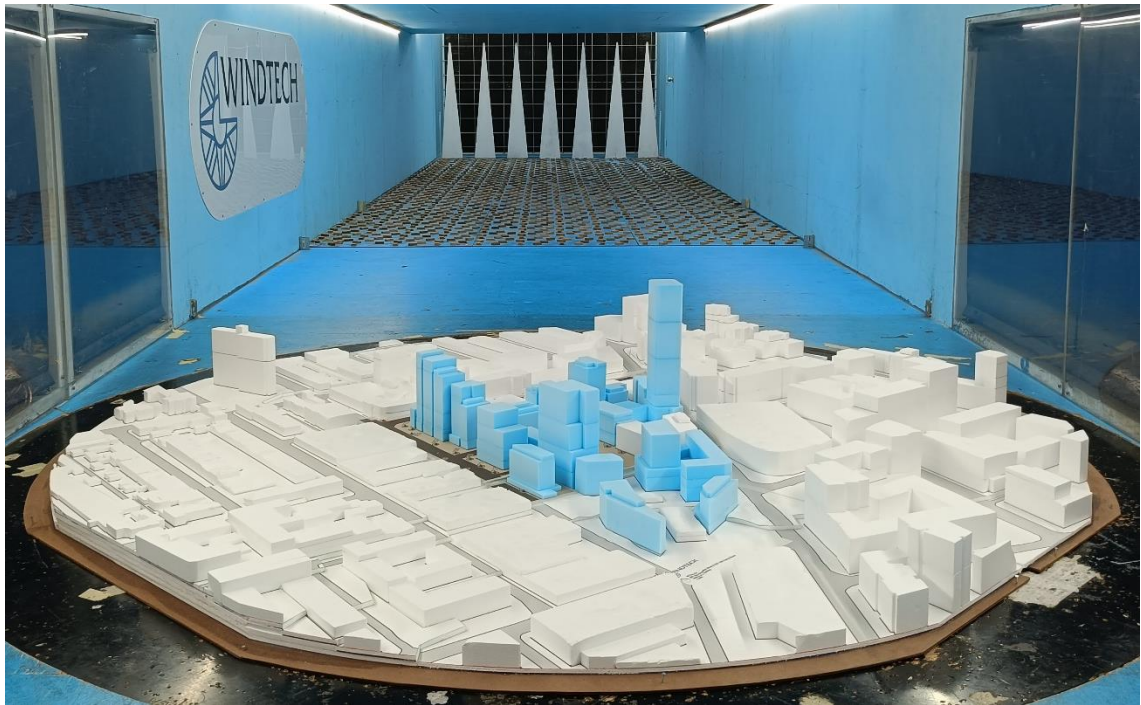


Figure 2d: Photograph of the Wind Tunnel Model (view from the south-west) - Proposed Site

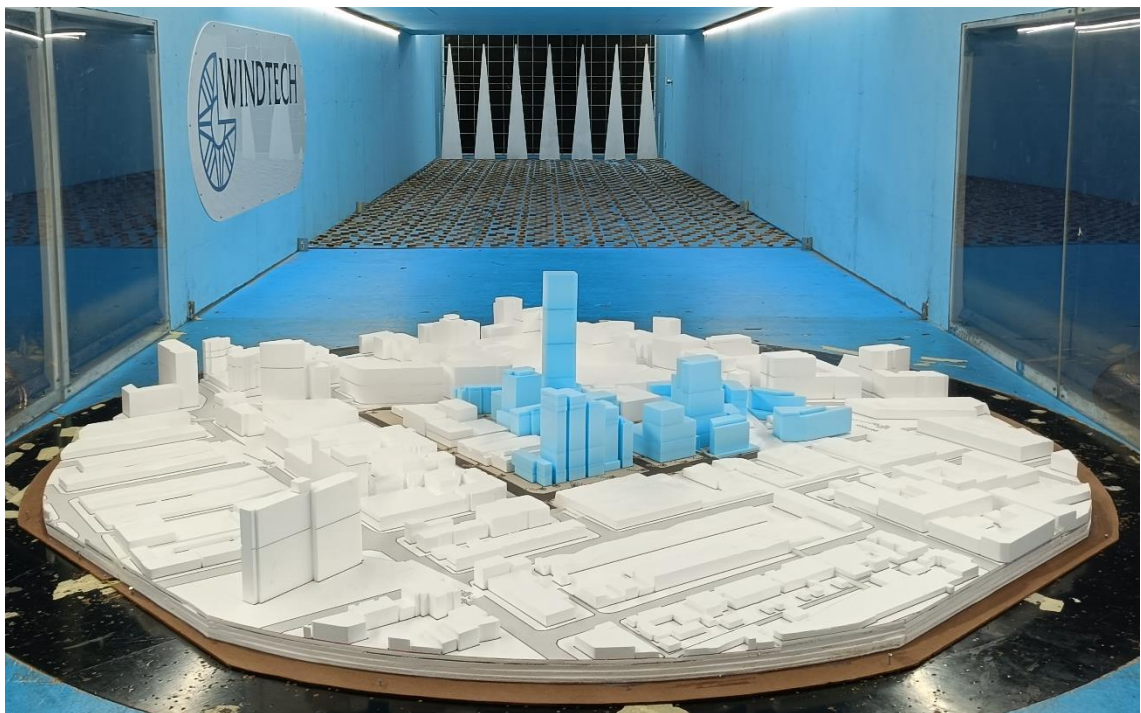


Figure 2e: Photograph of the Wind Tunnel Model (view from the north-west) - Proposed Site

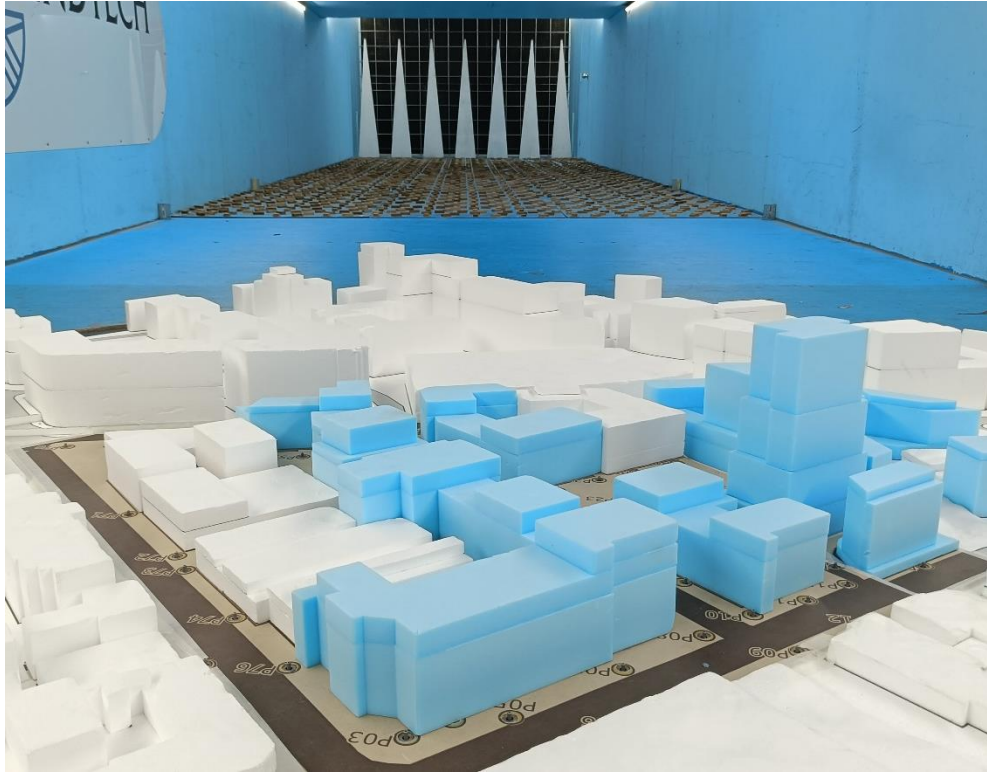


Figure 3a: Photograph of the Wind Tunnel Model (view from the north-west) – Approved Site

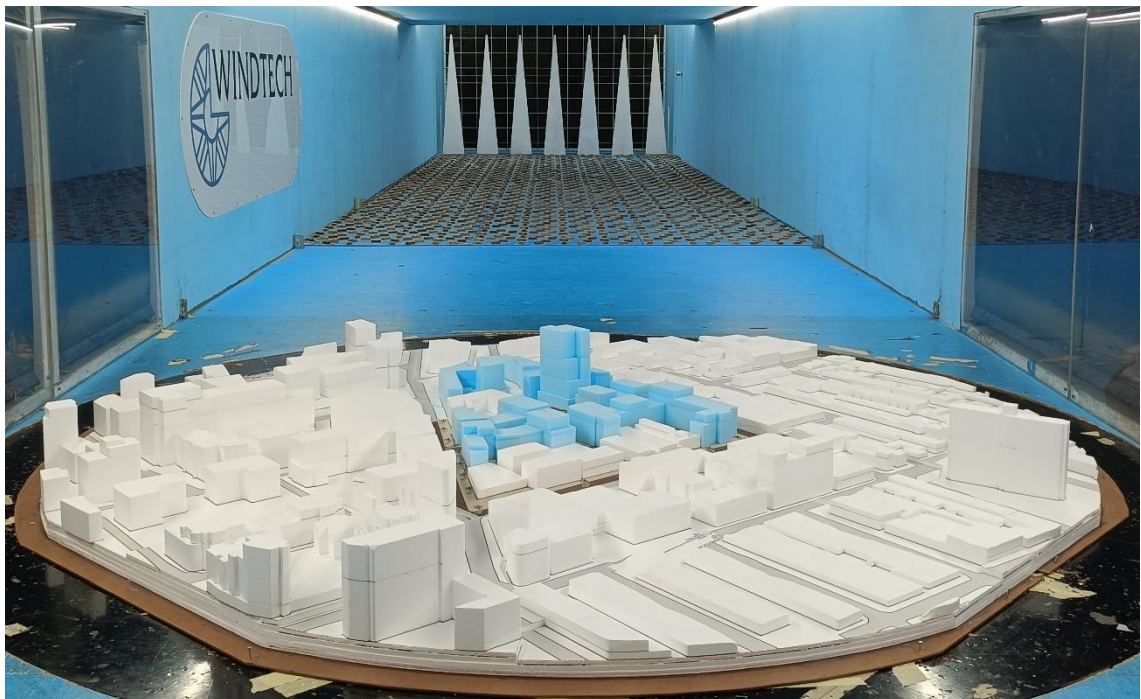


Figure 3b: Photograph of the Wind Tunnel Model (view from the north-east) - Approved Site

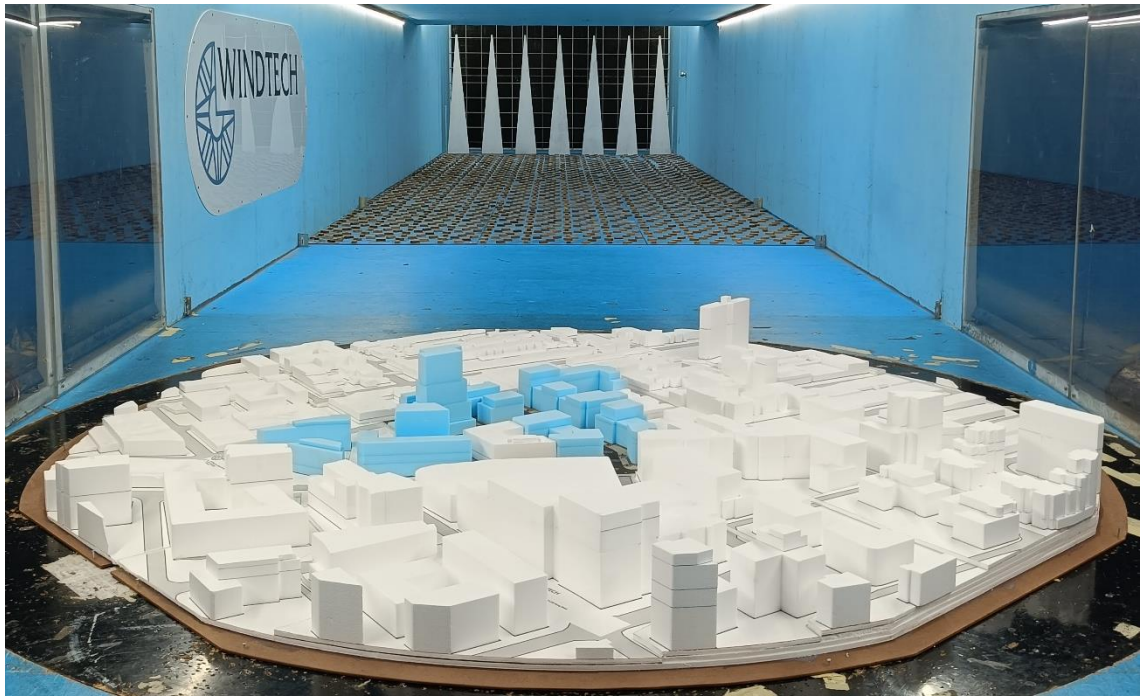


Figure 3c: Photograph of the Wind Tunnel Model (view from the south-east) - Approved Site

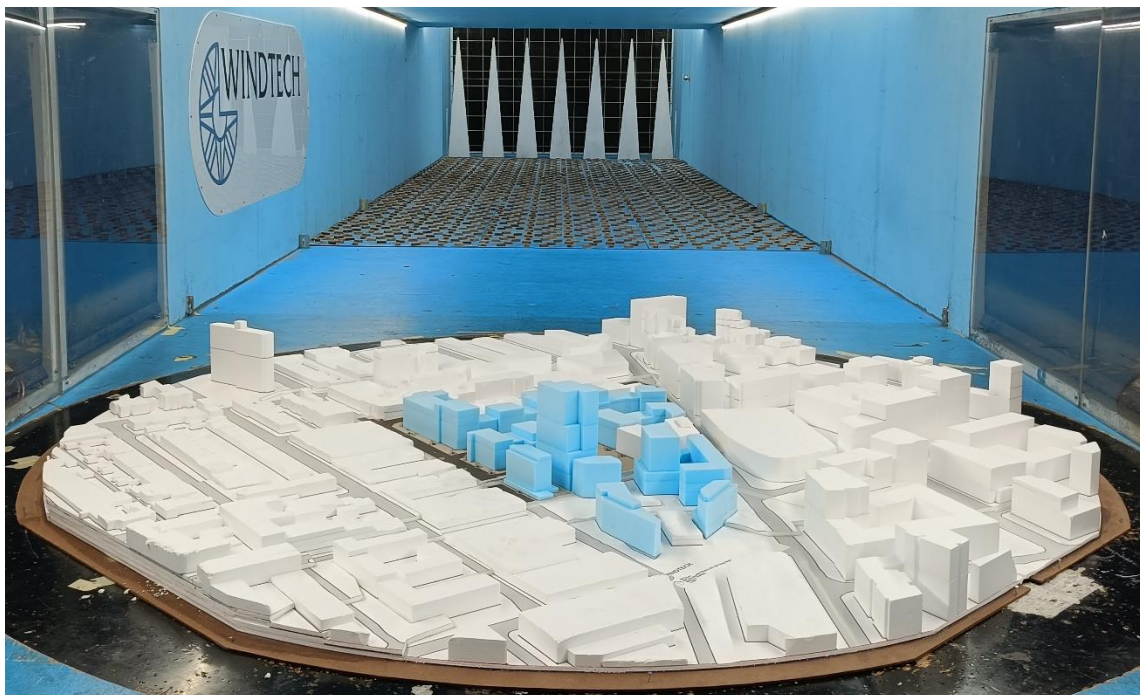


Figure 3d: Photograph of the Wind Tunnel Model (view from the south-west) - Approved Site

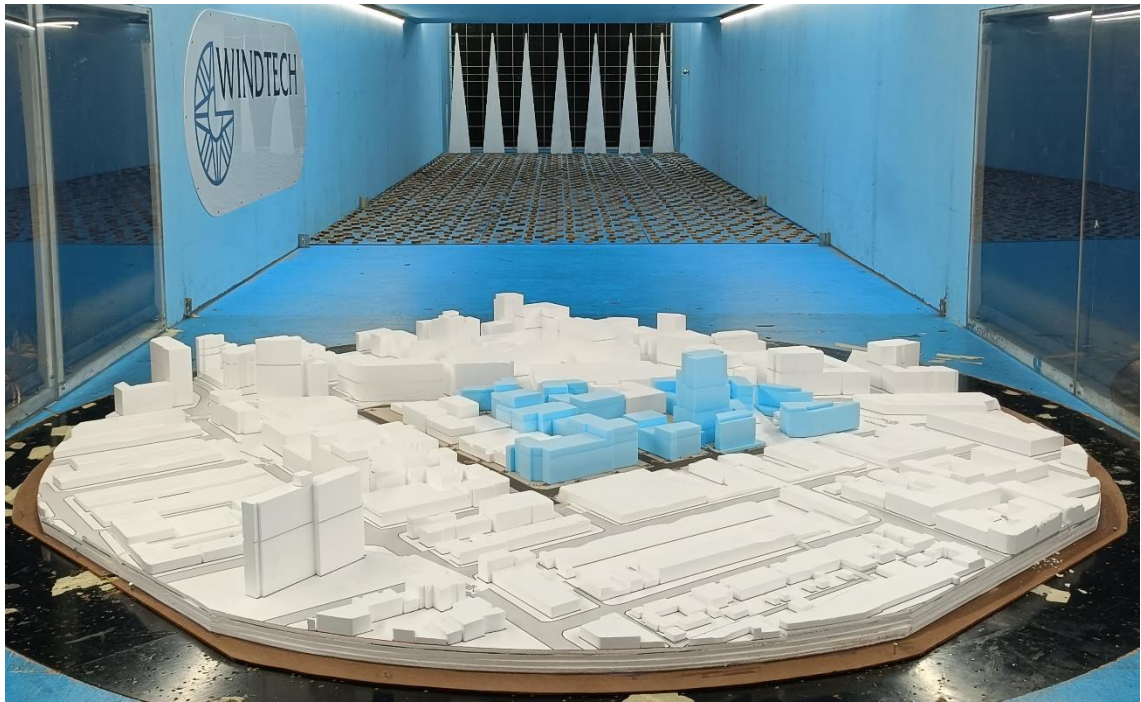


Figure 3e: Photograph of the Wind Tunnel Model (view from the north-west) - Approved Site

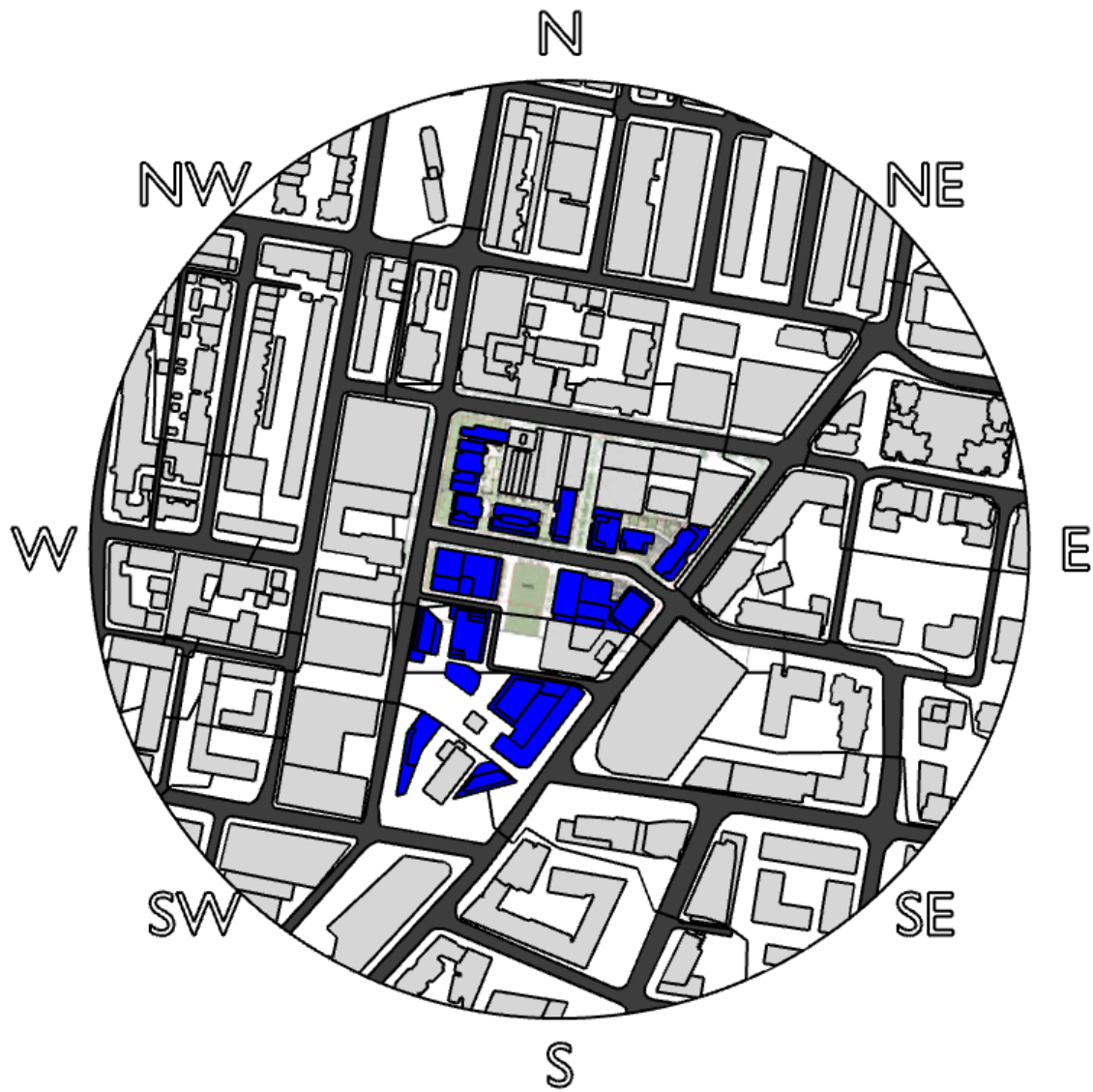


Figure 4a: Proximity Model Plan – Proposed Scheme

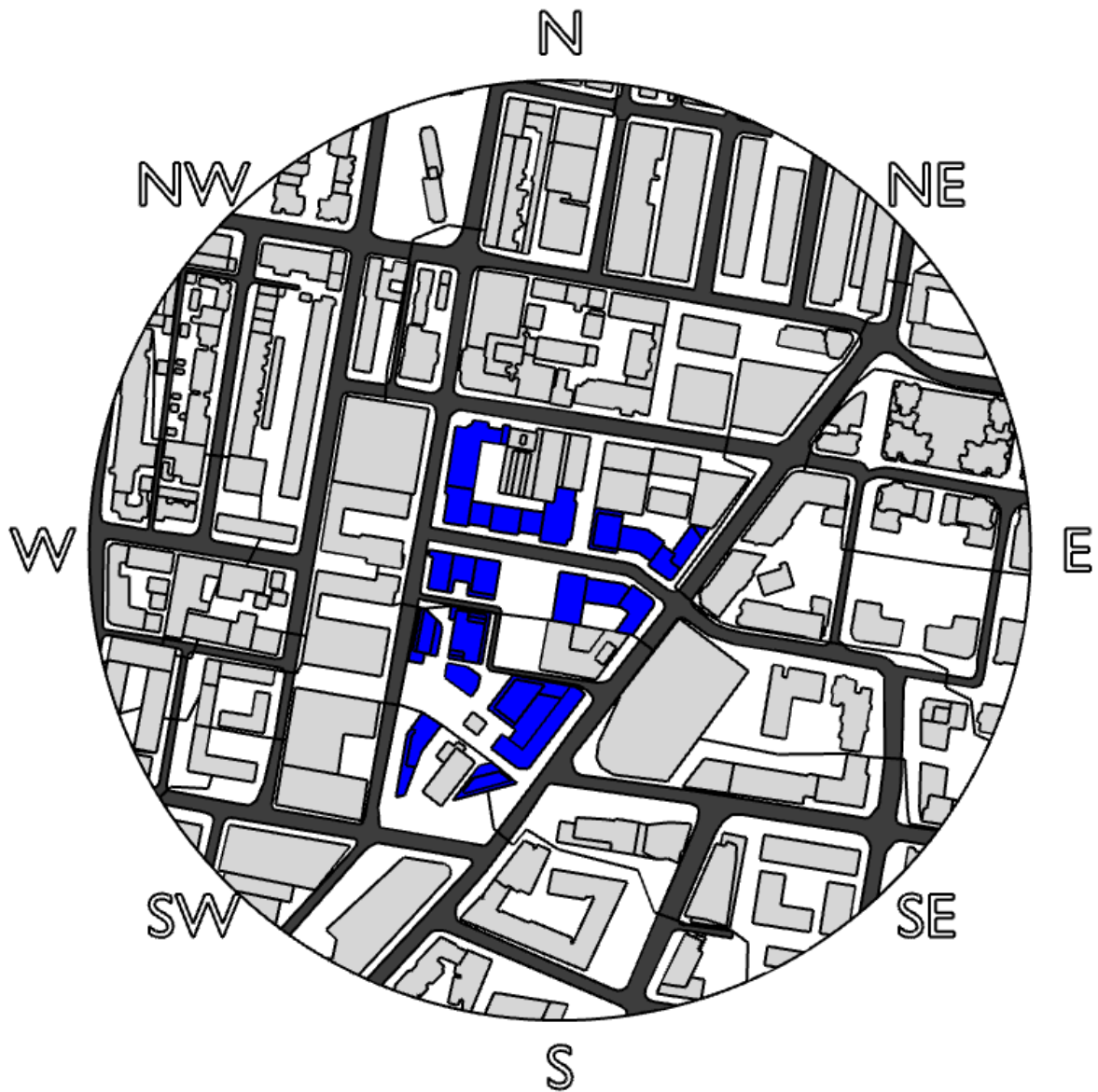


Figure 4b: Proximity Model Plan – Approved Scheme

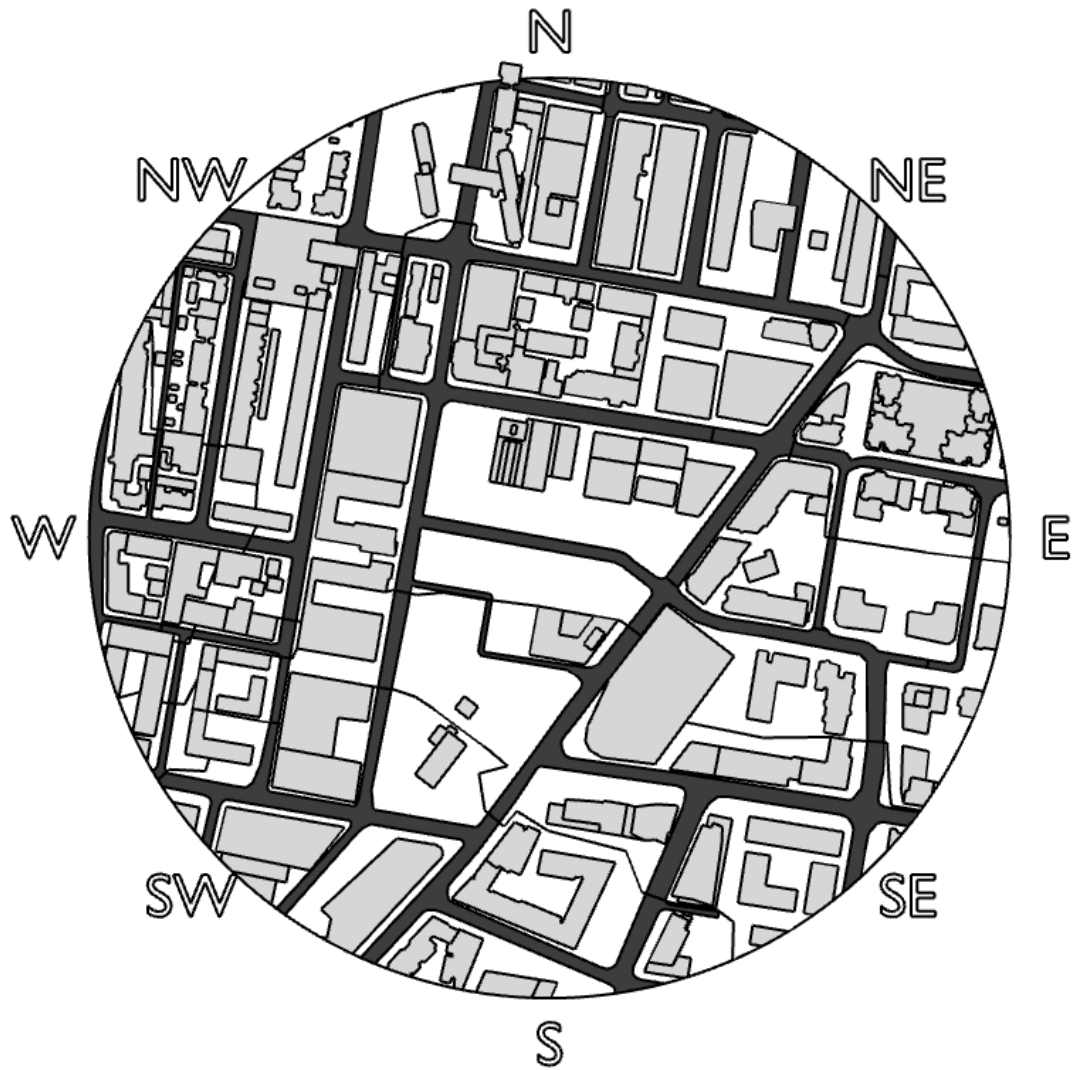


Figure 4c: Proximity Model Plan – Existing Scheme

# 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 D.M. Deaves and R.I. Harris (1978), are summarised as follows:

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

The proximity model accounts for the effect of the near field topographic effects as well as the influence of the local built forms. To account for further afield effects, an assessment of the upwind terrain roughness has been undertaken based on the method given in AS/NZS1170.2:2011, using a fetch ranging from 20 to 60 times the study reference height (as per the recommendation by AS/NZS1170.2:2011). An aerial image showing the surrounding terrain is presented in Figure 5 for a range of 3.6km 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 2, referenced to the study reference height (which is approximately half 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 2: Approaching Boundary Layer Wind Profile Analysis Summary (at the study reference height)

| Wind Sector<br>(degrees) | Terrain and Height Multiplier |                             |                         | Turbulence<br>Intensity<br>$I_v$ | Equivalent Terrain<br>Category<br>(AS/NZS1170.2:2011<br>naming convention) |
|--------------------------|-------------------------------|-----------------------------|-------------------------|----------------------------------|----------------------------------------------------------------------------|
|                          | $k_{tr,T=1hr}$<br>(hourly)    | $k_{tr,T=10min}$<br>(10min) | $k_{tr,T=3s}$<br>(3sec) |                                  |                                                                            |
| 0                        | 0.63                          | 0.68                        | 1.09                    | 0.245                            | 3.4                                                                        |
| 30                       | 0.74                          | 0.78                        | 1.16                    | 0.191                            | 2.8                                                                        |
| 60                       | 0.70                          | 0.74                        | 1.14                    | 0.208                            | 3.1                                                                        |
| 90                       | 0.75                          | 0.79                        | 1.17                    | 0.186                            | 2.8                                                                        |
| 120                      | 0.74                          | 0.78                        | 1.16                    | 0.192                            | 2.9                                                                        |
| 150                      | 0.71                          | 0.75                        | 1.15                    | 0.202                            | 3.0                                                                        |
| 180                      | 0.71                          | 0.75                        | 1.15                    | 0.202                            | 3.0                                                                        |
| 210                      | 0.66                          | 0.71                        | 1.11                    | 0.229                            | 3.2                                                                        |
| 240                      | 0.69                          | 0.73                        | 1.13                    | 0.215                            | 3.1                                                                        |
| 270                      | 0.71                          | 0.75                        | 1.15                    | 0.202                            | 3.0                                                                        |
| 300                      | 0.71                          | 0.75                        | 1.15                    | 0.202                            | 3.0                                                                        |
| 330                      | 0.67                          | 0.72                        | 1.12                    | 0.223                            | 3.2                                                                        |

NOTE: These terrain and height multipliers are to be applied to a basic regional wind speed averaged over 3-seconds. Divide these values by 1.10 for a basic wind speed averaged over 0.2-seconds, 0.69 for a basic wind speed averaged over 10-minutes, or 0.66 for a basic wind speed averaged over 1-hour.

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 2. Plots of the boundary layer wind profiles used for the wind tunnel testing are presented in Appendix E of this report.

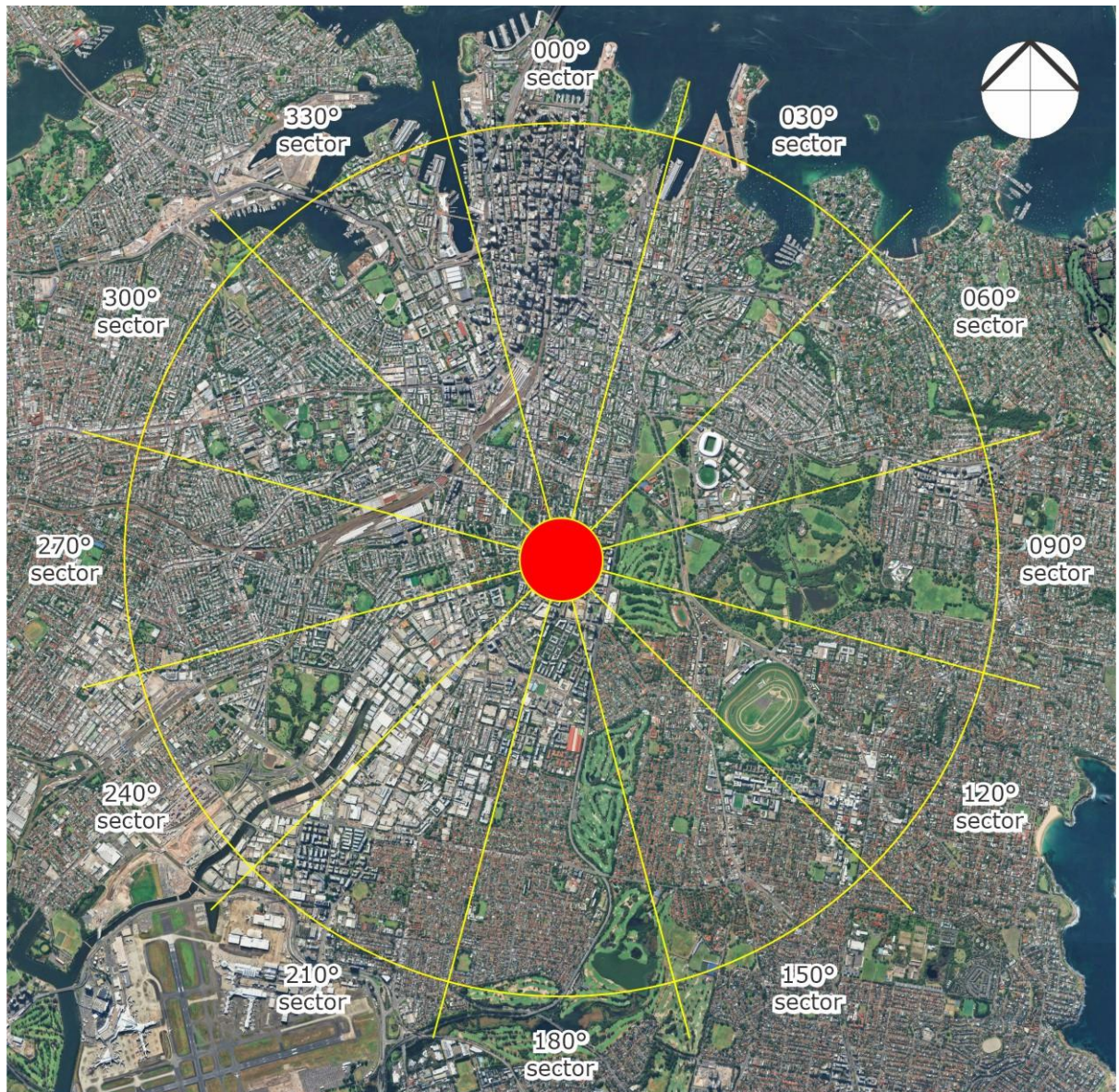


Figure 5: Aerial Image of the Surrounding Terrain (radius of 3.6km from the edge of the proximity model)

# REGIONAL WIND MODEL

The regional wind model used in this study was determined from an analysis of measured directional mean wind speeds obtained at the meteorological recording station located at Kingsford Smith Airport (Sydney Airport). Data was collected from 1995 to 2025 and corrected so that it represents winds over standard open terrain at a height of 10m above ground for each wind direction. From this analysis, directional probabilities of exceedance and directional wind speeds for the region are determined. The directional wind speeds are summarised in Table 3. The directional wind speeds and corresponding directional frequencies of occurrence are presented in Figure 6.

The data indicates that the southerly winds are by far the most frequent winds for the Sydney region, and are also the strongest. The westerly winds occur most frequently during the winter season for the Sydney region, and although they are typically not as strong as the southerly winds, they are usually a cold wind and hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently occur during the warmer months of the year for the Sydney region, and hence are usually welcomed within outdoor areas since they are typically not as strong as the southerly or westerly winds.

The recurrence intervals examined in this study are for exceedances of 5% (per 90 degree sector) of the pedestrian comfort criteria using Gust-Equivalent Mean (GEM) wind speeds, and annual maximum wind speeds (per 22.5 degree sector) for the pedestrian safety criterion. Note that the 5% probability wind speeds presented in Table 3 are only used for the directional plot presented in Figure 6 and are not used for the integration of the probabilities.

Table 3: Regional Directional Wind Speeds (hourly means, at 10m height in standard open terrain) (m/s)

| Wind Direction | 5% Exceedance | Annual Maximum |
|----------------|---------------|----------------|
| N              | 5.7           | 8.8            |
| NNE            | 8.3           | 10.6           |
| NE             | 8.7           | 10.9           |
| ENE            | 6.6           | 9.0            |
| E              | 5.5           | 8.6            |
| ESE            | 6.0           | 9.0            |
| SE             | 7.5           | 10.4           |
| SSE            | 9.4           | 12.9           |
| S              | 10.8          | 14.3           |
| SSW            | 9.8           | 13.4           |
| SW             | 6.4           | 10.4           |
| WSW            | 7.3           | 10.6           |
| W              | 7.8           | 11.5           |
| WNW            | 6.7           | 11.9           |
| NW             | 5.7           | 10.3           |

| Wind Direction | 5% Exceedance | Annual Maximum |
|----------------|---------------|----------------|
| NNW            | 5.2           | 9.1            |

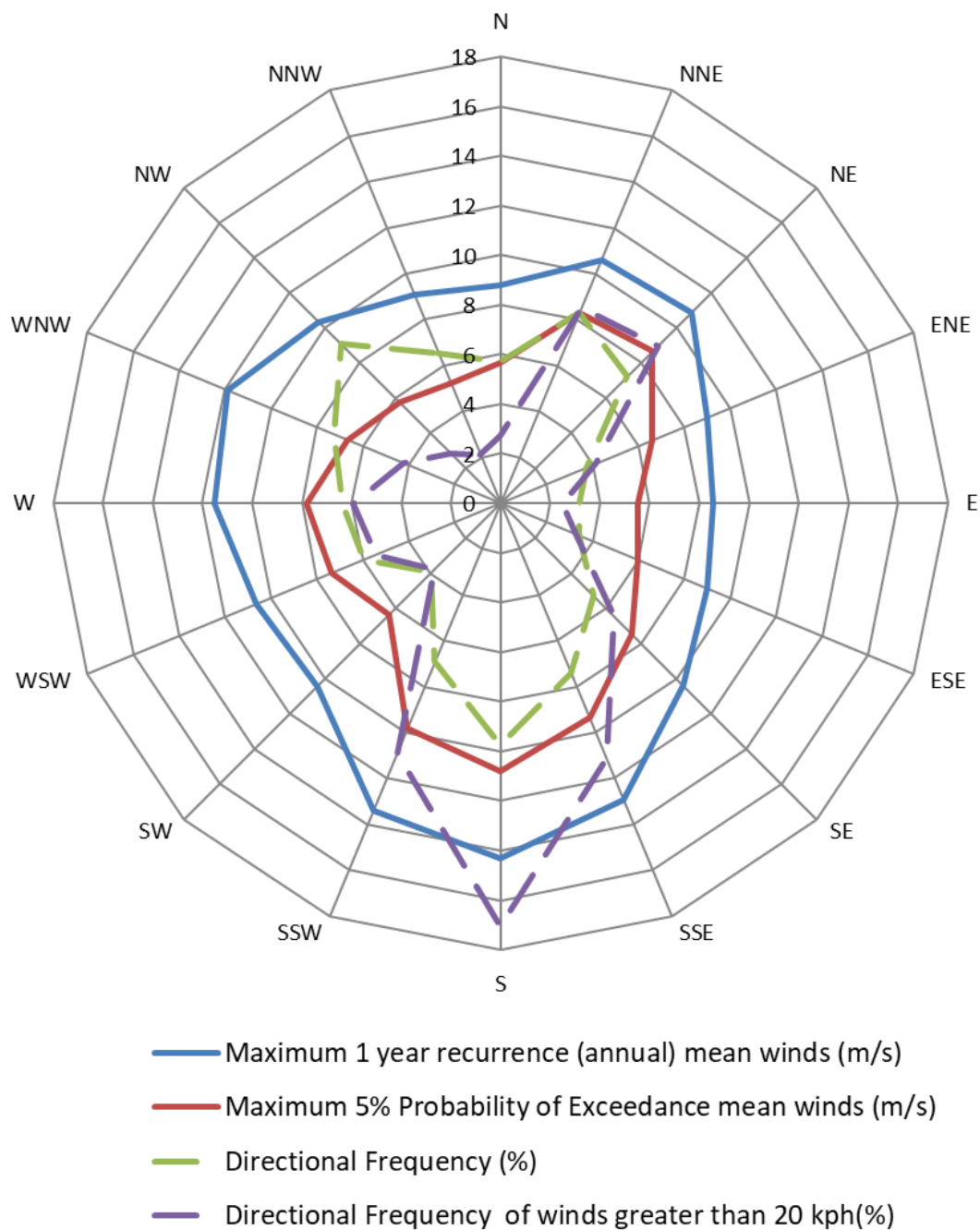


Figure 6: Annual and 5% Exceedance Hourly Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (at 10m height in standard open terrain)

# PEDESTRIAN WIND COMFORT AND SAFETY

The acceptability of wind conditions for 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 either Dantec hot-wire probe anemometers or pressure-based wind speed sensors, 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 either the Dantec Hot-wire probe anemometers or pressure-based wind speed sensors 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 for the various critical outdoor trafficable areas around the subject development are compared against the criteria presented in the Sydney Development Control Plan 2012 - Central Sydney Planning Review Amendment, which supersedes the criteria detailed in the City of Sydney Development Control Plan 2012 (SDCP2012).

For pedestrian comfort, the Sydney DCP 2012 requires that the hourly mean wind speed, or Gust-Equivalent Mean (GEM) wind speed (whichever is greater for each wind direction), must not exceed 8m/s for walking, 6m/s for standing, and 4m/s for sitting. These are based on a 5% probability of exceedance.

For pedestrian safety, the Sydney DCP 2012 defines a safety limit criterion of 24m/s, based on an annual maximum 0.5 second gust wind speed, which applies to all areas.

Furthermore, in accordance with the provisions of the Sydney DCP 2012, the existing conditions for the pedestrian footpaths around the site are also analysed as part of this study to determine the impact of the subject development. If it is found that the existing conditions exceed the relevant criteria, then the target wind speed for that area with the inclusion of the proposed development is to at least match the existing site conditions.

In accordance with the provisions of the Sydney DCP 2012, the wind speed assessment is undertaken for winds occurring between 6am and 10pm (AEST).

A more detailed comparison of published criteria for pedestrian wind comfort and safety is provided in Appendix A.

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:

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

where:

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

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

The criteria considered in this study are summarised in Tables 4 and 5 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 annual probability of exceedance of the assigned comfort criteria, and a plot for the annual maximum gust wind speeds using the safety criterion. The velocity coefficients are also presented in the form of directional plots in Appendix D

Table 4: Pedestrian Comfort Criteria (Sydney DCP 2012)

| Classification | Description                                                                                                       | Maximum 5% Exceedance GEM Wind Speed (m/s) |
|----------------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Sitting        | Outdoor areas that involve seating such as parks, dining areas in restaurants, amphitheatres, etc.                | 4.0                                        |
| Standing       | Short duration stationary activities (generally less than 1 hour), including window shopping, waiting areas, etc. | 6.0                                        |
| Walking        | For pedestrian thoroughfares, private swimming pools, most communal areas, private balconies and terraces, etc.   | 8.0                                        |

Table 5: Pedestrian Safety Criterion (Sydney DCP 2012)

| Classification | Description                                        | Annual Maximum Gust Wind Speed (m/s) |
|----------------|----------------------------------------------------|--------------------------------------|
| Safety         | Safety criterion applies to all trafficable areas. | 24                                   |

### 5.3 Layout of Study Points

For this study a total of 76 study point locations were selected for analysis in the wind tunnel. This includes the following:

- 64 study points on Ground level, along the pedestrian footpaths and trafficable areas around the site.
- 8 study points on Ground level around outdoor seating areas.
- 4 study points on Ground level around recreational areas around the site.

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 7 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.

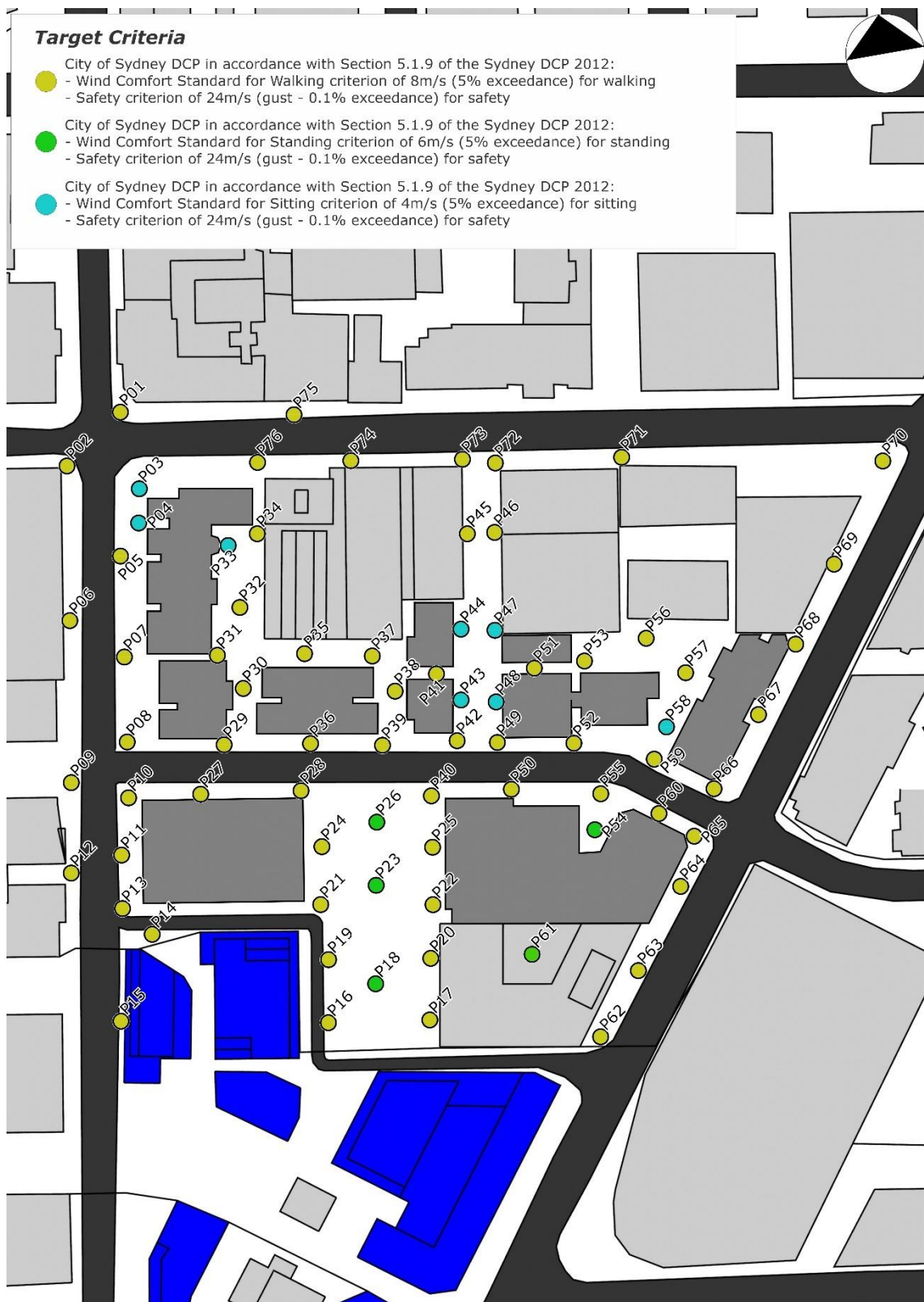


Figure 7a: Study Point Locations and Target Wind Speed Criteria – Ground Floor Plan (Proposed Scheme)

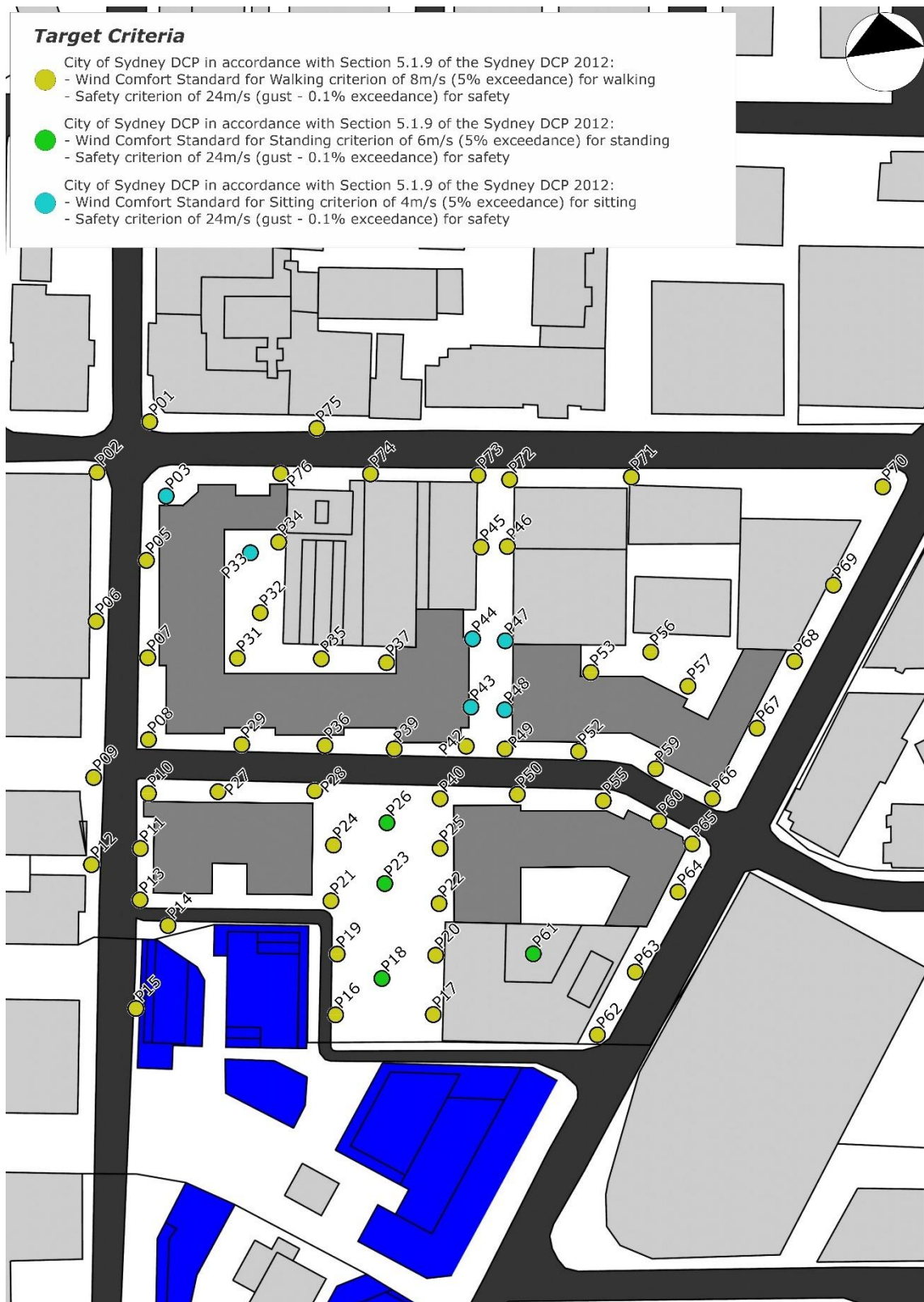


Figure 7b: Study Point Locations and Target Wind Speed Criteria – Ground Floor Plan (Approved Scheme)

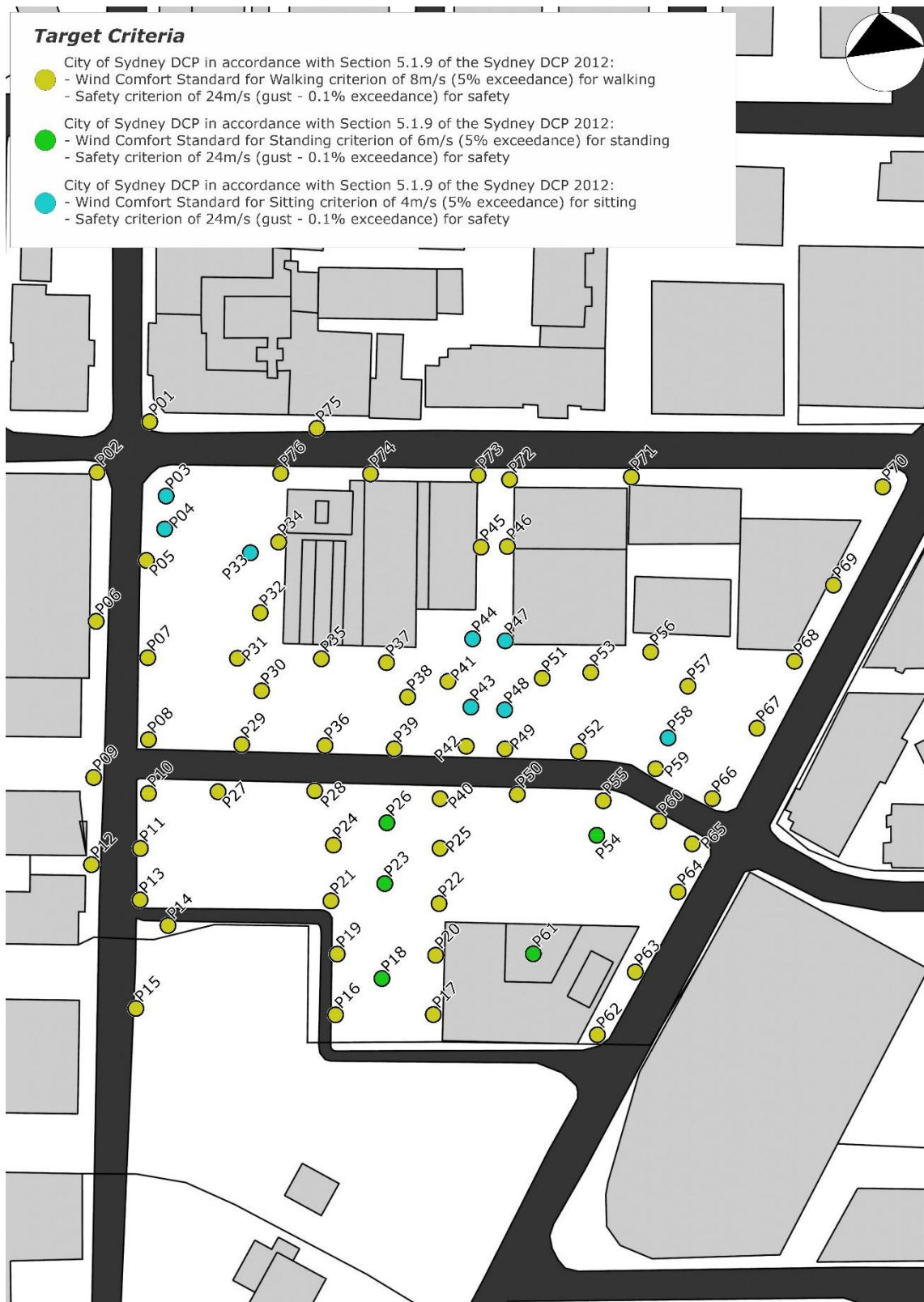


Figure 7c: Study Point Locations and Target Wind Speed Criteria – Ground Floor Plan (Existing Scheme)

# 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 6, and shown on marked-up plans in Figures 8. The velocity coefficients are also presented in the form of directional plots in Appendix D. The wind speed criteria that the wind conditions should achieve are also listed in Table 6 for each study point location, as well as in Figures 7.

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. However, some areas will experience strong winds which will exceed the relevant criteria for comfort. Suggested treatments are described as follows:

- Retention of the proposed densely foliated evergreen trees along the connecting corridor between Danks Street and New Street, along New Street itself, and at the corner of Danks Street and Young Street. These trees should have a minimum height of 3m and a minimum canopy width of 3m.
- Retention of the proposed 2.4m high impermeable screen at the outdoor seating area located at the eastern end of the New street.
- Inclusion of densely foliating evergreen trees with a height of 3-4m and a canopy width of 3m at the communal park located south of New street.
- Inclusion of awnings with a minimum depth of 2.5m along the connecting corridor between Danks Street and New Street, at the corner of Danks Street and Young Street, and at the communal area located in the north-western part of the site.
- Inclusion of 1m high planter boxes with 0.5-1m high densely foliated vegetation at the communal area located in the north-western part of the site.

As a general note, the use of loose glass-tops and light-weight sheets or covers (including loose BBQ lids) is not appropriate on high-rise outdoor terraces and balconies. Furthermore, lightweight furniture is not recommended unless it is securely attached to the balcony or terrace floor slab.

With the inclusion of these 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.

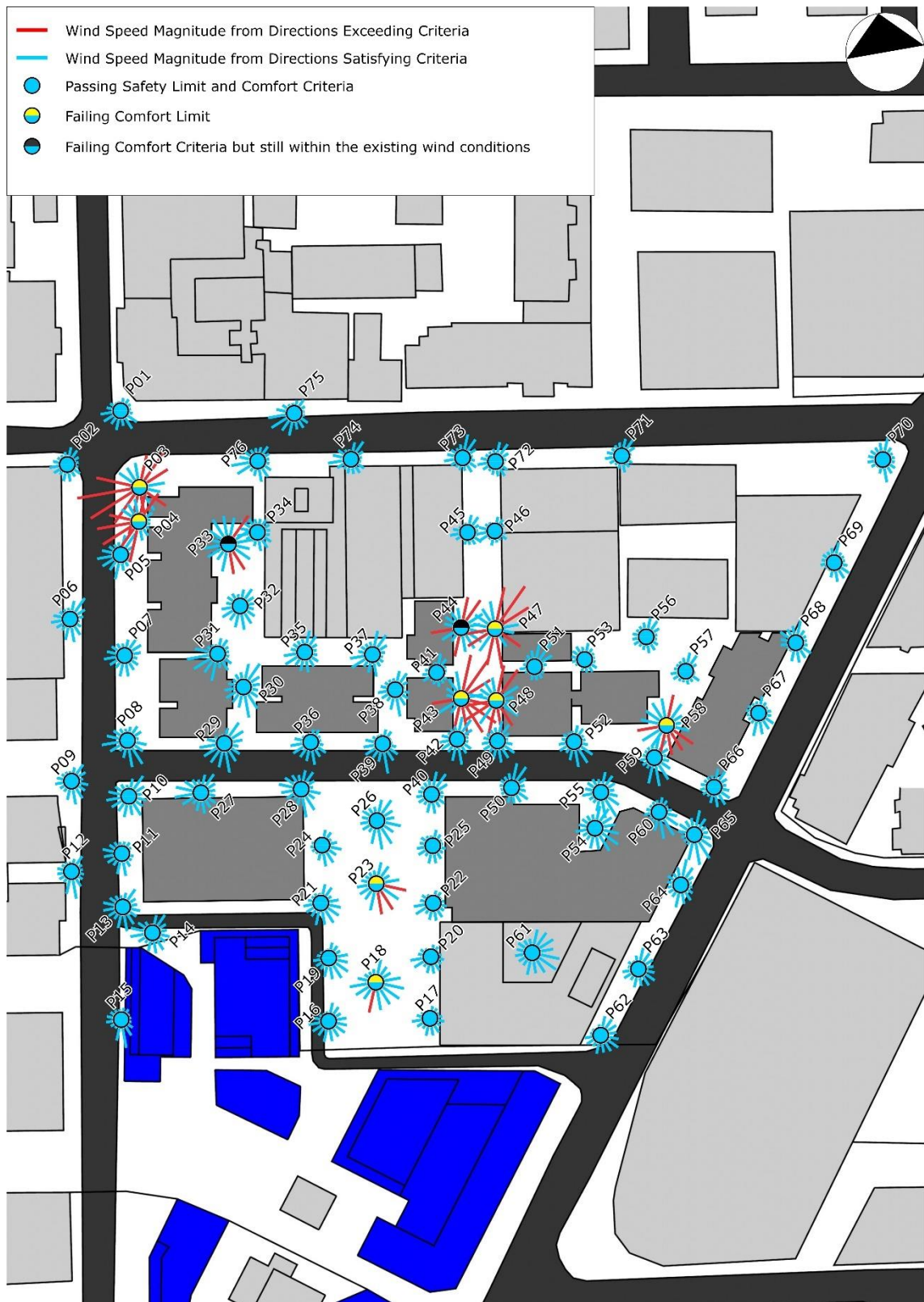


Figure 8a: Wind Tunnel Results – Ground Floor Plan (Proposed Scheme)  
(results shown without treatments applied)

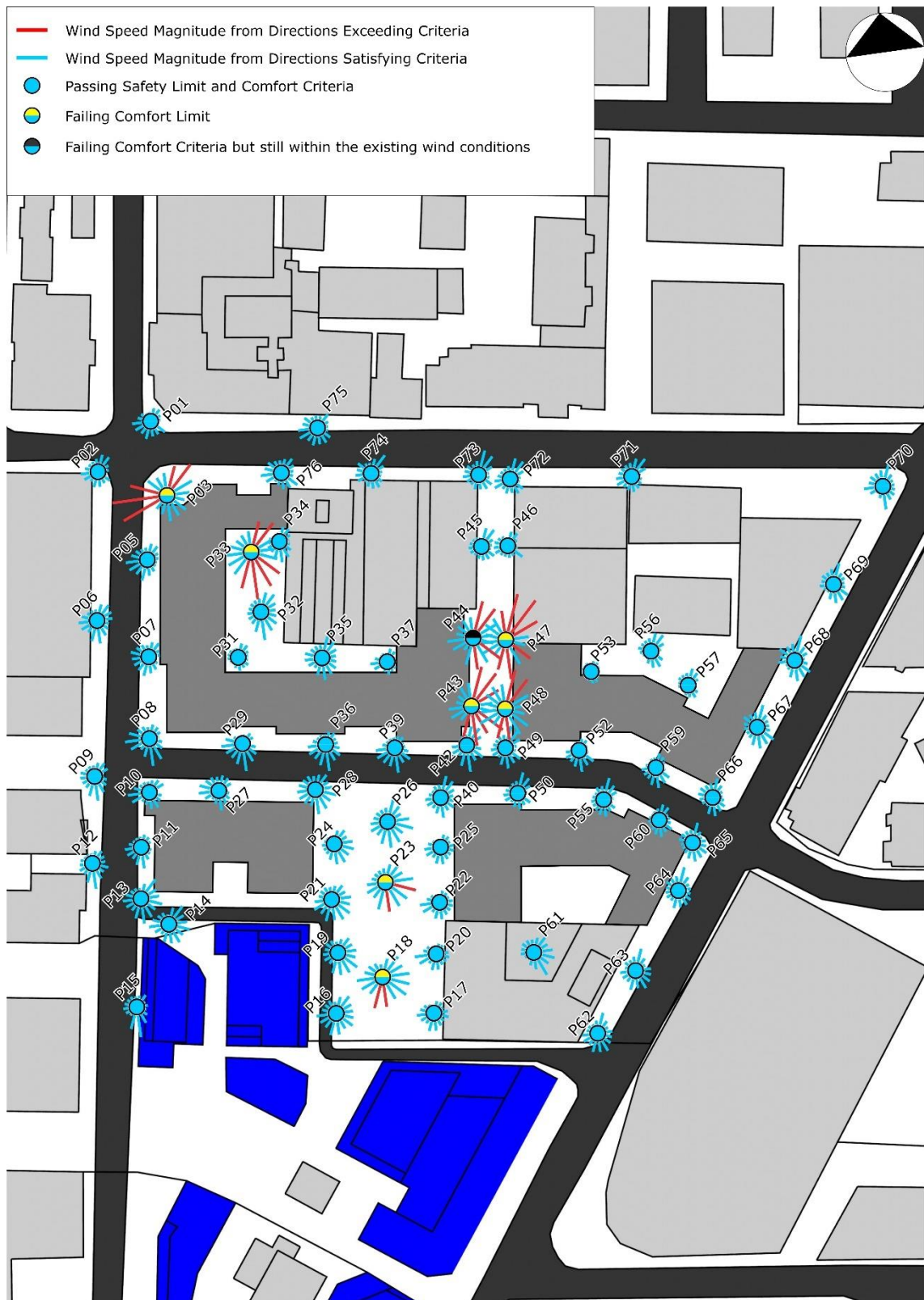


Figure 8b: Wind Tunnel Results – Ground Floor Plan (Approved Scheme)  
(results shown without treatments applied)

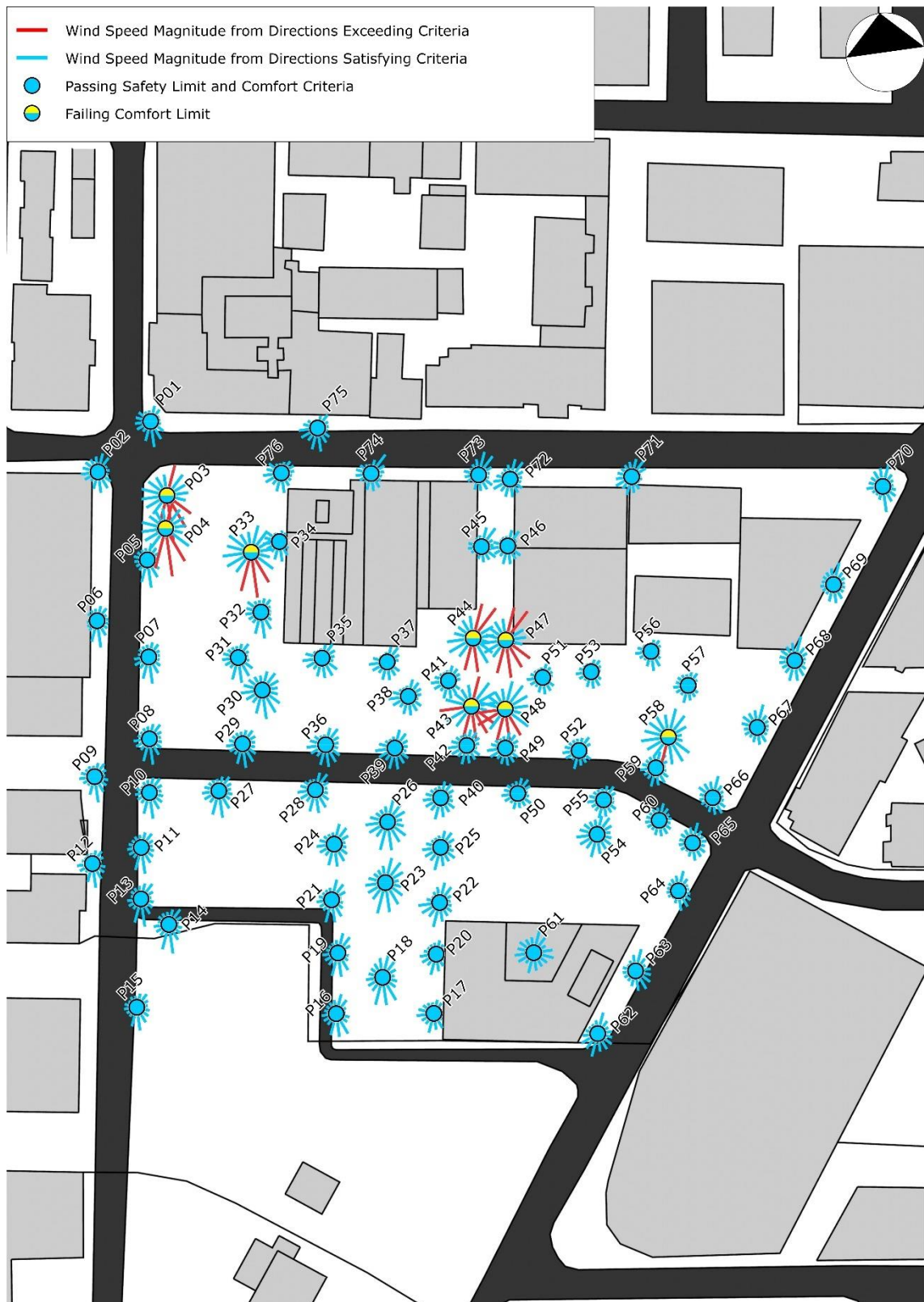


Figure 8c: Wind Tunnel Results – Ground Floor Plan (Existing Scheme)  
(results shown without treatments applied)

Table 6: Wind Tunnel Results Summary

|     | Study Point | GEM<br>(5% exceedance) |               |       | Annual Gust     |               |       | Final Result | Description of Treatment                          |
|-----|-------------|------------------------|---------------|-------|-----------------|---------------|-------|--------------|---------------------------------------------------|
|     |             | Criterion (m/s)        | Results (m/s) | Grade | Criterion (m/s) | Results (m/s) | Grade |              |                                                   |
| P01 | Proposed    |                        | 5.5           | Pass  |                 | 16            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 4.8           | Pass  | 24              | 15            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 6.0           | Pass  |                 | 16            | Pass  | Pass         |                                                   |
| P02 | Proposed    |                        | 4.8           | Pass  |                 | 13            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 4.7           | Pass  | 24              | 13            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 5.4           | Pass  |                 | 15            | Pass  | Pass         |                                                   |
| P03 | Proposed    |                        | 7.5           | Fail  |                 | 21            | Pass  | Fail         | Refer to Figure 9.                                |
|     | Approved    | 4.0                    | 6.3           | Fail  | 24              | 23            | Pass  | Fail         |                                                   |
|     | Existing    |                        | 5.4           | Fail  |                 | 15            | Pass  | Fail         |                                                   |
| P04 | Proposed    | 4.0                    | 5.6           | Fail  | 24              | 17            | Pass  | Fail         | Better than or equivalent to Existing Conditions. |
|     | Existing    |                        | 5.7           | Fail  |                 | 16            | Pass  | Fail         |                                                   |
| P05 | Proposed    |                        | 6.5           | Pass  |                 | 19            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 5.6           | Pass  | 24              | 17            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 6.3           | Pass  |                 | 17            | Pass  | Pass         |                                                   |
| P06 | Proposed    |                        | 6.2           | Pass  |                 | 17            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 5.7           | Pass  | 24              | 16            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 6.0           | Pass  |                 | 17            | Pass  | Pass         |                                                   |
| P07 | Proposed    |                        | 6.0           | Pass  |                 | 17            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 5.1           | Pass  | 24              | 17            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 6.1           | Pass  |                 | 17            | Pass  | Pass         |                                                   |
| P08 | Proposed    |                        | 7.1           | Pass  |                 | 21            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 6.8           | Pass  | 24              | 20            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 6.0           | Pass  |                 | 17            | Pass  | Pass         |                                                   |
| P09 | Proposed    |                        | 5.7           | Pass  |                 | 17            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 5.6           | Pass  | 24              | 17            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 5.8           | Pass  |                 | 16            | Pass  | Pass         |                                                   |
| P10 | Proposed    |                        | 6.5           | Pass  |                 | 20            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 5.1           | Pass  | 24              | 17            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 6.0           | Pass  |                 | 18            | Pass  | Pass         |                                                   |
| P11 | Proposed    |                        | 5.6           | Pass  |                 | 19            | Pass  | Pass         | -                                                 |
|     | Approved    | 8.0                    | 5.0           | Pass  | 24              | 15            | Pass  | Pass         |                                                   |
|     | Existing    |                        | 6.1           | Pass  |                 | 17            | Pass  | Pass         |                                                   |

|     | Study Point | GEM<br>(5% exceedance) |               |       | Annual Gust     |               |       | Final Result | Description of Treatment |
|-----|-------------|------------------------|---------------|-------|-----------------|---------------|-------|--------------|--------------------------|
|     |             | Criterion (m/s)        | Results (m/s) | Grade | Criterion (m/s) | Results (m/s) | Grade |              |                          |
| P12 | Proposed    |                        | 6.3           | Pass  |                 | 18            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 5.8           | Pass  | 24              | 18            | Pass  | Pass         |                          |
|     | Existing    |                        | 5.5           | Pass  |                 | 17            | Pass  | Pass         |                          |
| P13 | Proposed    |                        | 6.2           | Pass  |                 | 19            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 6.4           | Pass  | 24              | 18            | Pass  | Pass         |                          |
|     | Existing    |                        | 6.4           | Pass  |                 | 18            | Pass  | Pass         |                          |
| P14 | Proposed    |                        | 6.0           | Pass  |                 | 19            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 5.9           | Pass  | 24              | 16            | Pass  | Pass         |                          |
|     | Existing    |                        | 6.7           | Pass  |                 | 21            | Pass  | Pass         |                          |
| P15 | Proposed    |                        | 6.4           | Pass  |                 | 20            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 6.7           | Pass  | 24              | 22            | Pass  | Pass         |                          |
|     | Existing    |                        | 5.4           | Pass  |                 | 16            | Pass  | Pass         |                          |
| P16 | Proposed    |                        | 5.8           | Pass  |                 | 16            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 6.0           | Pass  | 24              | 17            | Pass  | Pass         |                          |
|     | Existing    |                        | 5.9           | Pass  |                 | 17            | Pass  | Pass         |                          |
| P17 | Proposed    |                        | 4.7           | Pass  |                 | 14            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 4.7           | Pass  | 24              | 13            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.8           | Pass  |                 | 15            | Pass  | Pass         |                          |
| P18 | Proposed    |                        | 6.1           | Fail  |                 | 18            | Pass  | Fail         | Refer to Figure 9.       |
|     | Approved    | 6.0                    | 6.3           | Fail  | 24              | 18            | Pass  | Fail         |                          |
|     | Existing    |                        | 5.5           | Pass  |                 | 15            | Pass  | Pass         |                          |
| P19 | Proposed    |                        | 6.0           | Pass  |                 | 17            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 6.1           | Pass  | 24              | 18            | Pass  | Pass         |                          |
|     | Existing    |                        | 5.9           | Pass  |                 | 17            | Pass  | Pass         |                          |
| P20 | Proposed    |                        | 4.9           | Pass  |                 | 16            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 4.9           | Pass  | 24              | 17            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.7           | Pass  |                 | 15            | Pass  | Pass         |                          |
| P21 | Proposed    |                        | 6.1           | Pass  |                 | 17            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 6.2           | Pass  | 24              | 17            | Pass  | Pass         |                          |
|     | Existing    |                        | 5.7           | Pass  |                 | 16            | Pass  | Pass         |                          |
| P22 | Proposed    |                        | 5.0           | Pass  |                 | 16            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 4.8           | Pass  | 24              | 15            | Pass  | Pass         |                          |
|     | Existing    |                        | 5.9           | Pass  |                 | 16            | Pass  | Pass         |                          |
| P23 | Proposed    | 6.0                    | 6.1           | Fail  | 24              | 17            | Pass  | Fail         |                          |

|     | Study Point | GEM<br>(5% exceedance) |               |       |    | Annual Gust     |               |       | Final Result | Description of Treatment                                                          |
|-----|-------------|------------------------|---------------|-------|----|-----------------|---------------|-------|--------------|-----------------------------------------------------------------------------------|
|     |             | Criterion (m/s)        | Results (m/s) | Grade |    | Criterion (m/s) | Results (m/s) | Grade |              |                                                                                   |
|     | Approved    |                        | 6.2           | Fail  |    |                 | 17            | Pass  | Fail         | Proposed scheme is better than or equivalent to Approved Conditions.              |
|     | Existing    |                        | 5.8           | Pass  |    |                 | 16            | Pass  | Pass         |                                                                                   |
| P24 | Proposed    |                        | 5.3           | Pass  |    |                 | 16            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 5.4           | Pass  | 24 |                 | 16            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.8           | Pass  |    |                 | 15            | Pass  | Pass         |                                                                                   |
| P25 | Proposed    |                        | 4.7           | Pass  |    |                 | 13            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 4.5           | Pass  | 24 |                 | 13            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.5           | Pass  |    |                 | 15            | Pass  | Pass         |                                                                                   |
| P26 | Proposed    |                        | 5.5           | Pass  |    |                 | 16            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 6.0                    | 5.2           | Pass  | 24 |                 | 15            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.5           | Pass  |    |                 | 15            | Pass  | Pass         |                                                                                   |
| P27 | Proposed    |                        | 6.7           | Pass  |    |                 | 22            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 5.3           | Pass  | 24 |                 | 18            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 6.3           | Pass  |    |                 | 18            | Pass  | Pass         |                                                                                   |
| P28 | Proposed    |                        | 7.0           | Pass  |    |                 | 21            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 6.2           | Pass  | 24 |                 | 17            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.8           | Pass  |    |                 | 16            | Pass  | Pass         |                                                                                   |
| P29 | Proposed    |                        | 7.5           | Pass  |    |                 | 21            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 6.5           | Pass  | 24 |                 | 20            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.8           | Pass  |    |                 | 17            | Pass  | Pass         |                                                                                   |
| P30 | Proposed    |                        | 7.5           | Pass  |    |                 | 22            | Pass  | Pass         | -                                                                                 |
|     | Existing    | 8.0                    | 7.1           | Pass  | 24 |                 | 21            | Pass  | Pass         |                                                                                   |
| P31 | Proposed    |                        | 7.5           | Pass  |    |                 | 20            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 3.7           | Pass  | 24 |                 | 10            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 6.0           | Pass  |    |                 | 17            | Pass  | Pass         |                                                                                   |
| P32 | Proposed    |                        | 6.1           | Pass  |    |                 | 17            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 6.5           | Pass  | 24 |                 | 20            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 6.2           | Pass  |    |                 | 19            | Pass  | Pass         |                                                                                   |
| P33 | Proposed    |                        | 4.6           | Fail  |    |                 | 14            | Pass  | Fail         | Proposed scheme is better than or equivalent to Existing and Approved Conditions. |
|     | Approved    | 4.0                    | 5.8           | Fail  | 24 |                 | 18            | Pass  | Fail         |                                                                                   |
|     | Existing    |                        | 5.5           | Fail  |    |                 | 17            | Pass  | Fail         |                                                                                   |
| P34 | Proposed    |                        | 5.5           | Pass  |    |                 | 17            | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 4.9           | Pass  | 24 |                 | 15            | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 4.9           | Pass  |    |                 | 14            | Pass  | Pass         |                                                                                   |

|     | Study Point | GEM<br>(5% exceedance) |                  |       | Annual Gust<br>Criterion<br>(m/s) | Annual Gust      |       | Final Result | Description of Treatment                                                          |
|-----|-------------|------------------------|------------------|-------|-----------------------------------|------------------|-------|--------------|-----------------------------------------------------------------------------------|
|     |             | Criterion<br>(m/s)     | Results<br>(m/s) | Grade |                                   | Results<br>(m/s) | Grade |              |                                                                                   |
| P35 | Proposed    |                        | 5.9              | Pass  |                                   | 17               | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 5.9              | Pass  | 24                                | 16               | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.5              | Pass  |                                   | 16               | Pass  | Pass         |                                                                                   |
| P36 | Proposed    |                        | 5.8              | Pass  |                                   | 16               | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 6.2              | Pass  | 24                                | 19               | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.7              | Pass  |                                   | 16               | Pass  | Pass         |                                                                                   |
| P37 | Proposed    |                        | 6.4              | Pass  |                                   | 17               | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 3.8              | Pass  | 24                                | 13               | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 4.9              | Pass  |                                   | 13               | Pass  | Pass         |                                                                                   |
| P38 | Proposed    |                        | 6.2              | Pass  |                                   | 19               | Pass  | Pass         | -                                                                                 |
|     | Existing    | 8.0                    | 5.2              | Pass  | 24                                | 15               | Pass  | Pass         |                                                                                   |
| P39 | Proposed    |                        | 6.9              | Pass  |                                   | 22               | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 6.0              | Pass  | 24                                | 18               | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.6              | Pass  |                                   | 15               | Pass  | Pass         |                                                                                   |
| P40 | Proposed    |                        | 5.9              | Pass  |                                   | 16               | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 5.5              | Pass  | 24                                | 14               | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.3              | Pass  |                                   | 15               | Pass  | Pass         |                                                                                   |
| P41 | Proposed    |                        | 4.5              | Pass  |                                   | 13               | Pass  | Pass         | -                                                                                 |
|     | Existing    | 8.0                    | 4.8              | Pass  | 24                                | 13               | Pass  | Pass         |                                                                                   |
| P42 | Proposed    |                        | 6.4              | Pass  |                                   | 18               | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 6.2              | Pass  | 24                                | 19               | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.1              | Pass  |                                   | 14               | Pass  | Pass         |                                                                                   |
| P43 | Proposed    |                        | 6.0              | Fail  |                                   | 16               | Pass  | Fail         | Refer to Figure 9.                                                                |
|     | Approved    | 4.0                    | 5.5              | Fail  | 24                                | 15               | Pass  | Fail         |                                                                                   |
|     | Existing    |                        | 4.8              | Fail  |                                   | 14               | Pass  | Fail         |                                                                                   |
| P44 | Proposed    |                        | 4.3              | Fail  |                                   | 12               | Pass  | Fail         | Proposed scheme is better than or equivalent to Existing and Approved Conditions. |
|     | Approved    | 4.0                    | 4.8              | Fail  | 24                                | 13               | Pass  | Fail         |                                                                                   |
|     | Existing    |                        | 4.8              | Fail  |                                   | 13               | Pass  | Fail         |                                                                                   |
| P45 | Proposed    |                        | 4.7              | Pass  |                                   | 14               | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 4.8              | Pass  | 24                                | 14               | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 5.2              | Pass  |                                   | 15               | Pass  | Pass         |                                                                                   |
| P46 | Proposed    |                        | 4.6              | Pass  |                                   | 16               | Pass  | Pass         | -                                                                                 |
|     | Approved    | 8.0                    | 4.2              | Pass  | 24                                | 13               | Pass  | Pass         |                                                                                   |
|     | Existing    |                        | 4.9              | Pass  |                                   | 14               | Pass  | Pass         |                                                                                   |

|     | Study Point | GEM<br>(5% exceedance) |               |       | Annual Gust     |               |       | Final Result | Description of Treatment |
|-----|-------------|------------------------|---------------|-------|-----------------|---------------|-------|--------------|--------------------------|
|     |             | Criterion (m/s)        | Results (m/s) | Grade | Criterion (m/s) | Results (m/s) | Grade |              |                          |
| P47 | Proposed    |                        | 6.2           | Fail  |                 | 18            | Pass  | Fail         | Refer to Figure 9.       |
|     | Approved    | 4.0                    | 6.1           | Fail  | 24              | 17            | Pass  | Fail         |                          |
|     | Existing    |                        | 4.9           | Fail  |                 | 14            | Pass  | Fail         |                          |
| P48 | Proposed    |                        | 5.8           | Fail  |                 | 17            | Pass  | Fail         | Refer to Figure 9.       |
|     | Approved    | 4.0                    | 5.3           | Fail  | 24              | 16            | Pass  | Fail         |                          |
|     | Existing    |                        | 4.7           | Fail  |                 | 12            | Pass  | Fail         |                          |
| P49 | Proposed    |                        | 5.7           | Pass  |                 | 15            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 5.6           | Pass  | 24              | 15            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.9           | Pass  |                 | 13            | Pass  | Pass         |                          |
| P50 | Proposed    |                        | 6.1           | Pass  |                 | 17            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 5.0           | Pass  | 24              | 14            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.6           | Pass  |                 | 13            | Pass  | Pass         |                          |
| P51 | Proposed    | 8.0                    | 6.4           | Pass  | 24              | 16            | Pass  | Pass         | -                        |
|     | Existing    |                        | 4.3           | Pass  |                 | 12            | Pass  | Pass         |                          |
| P52 | Proposed    |                        | 6.3           | Pass  |                 | 19            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 5.0           | Pass  | 24              | 15            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.6           | Pass  |                 | 14            | Pass  | Pass         |                          |
| P53 | Proposed    |                        | 4.3           | Pass  |                 | 14            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 3.0           | Pass  | 24              | 08            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.2           | Pass  |                 | 12            | Pass  | Pass         |                          |
| P54 | Proposed    | 6.0                    | 5.3           | Pass  | 24              | 16            | Pass  | Pass         | -                        |
|     | Existing    |                        | 4.5           | Pass  |                 | 13            | Pass  | Pass         |                          |
| P55 | Proposed    |                        | 6.8           | Pass  |                 | 21            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 5.1           | Pass  | 24              | 14            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.7           | Pass  |                 | 14            | Pass  | Pass         |                          |
| P56 | Proposed    |                        | 5.0           | Pass  |                 | 14            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 4.9           | Pass  | 24              | 13            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.6           | Pass  |                 | 14            | Pass  | Pass         |                          |
| P57 | Proposed    |                        | 4.8           | Pass  |                 | 14            | Pass  | Pass         | -                        |
|     | Approved    | 8.0                    | 4.0           | Pass  | 24              | 11            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.3           | Pass  |                 | 13            | Pass  | Pass         |                          |
| P58 | Proposed    | 4.0                    | 4.7           | Fail  | 24              | 14            | Pass  | Fail         | Refer to Figure 9.       |
|     | Existing    |                        | 4.4           | Fail  |                 | 13            | Pass  | Fail         |                          |
| P59 | Proposed    | 8.0                    | 6.9           | Pass  | 24              | 20            | Pass  | Pass         | -                        |

|     | Study Point | GEM<br>(5% exceedance) |               |       |    | Annual Gust     |               |       | Final Result | Description of Treatment |
|-----|-------------|------------------------|---------------|-------|----|-----------------|---------------|-------|--------------|--------------------------|
|     |             | Criterion (m/s)        | Results (m/s) | Grade |    | Criterion (m/s) | Results (m/s) | Grade |              |                          |
|     | Approved    |                        | 4.9           | Pass  |    |                 | 15            | Pass  | Pass         |                          |
|     | Existing    |                        | 4.8           | Pass  |    |                 | 14            | Pass  | Pass         |                          |
|     | Proposed    |                        | 6.6           | Pass  |    |                 | 20            | Pass  | Pass         |                          |
| P60 | Approved    | 8.0                    | 4.3           | Pass  | 24 |                 | 12            | Pass  | Pass         | -                        |
|     | Existing    |                        | 4.5           | Pass  |    |                 | 12            | Pass  | Pass         |                          |
|     | Proposed    |                        | 5.6           | Pass  |    |                 | 17            | Pass  | Pass         |                          |
| P61 | Approved    | 6.0                    | 4.4           | Pass  | 24 |                 | 14            | Pass  | Pass         | -                        |
|     | Existing    |                        | 4.8           | Pass  |    |                 | 13            | Pass  | Pass         |                          |
|     | Proposed    |                        | 5.6           | Pass  |    |                 | 16            | Pass  | Pass         |                          |
| P62 | Approved    | 8.0                    | 5.3           | Pass  | 24 |                 | 15            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.7           | Pass  |    |                 | 17            | Pass  | Pass         |                          |
|     | Proposed    |                        | 5.5           | Pass  |    |                 | 14            | Pass  | Pass         |                          |
| P63 | Approved    | 8.0                    | 5.5           | Pass  | 24 |                 | 15            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.5           | Pass  |    |                 | 15            | Pass  | Pass         |                          |
|     | Proposed    |                        | 6.2           | Pass  |    |                 | 15            | Pass  | Pass         |                          |
| P64 | Approved    | 8.0                    | 5.5           | Pass  | 24 |                 | 14            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.1           | Pass  |    |                 | 14            | Pass  | Pass         |                          |
|     | Proposed    |                        | 7.5           | Pass  |    |                 | 21            | Pass  | Pass         |                          |
| P65 | Approved    | 8.0                    | 5.1           | Pass  | 24 |                 | 13            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.1           | Pass  |    |                 | 14            | Pass  | Pass         |                          |
|     | Proposed    |                        | 5.4           | Pass  |    |                 | 15            | Pass  | Pass         |                          |
| P66 | Approved    | 8.0                    | 5.0           | Pass  | 24 |                 | 14            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.4           | Pass  |    |                 | 16            | Pass  | Pass         |                          |
|     | Proposed    |                        | 5.4           | Pass  |    |                 | 15            | Pass  | Pass         |                          |
| P67 | Approved    | 8.0                    | 5.8           | Pass  | 24 |                 | 15            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.6           | Pass  |    |                 | 17            | Pass  | Pass         |                          |
|     | Proposed    |                        | 6.0           | Pass  |    |                 | 15            | Pass  | Pass         |                          |
| P68 | Approved    | 8.0                    | 6.1           | Pass  | 24 |                 | 16            | Pass  | Pass         | -                        |
|     | Existing    |                        | 6.0           | Pass  |    |                 | 16            | Pass  | Pass         |                          |
|     | Proposed    |                        | 5.2           | Pass  |    |                 | 14            | Pass  | Pass         |                          |
| P69 | Approved    | 8.0                    | 5.2           | Pass  | 24 |                 | 14            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.3           | Pass  |    |                 | 14            | Pass  | Pass         |                          |
|     | Proposed    |                        | 5.6           | Pass  |    |                 | 16            | Pass  | Pass         |                          |
| P70 | Approved    | 8.0                    | 5.7           | Pass  | 24 |                 | 17            | Pass  | Pass         | -                        |

|     | Study Point | GEM<br>(5% exceedance) |               |       | Annual Gust     |               |       | Final Result | Description of Treatment |
|-----|-------------|------------------------|---------------|-------|-----------------|---------------|-------|--------------|--------------------------|
|     |             | Criterion (m/s)        | Results (m/s) | Grade | Criterion (m/s) | Results (m/s) | Grade |              |                          |
|     | Existing    |                        | 6.1           | Pass  |                 | 19            | Pass  | Pass         |                          |
| P71 | Proposed    |                        | 4.9           | Pass  |                 | 14            | Pass  | Pass         |                          |
|     | Approved    | 8.0                    | 5.1           | Pass  | 24              | 15            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.3           | Pass  |                 | 14            | Pass  | Pass         |                          |
| P72 | Proposed    |                        | 5.2           | Pass  |                 | 14            | Pass  | Pass         |                          |
|     | Approved    | 8.0                    | 5.3           | Pass  | 24              | 15            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.4           | Pass  |                 | 14            | Pass  | Pass         |                          |
| P73 | Proposed    |                        | 5.8           | Pass  |                 | 16            | Pass  | Pass         |                          |
|     | Approved    | 8.0                    | 5.8           | Pass  | 24              | 17            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.7           | Pass  |                 | 16            | Pass  | Pass         |                          |
| P74 | Proposed    |                        | 5.5           | Pass  |                 | 18            | Pass  | Pass         |                          |
|     | Approved    | 8.0                    | 5.2           | Pass  | 24              | 15            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.4           | Pass  |                 | 16            | Pass  | Pass         |                          |
| P75 | Proposed    |                        | 6.6           | Pass  |                 | 21            | Pass  | Pass         |                          |
|     | Approved    | 8.0                    | 5.3           | Pass  | 24              | 16            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.7           | Pass  |                 | 17            | Pass  | Pass         |                          |
| P76 | Proposed    |                        | 6.2           | Pass  |                 | 21            | Pass  | Pass         |                          |
|     | Approved    | 8.0                    | 5.3           | Pass  | 24              | 16            | Pass  | Pass         | -                        |
|     | Existing    |                        | 5.2           | Pass  |                 | 15            | Pass  | Pass         |                          |

The test results shown in Table 6 are without any treatments applied. If treatment is required, the treatment is described in Table 6.

### Treatments Legend

-  Retention of the proposed densely foliating evergreen trees. (Minimum height of 3m with a minimum canopy width of 3m)
-  Retention of the proposed 2.4m high impermeable screen.
-  Inclusion of densely foliating evergreen trees with a height of 3-4m and a canopy of 3m wide.
-  Inclusion of an awning with a minimum depth of 2.5m.
-  Inclusion of 1m high planter box with 0.5-1m high densely foliating vegetation.



Figure 9: Suggested Treatments for the Proposed Scheme – Ground Level Plan

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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.2 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 - 0.3                      |                                                                                                                |
| Calm, light air | 1               | 0.3 - 1.6                    | No noticeable wind                                                                                             |
| Light breeze    | 2               | 1.6 - 3.4                    | Wind felt on face                                                                                              |
| Gentle breeze   | 3               | 3.4 - 5.5                    | Hair is disturbed, clothing flaps, newspapers difficult to read                                                |
| Moderate breeze | 4               | 5.5 - 8.0                    | Raises dust, dry soil and loose paper, hair disarranged                                                        |
| Fresh breeze    | 5               | 8.0 - 10.8                   | Force of wind felt on body, danger of stumbling                                                                |
| Strong breeze   | 6               | 10.8 - 13.9                  | Umbrellas used with difficulty, hair blown straight, difficult to walk steadily, wind noise on ears unpleasant |
| Near gale       | 7               | 13.9 - 17.2                  | Inconvenience felt when walking                                                                                |
| Gale            | 8               | 17.2 - 20.8                  | Generally impedes progress, difficulty balancing in gusts                                                      |
| Strong gale     | 9               | 20.8 - 24.5                  | People blown over                                                                                              |

## A.3 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.4 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.5 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            | 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.6 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%.

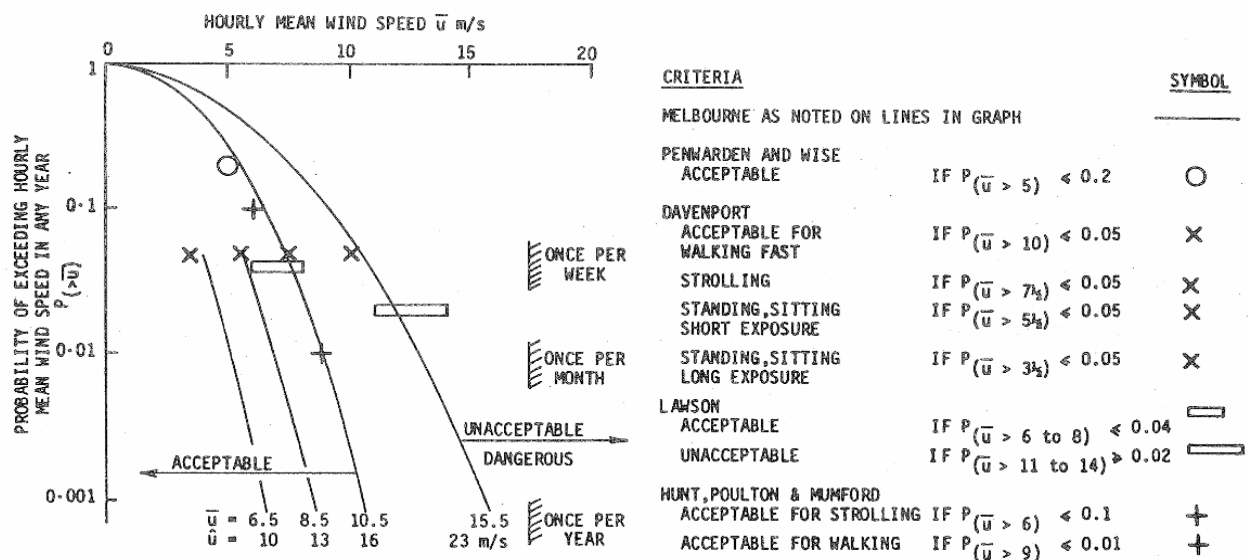


Figure A.1: Comparison of Various Mean and Gust Wind Environment Criteria, assuming 15% turbulence and a Gust Factor of 1.5 (W.H. Melbourne, 1978)

## A.7 References relating to Pedestrian Comfort Criteria

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## APPENDIX B DATA ACQUISITION

The wind tunnel testing procedures utilised 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 determined as coefficients using data acquired by either Dantec hot-wire probe anemometers or pressure-based wind speed sensors 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 either Dantec hot-wire probe anemometers or pressure-based wind speed sensors at selected critical outdoor locations. The wind velocity results presented in this study for each study point are representative of wind at a full-scale height of approximately 1.5m above ground/slab level. In the case of the Dantec hot-wire probe anemometers, the support of the probe is mounted such that the probe wire is 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 hot-wire probe wire and in avoiding wall-heating effects.

Wind speed measurements were made in the wind tunnel for the wind directions described within this report. 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. In the case of the pressure-based wind speed sensors, the phase lag between the various channels where data is acquired simultaneously is within 10% of a typical pressure cycle, and the signal is low-pass filtered at 500Hz and then digital filtering is applied over this range to provide an unbiased response from the pressure measurement system (A.W. Rofail, 2004).

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

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

where:

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

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

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

$\sigma_{C_V}$  is the standard deviation of the velocity coefficient measurement.

In the case of a Dantec hot-wire probe anemometer, the velocity coefficient is obtained as follows:

$$C_V = \frac{C_{V,study}}{C_{V,200m}} \quad B.2$$

where:

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

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

However, in the case of the pressure-based wind speed sensors, these are determined from the measured differential mean, standard deviation and maximum pressure coefficients obtained from the wind speed sensor. For this analysis all calculations are performed on the square root of the differential pressure measurements. The velocity coefficient at the pressure-based wind speed sensor location is then calculated as follows:

$$C_V = \frac{\alpha + \beta\sqrt{\Delta p}}{V_{200m}} \quad B.3$$

where:

$C_V$  is the velocity coefficient measurement at the study point location.

$\alpha$  is a calibration coefficient for the pressure-based wind speed sensor.

$\beta$  is a calibration coefficient for the pressure-based wind speed sensor.

$\Delta p$  is the differential pressure obtained from the pressure-based wind speed sensor at the study point location.

$V_{200m}$  is the wind speed at the free-stream reference location of 200m height (full-scale) in the wind tunnel, which is determined directly in the wind tunnel using a pitot static probe.

## 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.3 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:

$$V_{study} = V_{ref,RH} \left( \frac{k_{200m,tr,T=1hr}}{k_{RH,tr,T=1hr}} \right) C_V \quad B.4$$

where:

$V_{study}$  is the full-scale wind speed at the study point location.

$V_{ref,RH}$  is the full-scale reference wind speed 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 hourly mean terrain and height multiplier at the free-stream reference location of 200m height.

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

$C_V$  is the velocity coefficient, obtained from either Equation B.2 (in the case of Dantec hot-wire probe anemometers) or Equation B.3 (in the case of pressure-based wind speed sensors).

The value of  $V_{ref,RH}$  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.4 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.

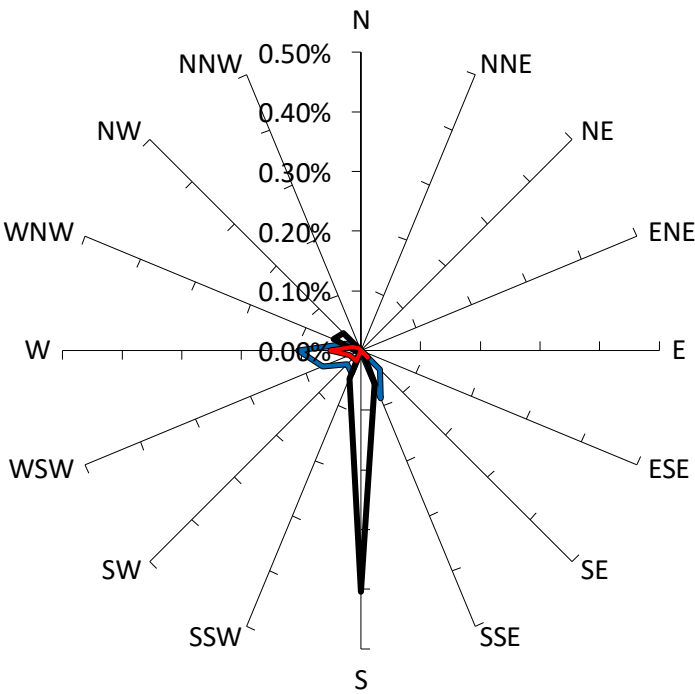
## B.5 References relating to Data Acquisition

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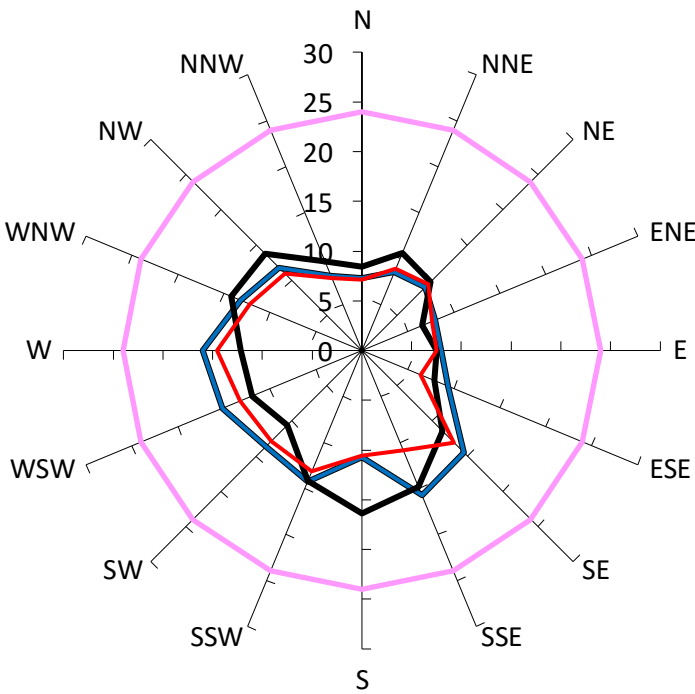


## APPENDIX C DIRECTIONAL PLOTS OF WIND TUNNEL RESULTS

Results for P01



Annual probability of exceeding 8m/s (%)



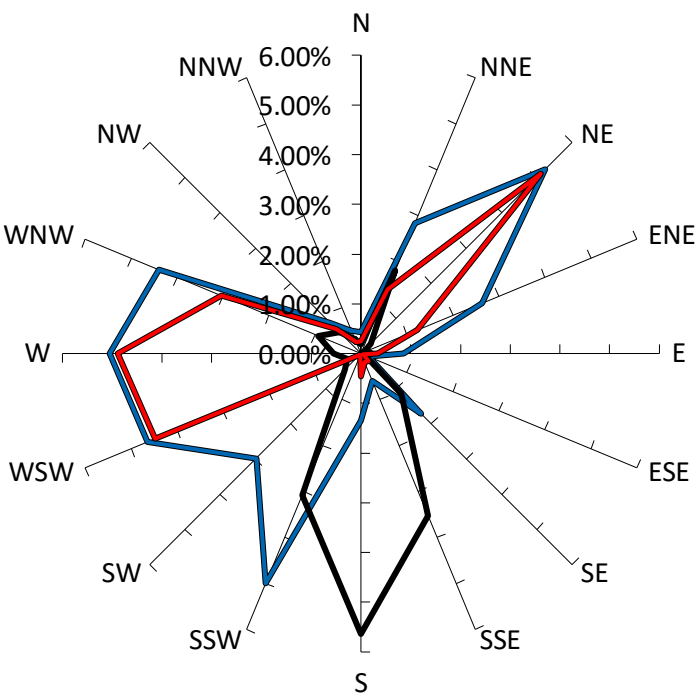
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 5.5                  | 16            |
| <div></div> Existing site.                                                                       |  | 6.0                  | 16            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 4.8                  | 15            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
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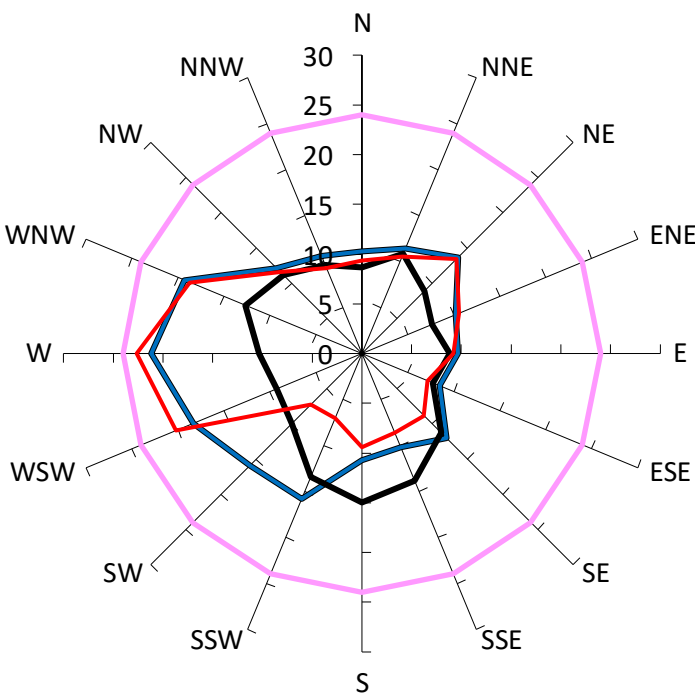


WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

Results for P03



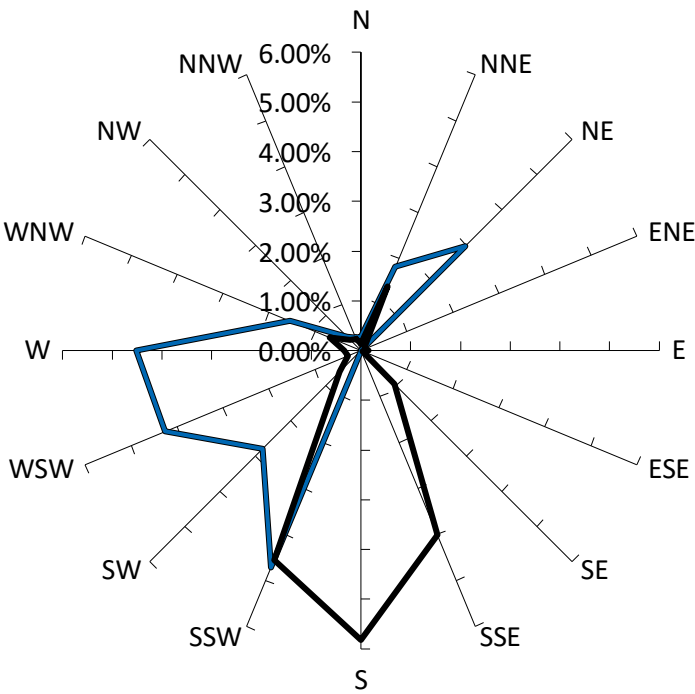
Annual probability of exceeding 4m/s (%)



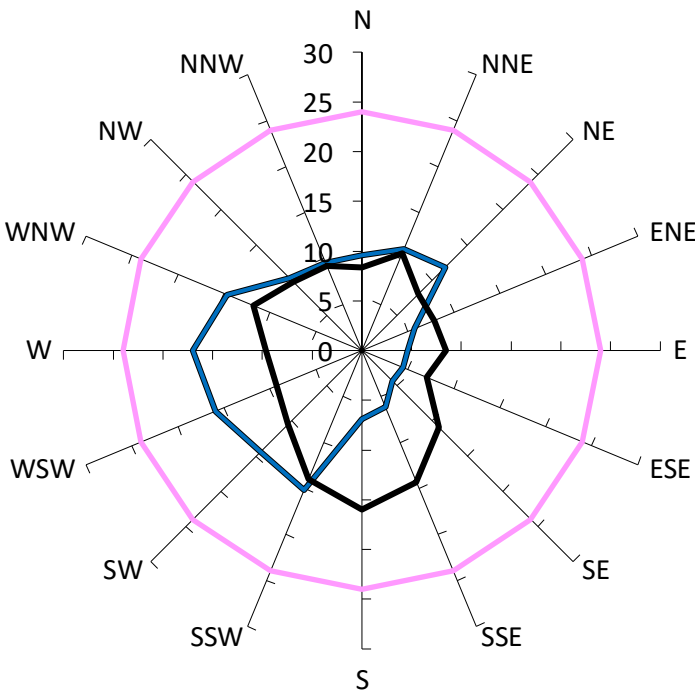
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Sitting Criterion (4m/s). Safety Limit (24m/s). |  | 4.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 7.5                  | 21            |
| <div></div> Existing site.                                                                       |  | 5.4                  | 15            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 6.3                  | 23            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P04



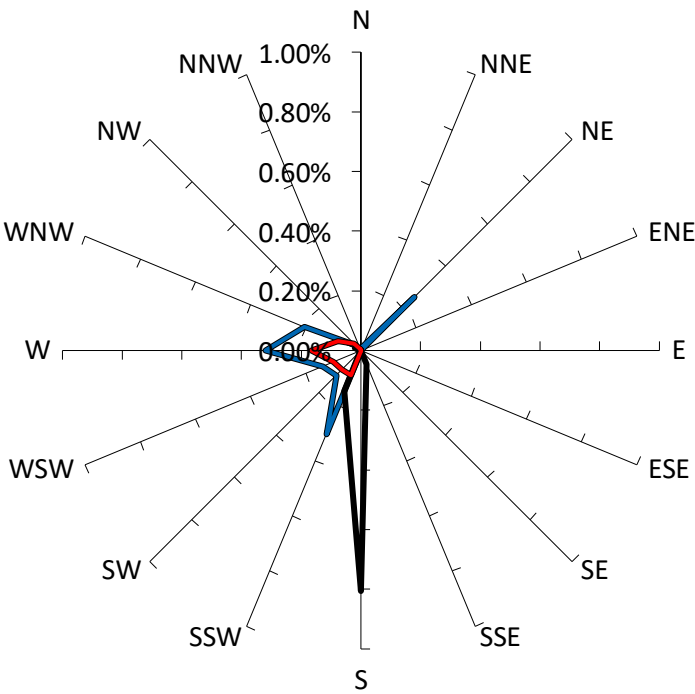
Annual probability of exceeding 4m/s (%)



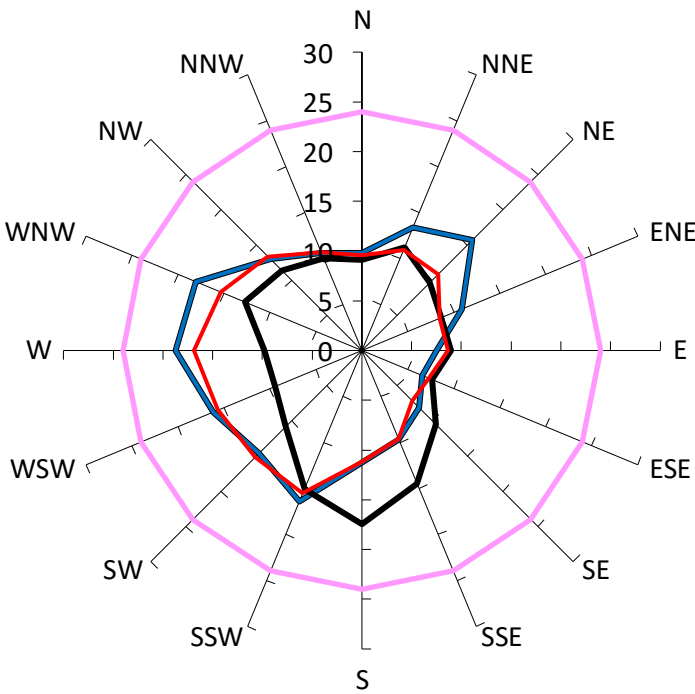
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Sitting Criterion (4m/s). Safety Limit (24m/s). |  | 4.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 5.6                  | 17            |
| <div></div> Existing site.                                                                       |  | 5.7                  | 16            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P05



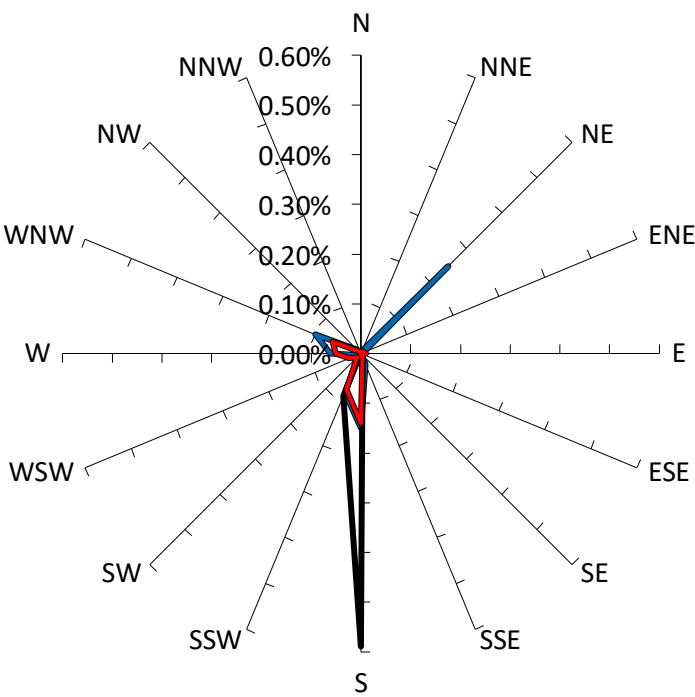
Annual probability of exceeding 8m/s (%)



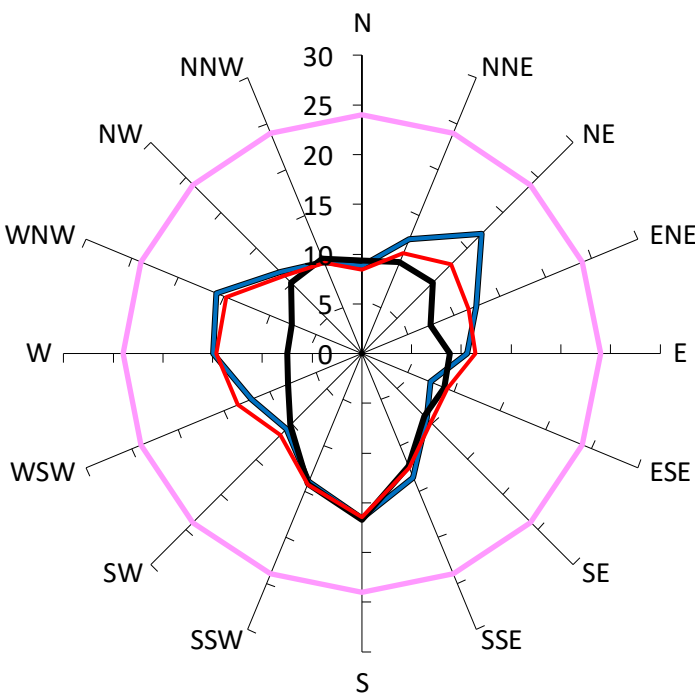
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.5                  | 19            |
| <div></div> Existing site.                                                                       |  | 6.3                  | 17            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.6                  | 17            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P06



Annual probability of exceeding 8m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.2                  | 17            |
| <div></div> Existing site.                                                                       |  | 6.0                  | 17            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.7                  | 16            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

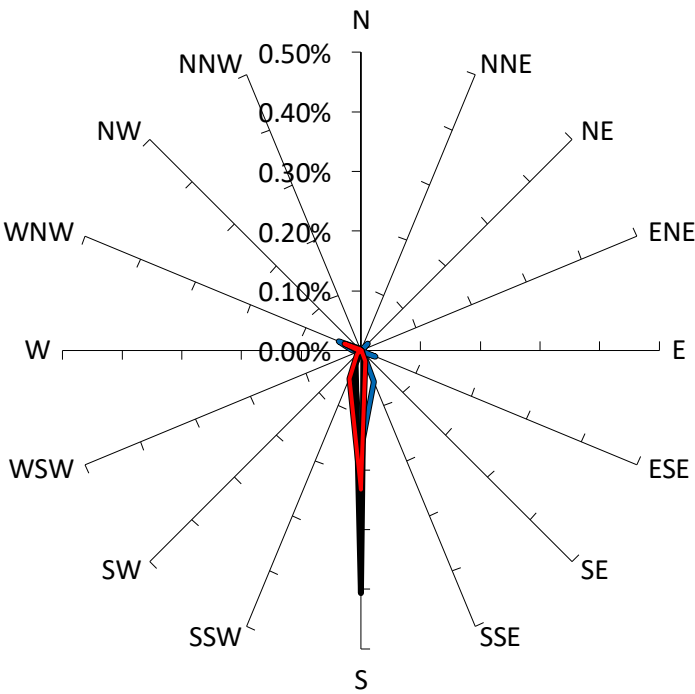


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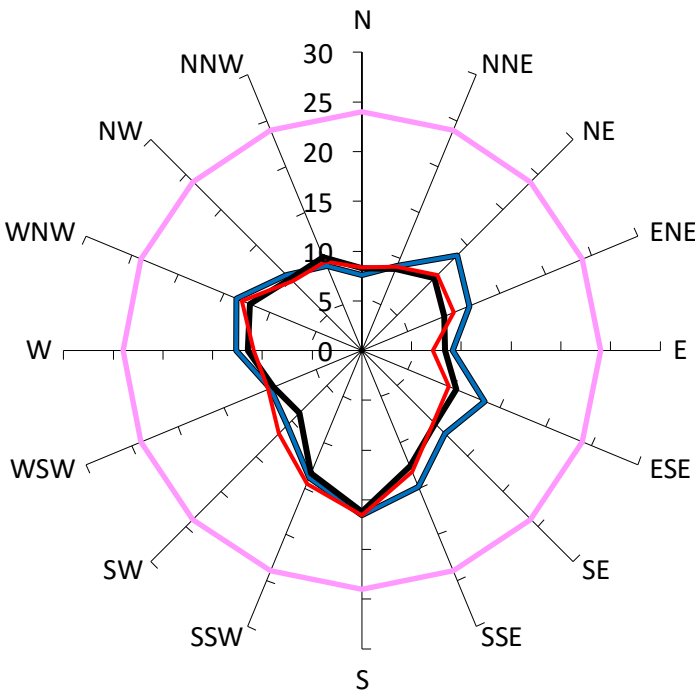


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Results for P09



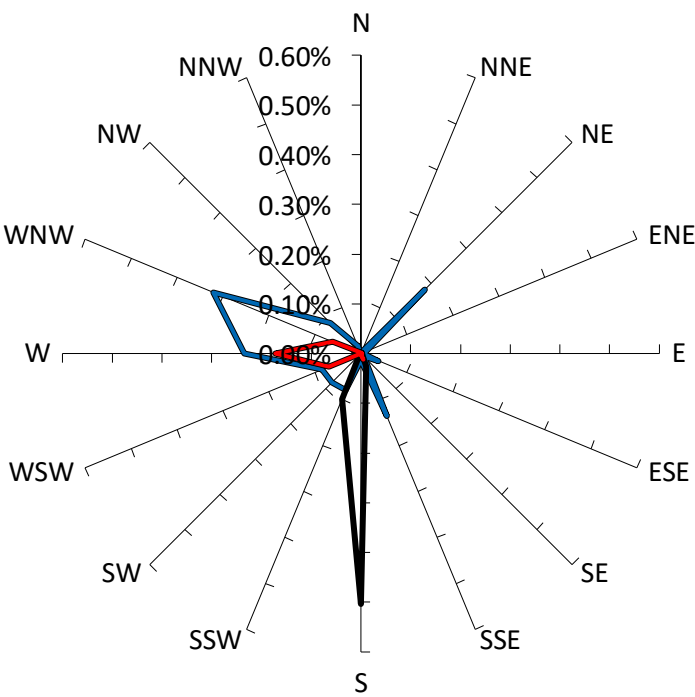
Annual probability of exceeding 8m/s (%)



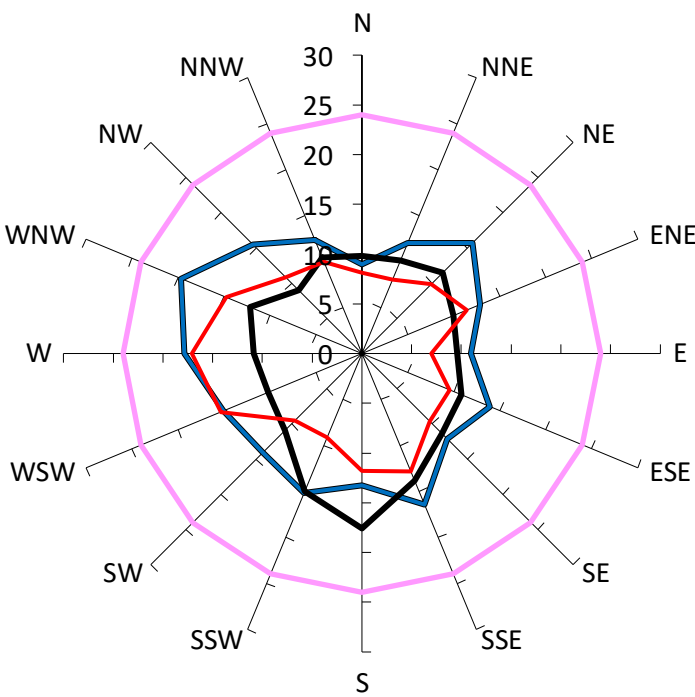
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 5.7                  | 17            |
| <div></div> Existing site.                                                                       |  | 5.8                  | 16            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.6                  | 17            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P10



Annual probability of exceeding 8m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.5                  | 20            |
| <div></div> Existing site.                                                                       |  | 6.0                  | 18            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.1                  | 17            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

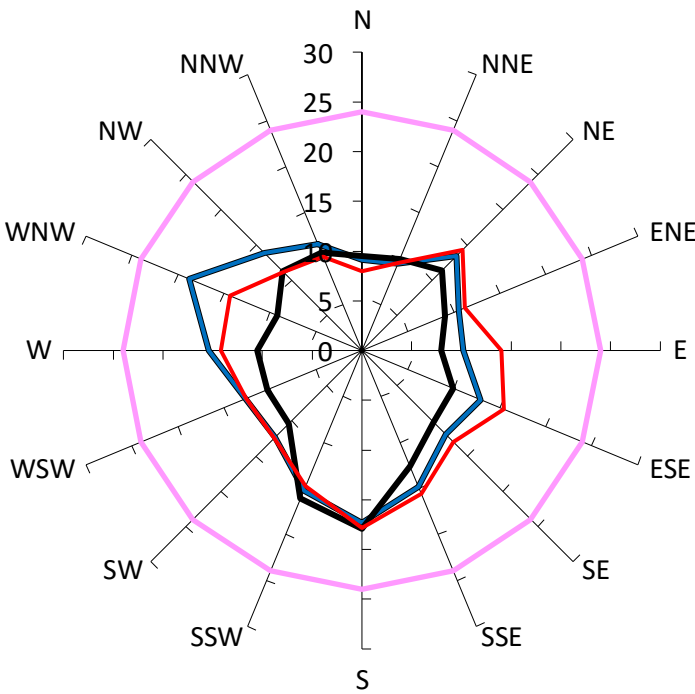
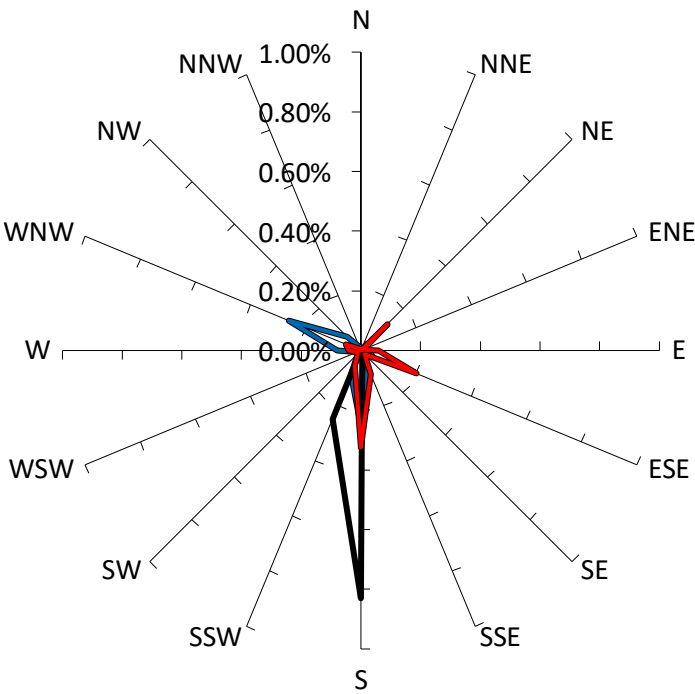


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Results for P13

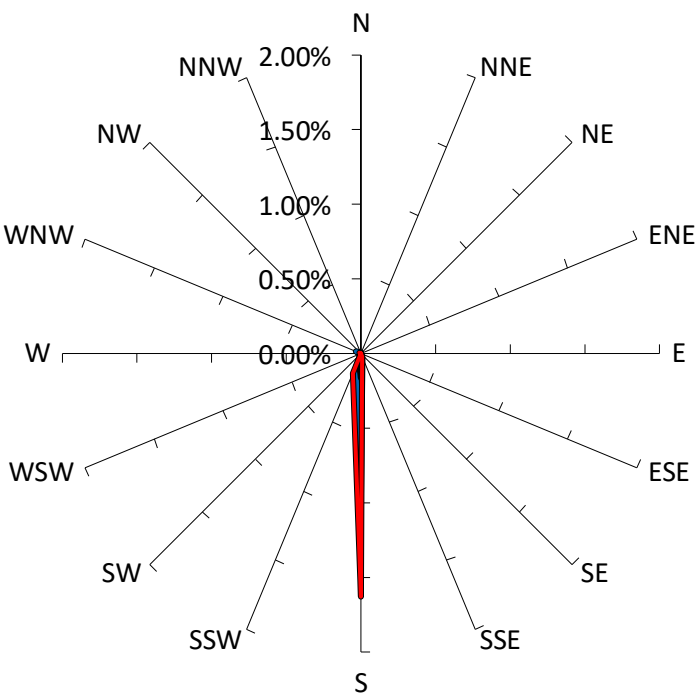


| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.2                  | 19            |
| <div></div> Existing site.                                                                       |  | 6.4                  | 18            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 6.4                  | 18            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

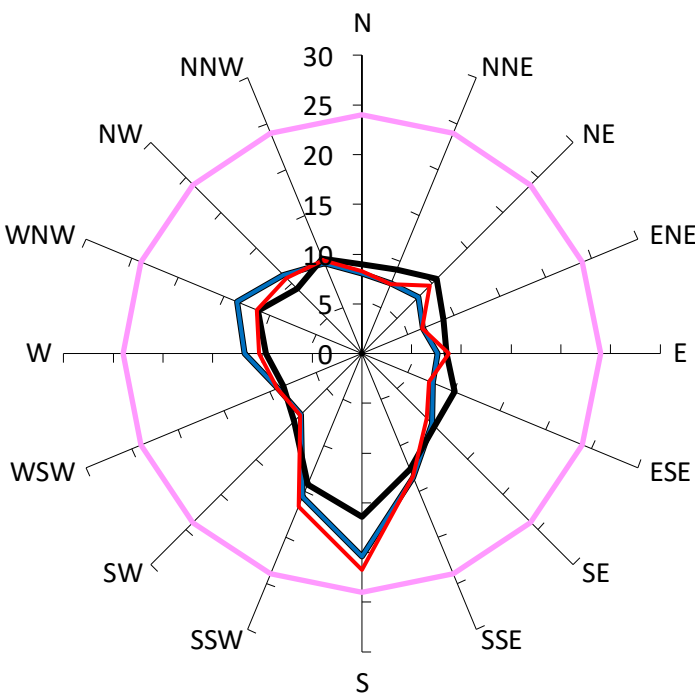


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Results for P15



Annual probability of exceeding 8m/s (%)



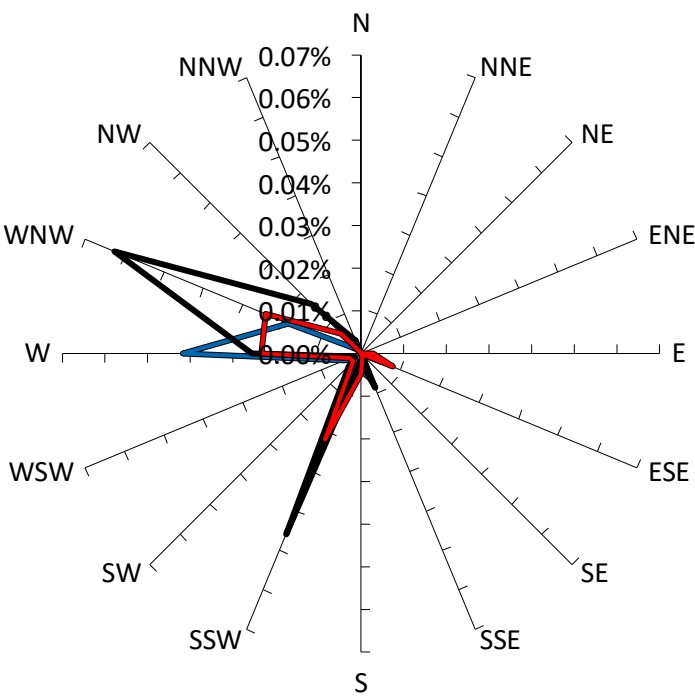
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.4                  | 20            |
| <div></div> Existing site.                                                                       |  | 5.4                  | 16            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 6.7                  | 22            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

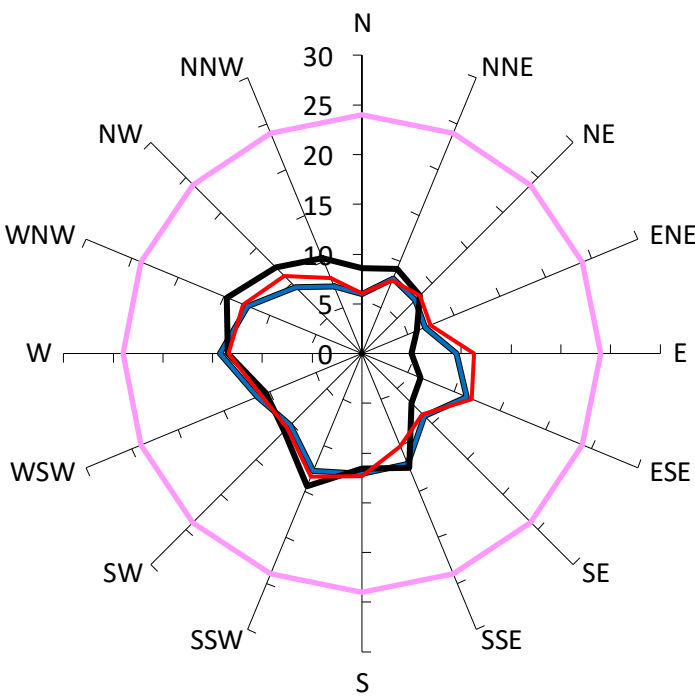


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Results for P17



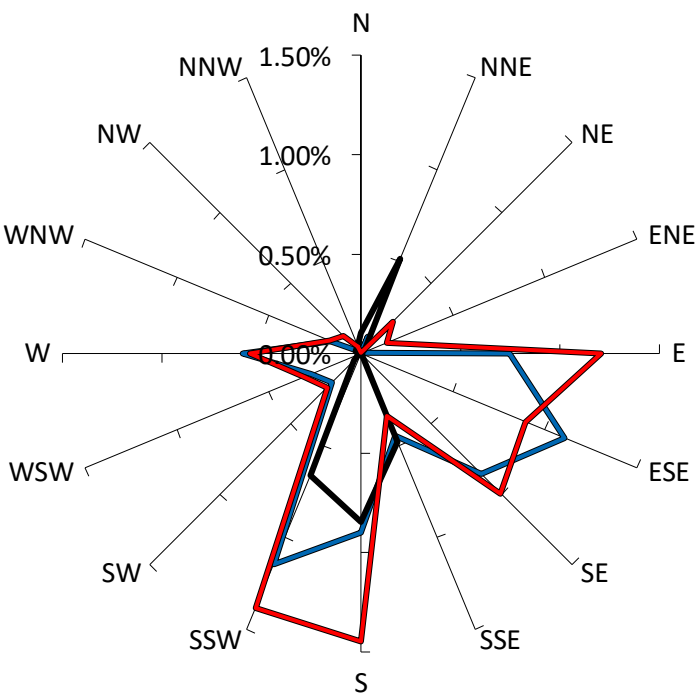
Annual probability of exceeding 8m/s (%)



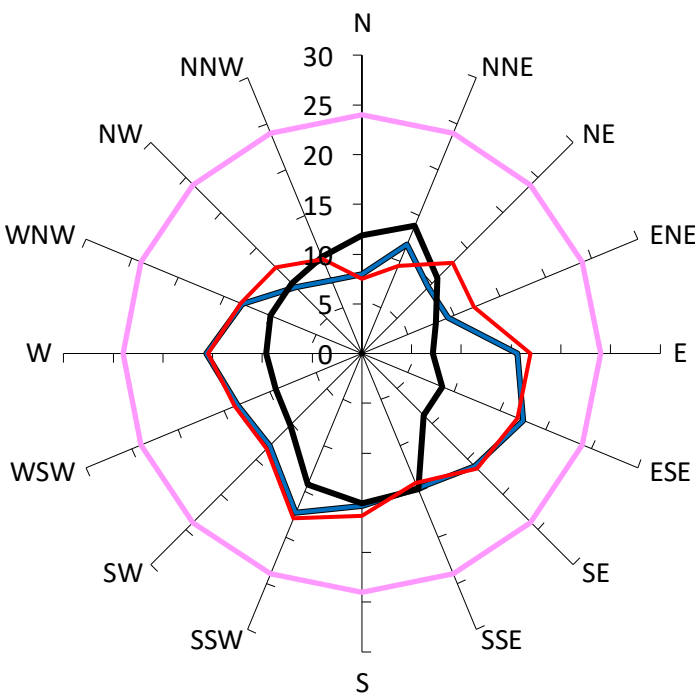
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 4.7                  | 14            |
| <div></div> Existing site.                                                                       |  | 4.8                  | 15            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 4.7                  | 13            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P18



Annual probability of exceeding 6m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                       |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|---------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Standing Criterion (6m/s). Safety Limit (24m/s). |  | 6.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                    |  | 6.1                  | 18            |
| <div></div> Existing site.                                                                        |  | 5.5                  | 15            |
| <div></div> With development "as approved", no vegetation or other treatments.                    |  | 6.3                  | 18            |
| <div></div>                                                                                       |  |                      |               |
| <div></div>                                                                                       |  |                      |               |
| <div></div>                                                                                       |  |                      |               |
| <div></div>                                                                                       |  |                      |               |
| <div></div>                                                                                       |  |                      |               |
| <div></div>                                                                                       |  |                      |               |
| <div></div>                                                                                       |  |                      |               |



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WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo



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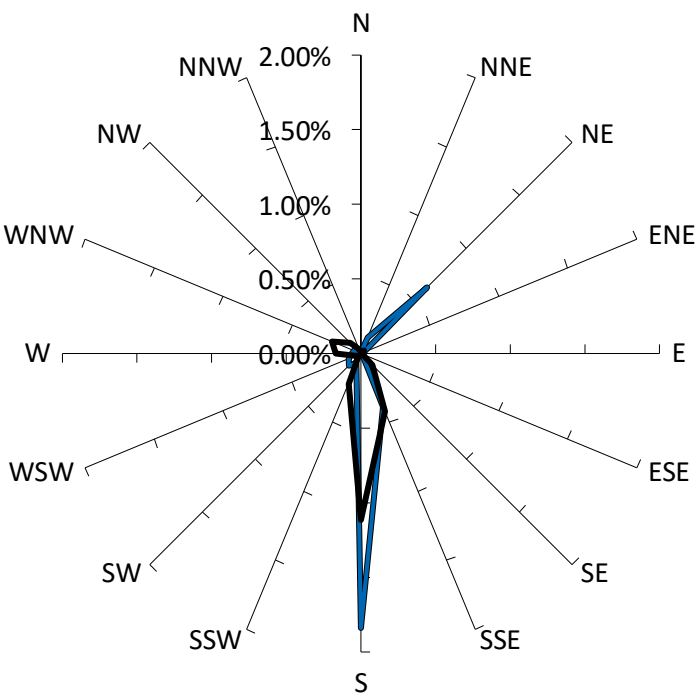


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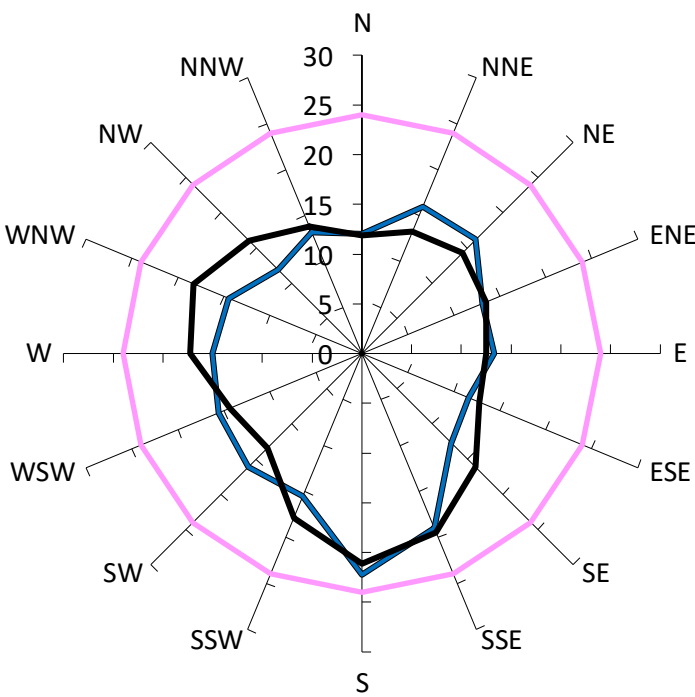


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Results for P30



Annual probability of exceeding 8m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 7.5                  | 22            |
| <div></div> Existing site.                                                                       |  | 7.1                  | 21            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |



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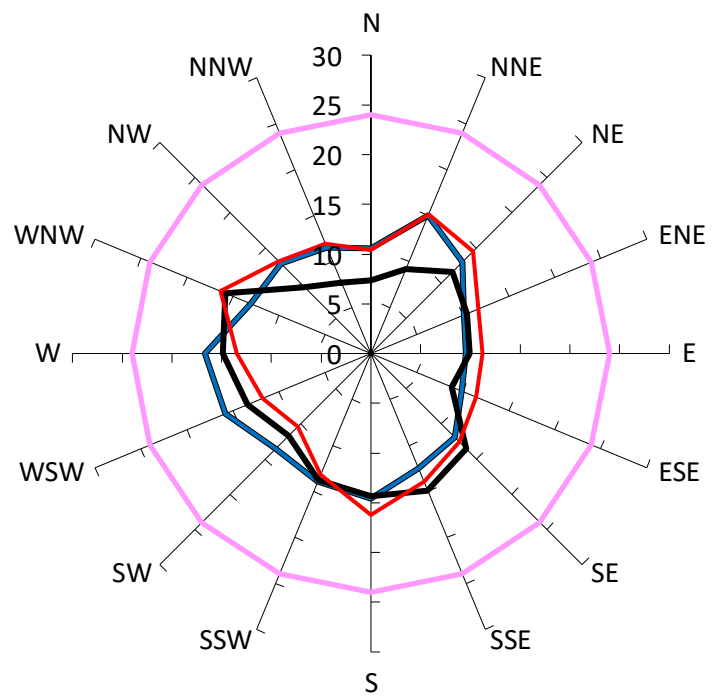
WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo



WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo



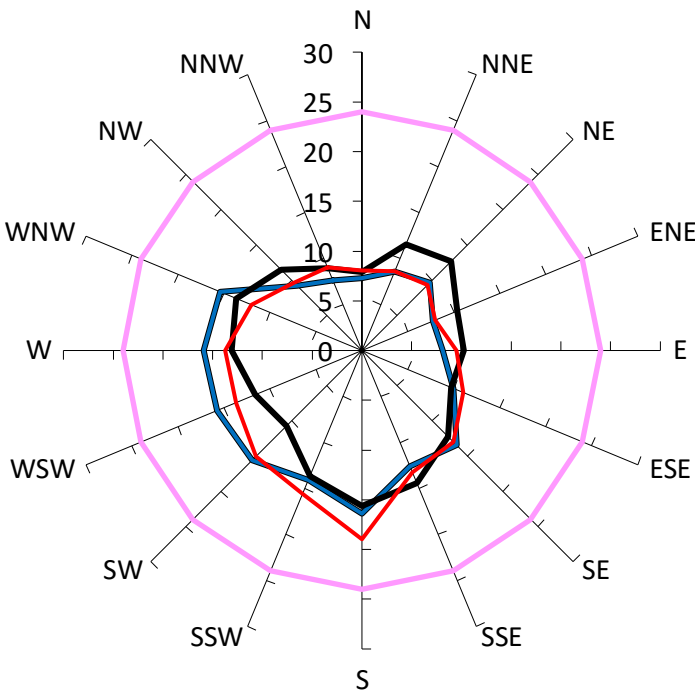
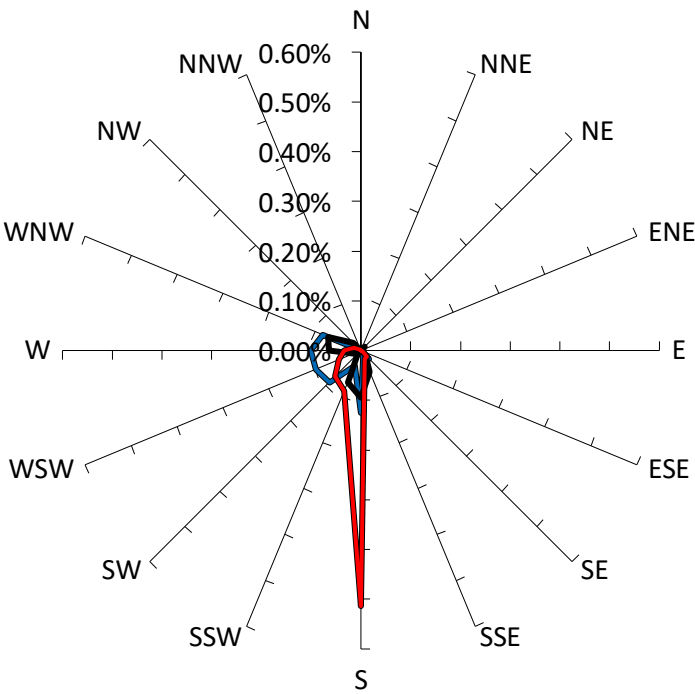
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Annual Maximum Gust (m/s)

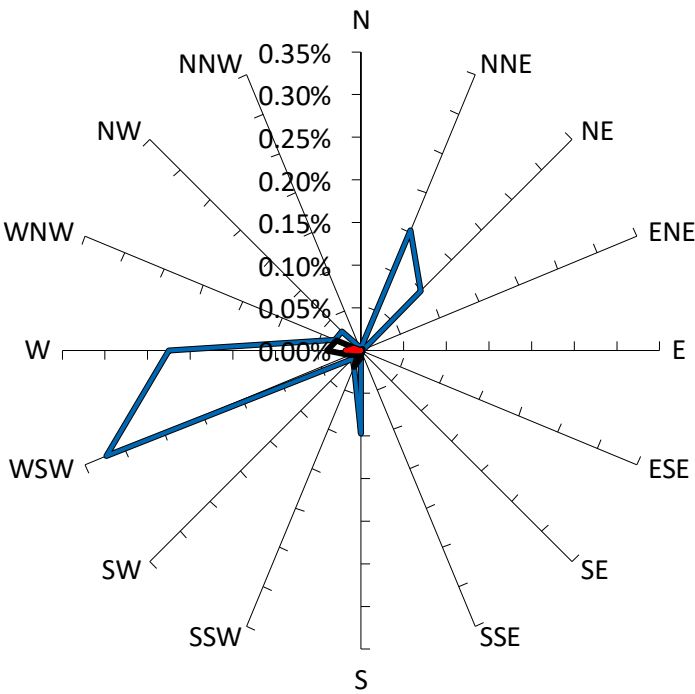
WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

Results for P36

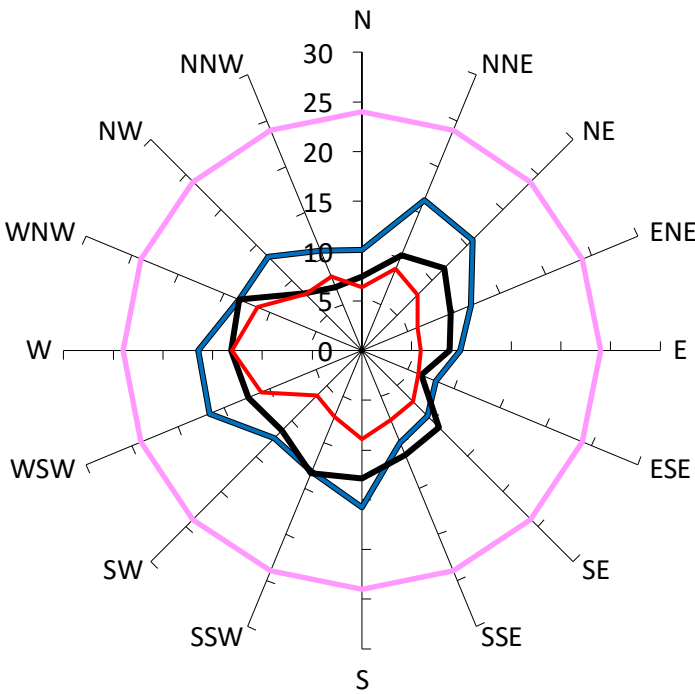


| Description                                                                          |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------|--|----------------------|---------------|
| Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| With development "as proposed", no vegetation or other treatments.                   |  | 5.8                  | 16            |
| Existing site.                                                                       |  | 5.7                  | 16            |
| With development "as approved", no vegetation or other treatments.                   |  | 6.2                  | 19            |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |

Results for P37



Annual probability of exceeding 8m/s (%)



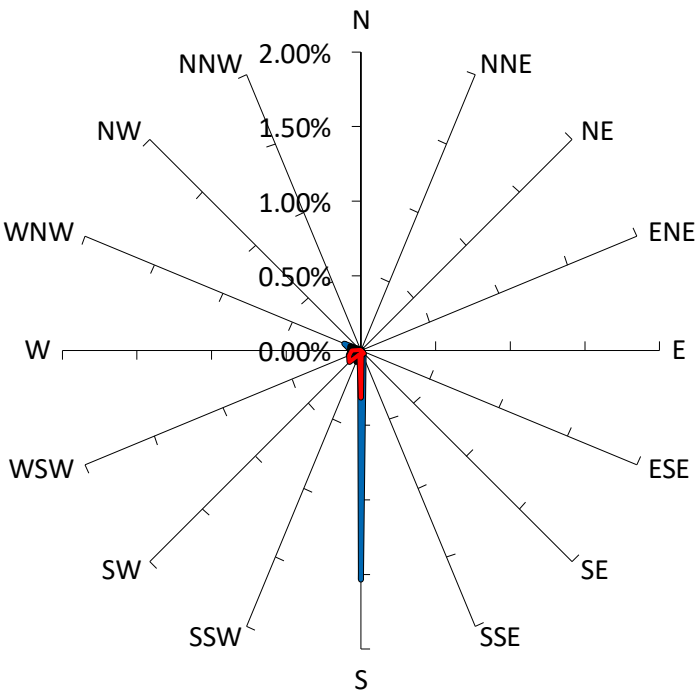
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.4                  | 17            |
| <div></div> Existing site.                                                                       |  | 4.9                  | 13            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 3.8                  | 13            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

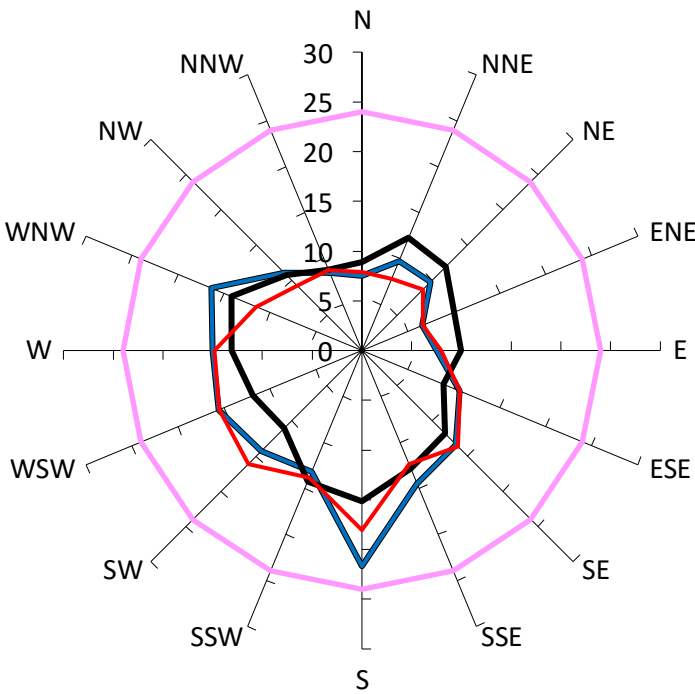


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Results for P39



Annual probability of exceeding 8m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.9                  | 22            |
| <div></div> Existing site.                                                                       |  | 5.6                  | 15            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 6.0                  | 18            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

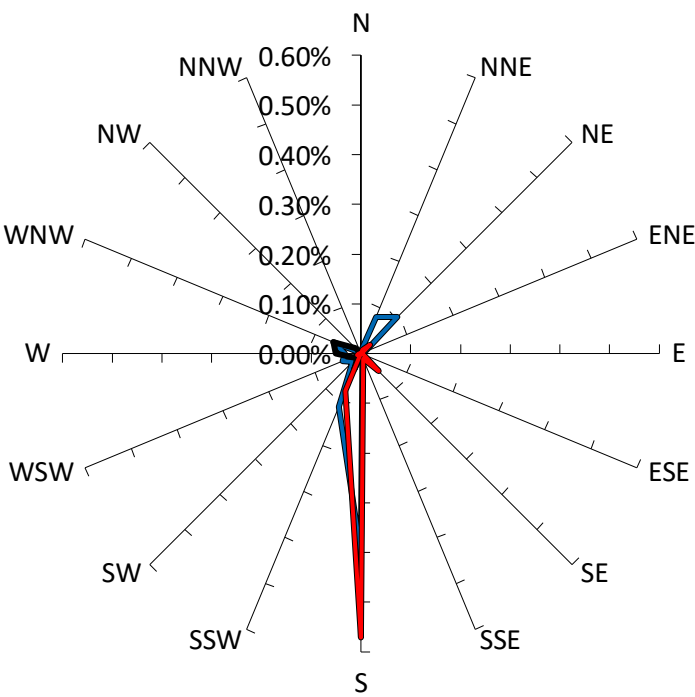


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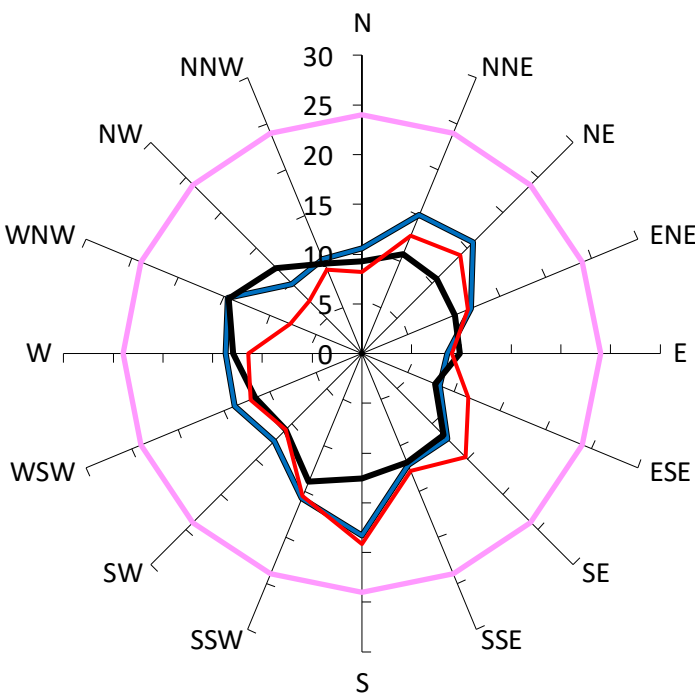


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Results for P42



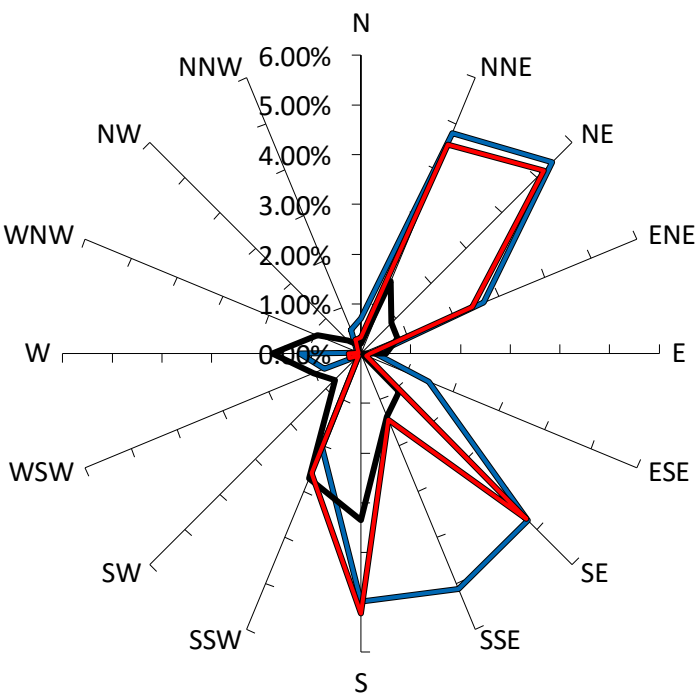
Annual probability of exceeding 8m/s (%)



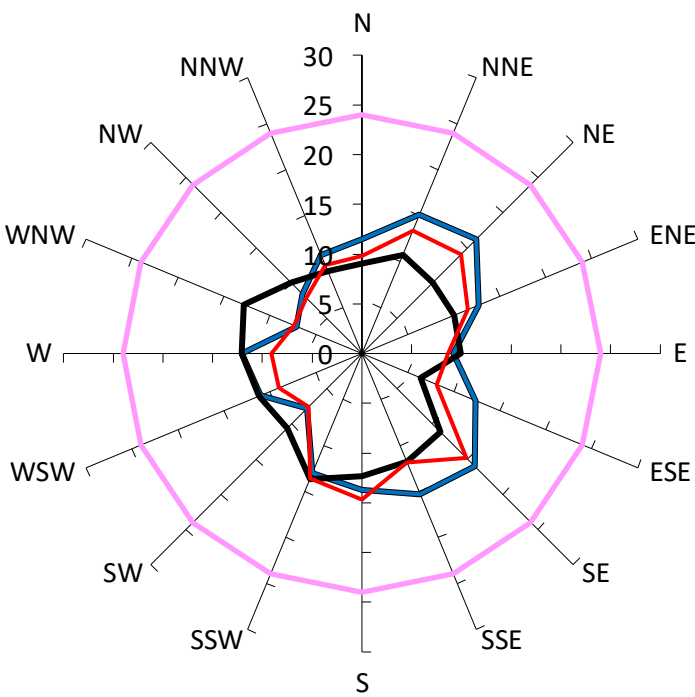
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.4                  | 18            |
| <div></div> Existing site.                                                                       |  | 5.1                  | 14            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 6.2                  | 19            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P43



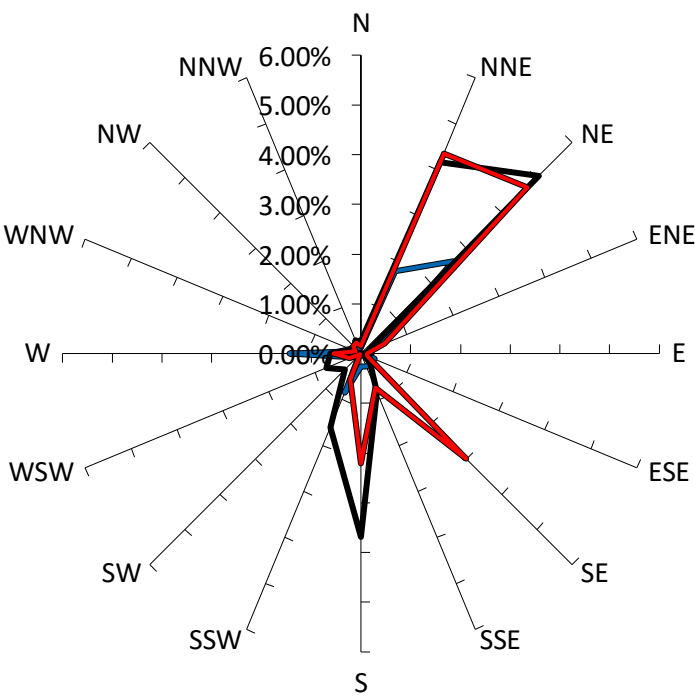
Annual probability of exceeding 4m/s (%)



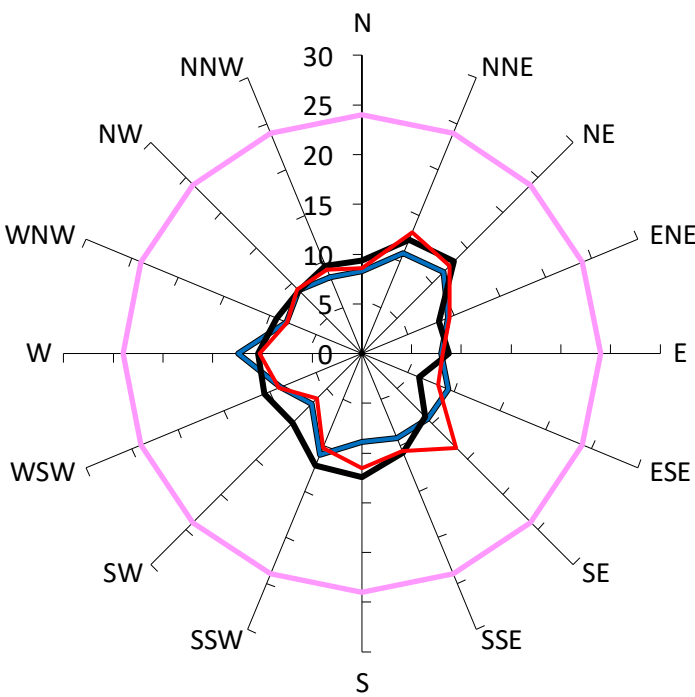
Annual Maximum Gust (m/s)

| Description |                                                                                      | GEM Wind Speed (m/s) | Peak Gust m/s |
|-------------|--------------------------------------------------------------------------------------|----------------------|---------------|
| <div></div> | Criterion: Wind Comfort Standard for Sitting Criterion (4m/s). Safety Limit (24m/s). | 4.0                  | 24            |
| <div></div> | With development "as proposed", no vegetation or other treatments.                   | 6.0                  | 16            |
| <div></div> | Existing site.                                                                       | 4.8                  | 14            |
| <div></div> | With development "as approved", no vegetation or other treatments.                   | 5.5                  | 15            |
| <div></div> |                                                                                      |                      |               |
| <div></div> |                                                                                      |                      |               |
| <div></div> |                                                                                      |                      |               |
| <div></div> |                                                                                      |                      |               |
| <div></div> |                                                                                      |                      |               |
| <div></div> |                                                                                      |                      |               |
| <div></div> |                                                                                      |                      |               |

Results for P44



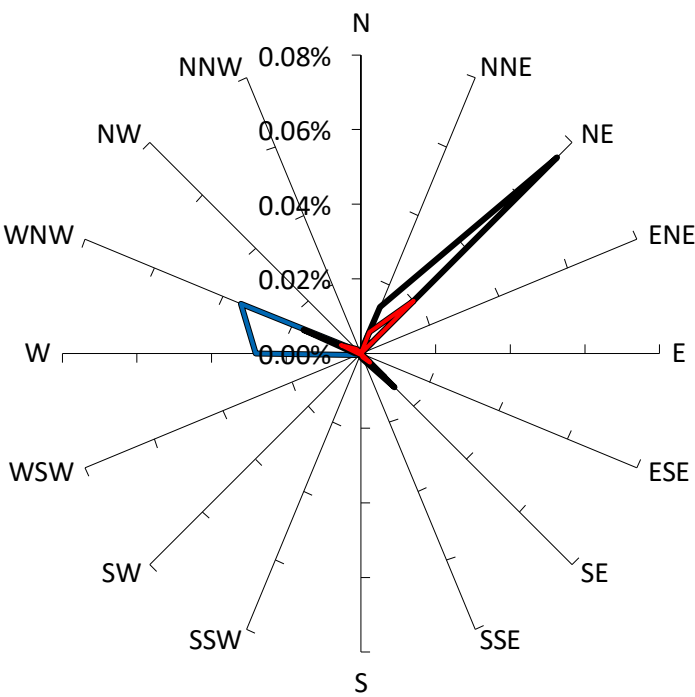
Annual probability of exceeding 4m/s (%)



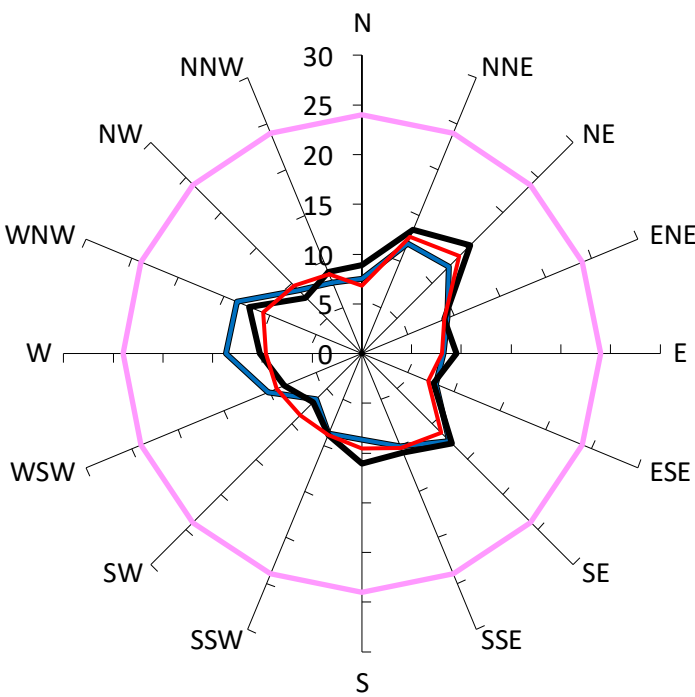
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Sitting Criterion (4m/s). Safety Limit (24m/s). |  | 4.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 4.3                  | 12            |
| <div></div> Existing site.                                                                       |  | 4.8                  | 13            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 4.8                  | 13            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P45



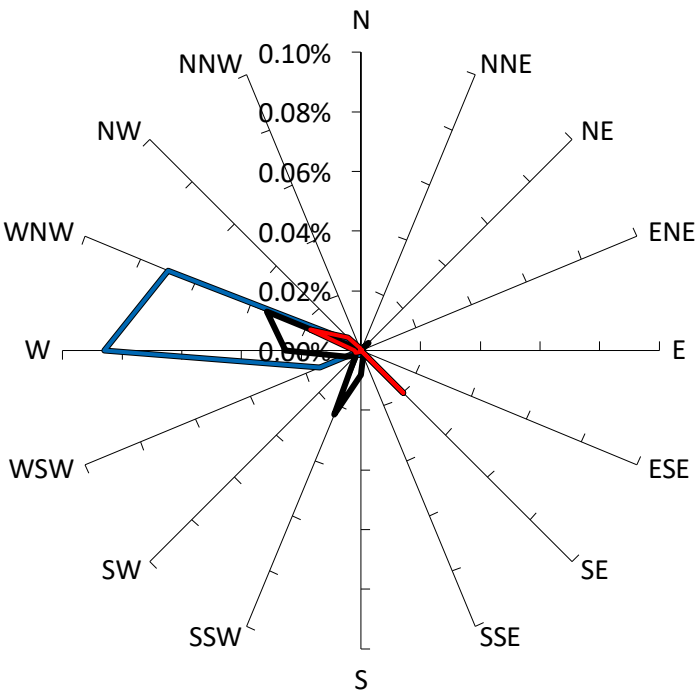
Annual probability of exceeding 8m/s (%)



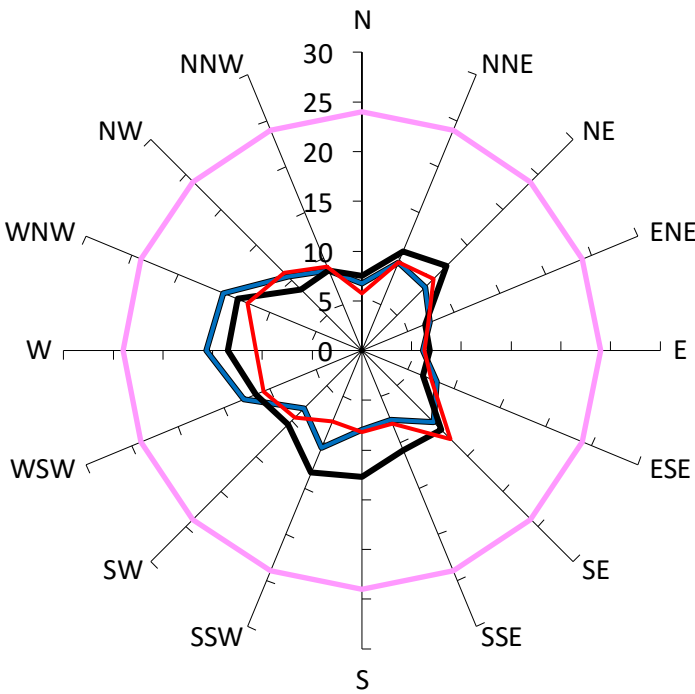
Annual Maximum Gust (m/s)

| Description                                                                          |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------|--|----------------------|---------------|
| Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| With development "as proposed", no vegetation or other treatments.                   |  | 4.7                  | 14            |
| Existing site.                                                                       |  | 5.2                  | 15            |
| With development "as approved", no vegetation or other treatments.                   |  | 4.8                  | 14            |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |
|                                                                                      |  |                      |               |

Results for P46



Annual probability of exceeding 8m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 4.6                  | 16            |
| <div></div> Existing site.                                                                       |  | 4.9                  | 14            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 4.2                  | 13            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |



WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo



WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo



WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo



| Description                                                                        |                                                                                      | GEM Wind Speed (m/s) | Peak Gust m/s |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|---------------|
|  | Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). | 8.0                  | 24            |
|  | With development "as proposed", no vegetation or other treatments.                   | 6.1                  | 17            |
|  | Existing site.                                                                       | 4.6                  | 13            |
|  | With development "as approved", no vegetation or other treatments.                   | 5.0                  | 14            |
|  |                                                                                      |                      |               |
|  |                                                                                      |                      |               |
|  |                                                                                      |                      |               |
|  |                                                                                      |                      |               |
|  |                                                                                      |                      |               |



WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo



|                                                                                    | Description                                                                          | GEM Wind Speed (m/s) | Peak Gust m/s |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|---------------|
|  | Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). | 8.0                  | 24            |
|  | With development "as proposed", no vegetation or other treatments.                   | 6.3                  | 19            |
|  | Existing site.                                                                       | 4.6                  | 14            |
|  | With development "as approved", no vegetation or other treatments.                   | 5.0                  | 15            |
|  |                                                                                      |                      |               |
|  |                                                                                      |                      |               |
|  |                                                                                      |                      |               |
|  |                                                                                      |                      |               |
|  |                                                                                      |                      |               |



WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo



WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

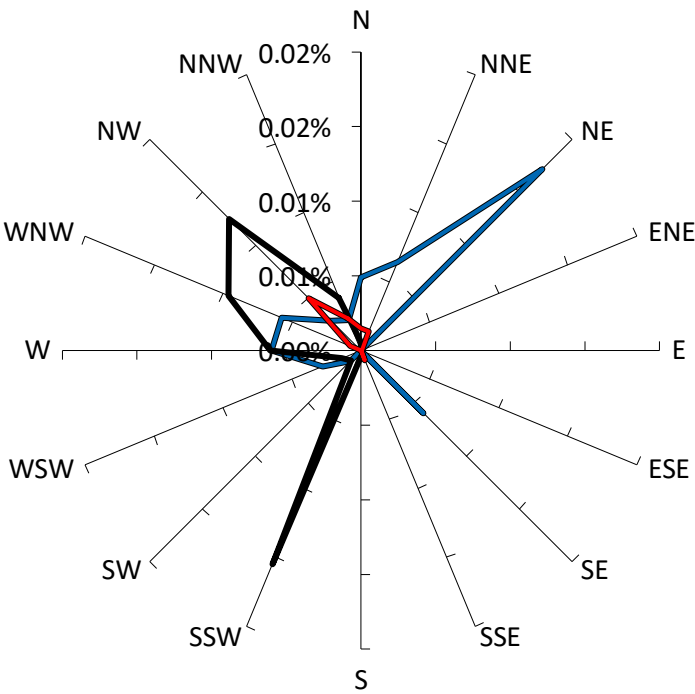


WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

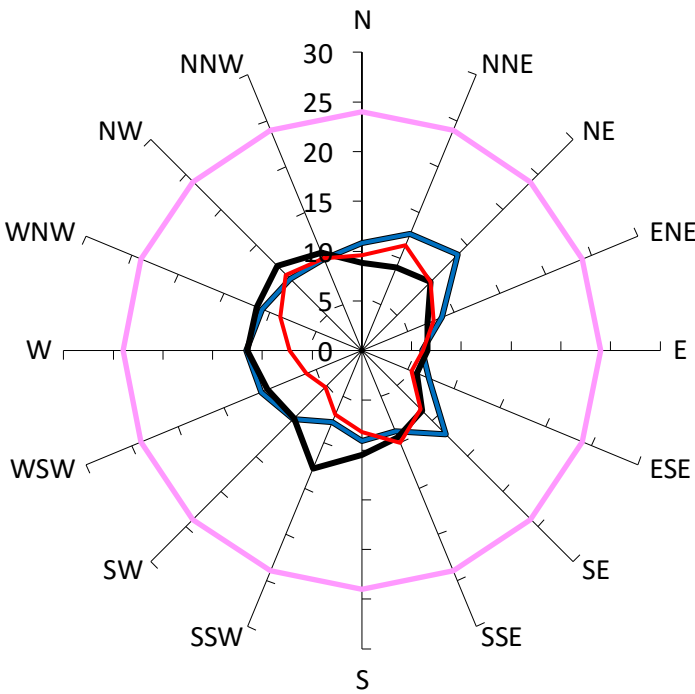


WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

Results for P57



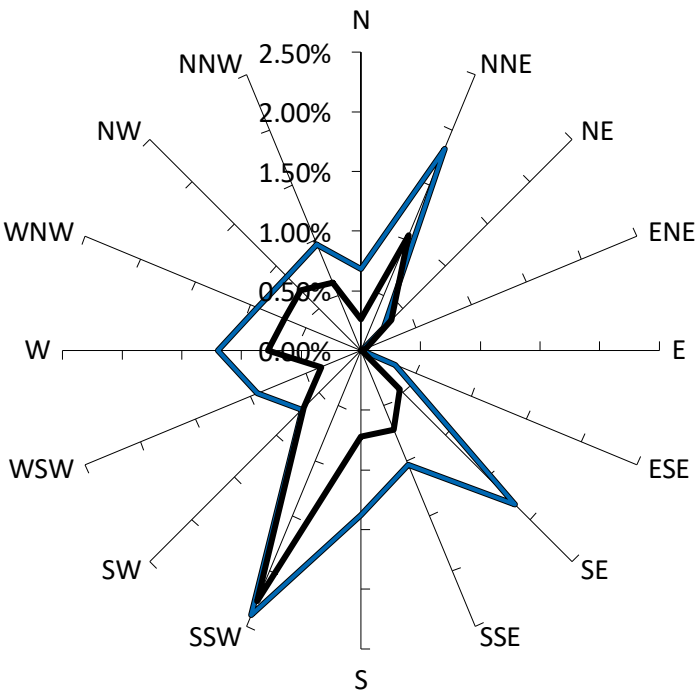
Annual probability of exceeding 8m/s (%)



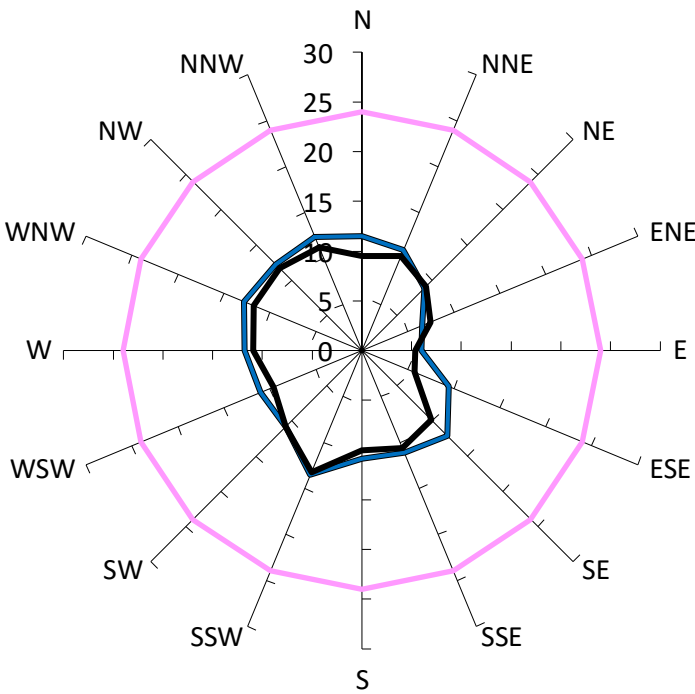
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 4.8                  | 14            |
| <div></div> Existing site.                                                                       |  | 4.3                  | 13            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 4.0                  | 11            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P58



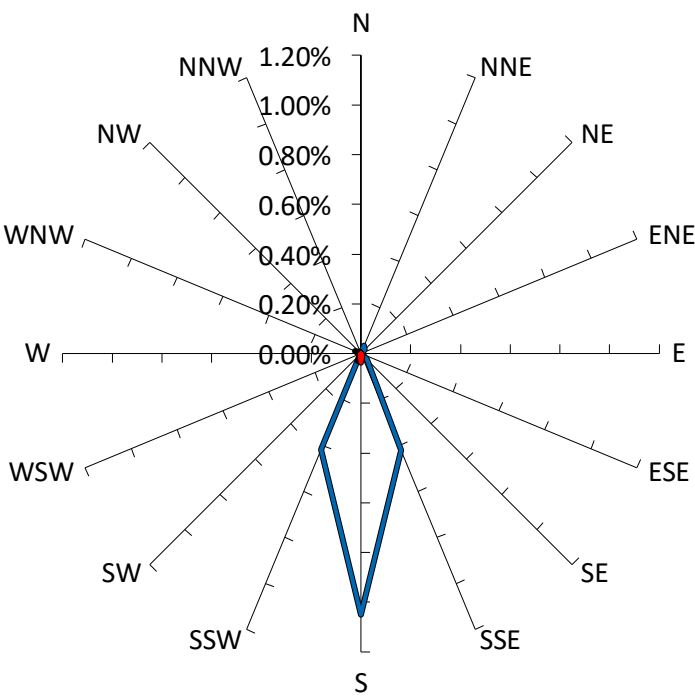
Annual probability of exceeding 4m/s (%)



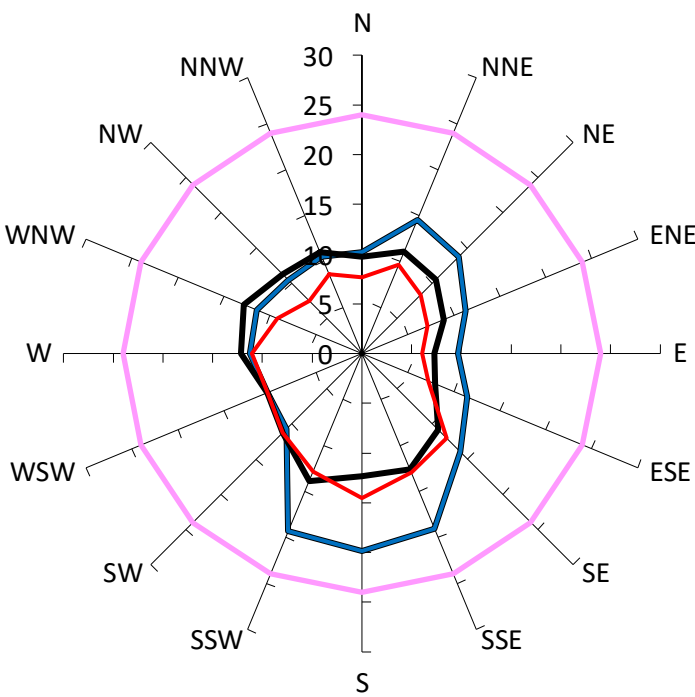
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Sitting Criterion (4m/s). Safety Limit (24m/s). |  | 4.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 4.7                  | 14            |
| <div></div> Existing site.                                                                       |  | 4.4                  | 13            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P59



Annual probability of exceeding 8m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.9                  | 20            |
| <div></div> Existing site.                                                                       |  | 4.8                  | 14            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 4.9                  | 15            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

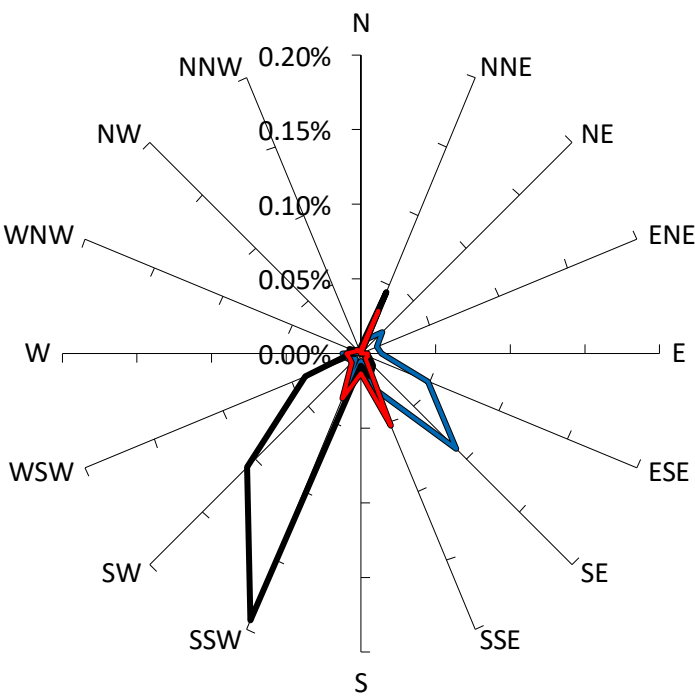


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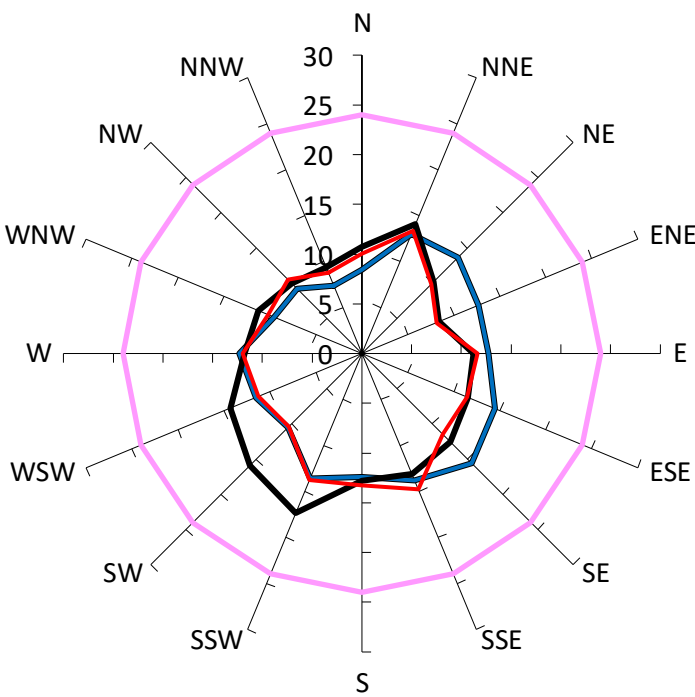


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Results for P62



Annual probability of exceeding 8m/s (%)



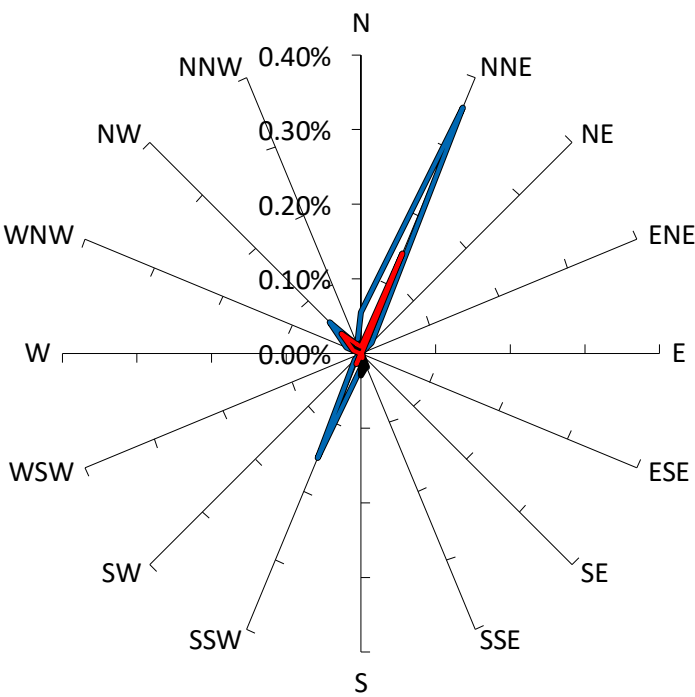
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 5.6                  | 16            |
| <div></div> Existing site.                                                                       |  | 5.7                  | 17            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.3                  | 15            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

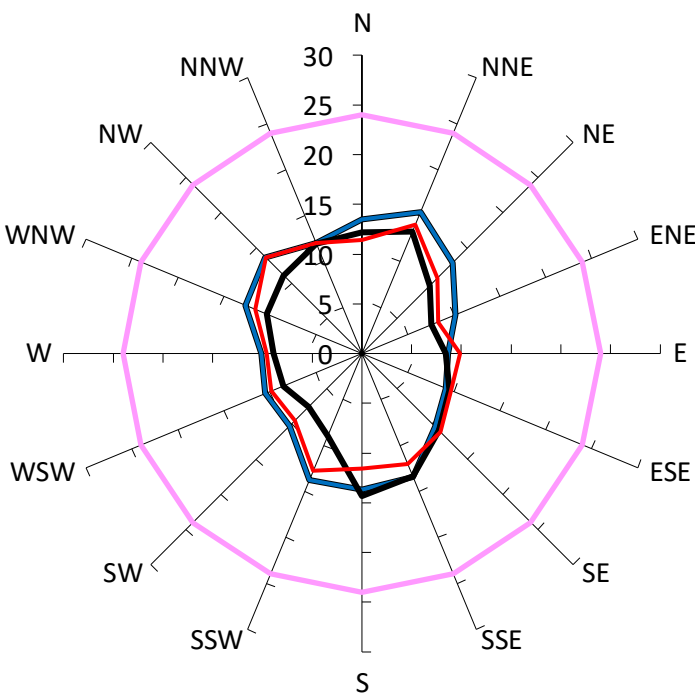


WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

Results for P64



Annual probability of exceeding 8m/s (%)



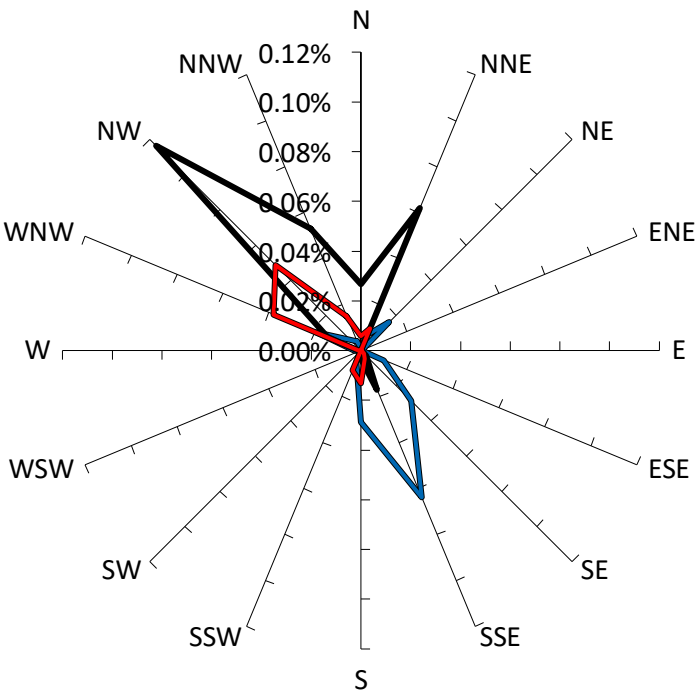
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.2                  | 15            |
| <div></div> Existing site.                                                                       |  | 5.1                  | 14            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.5                  | 14            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

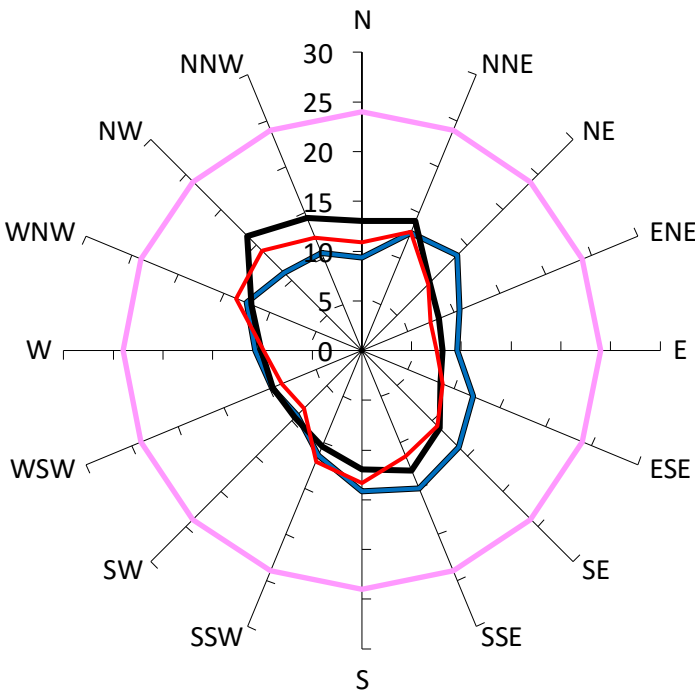


WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

Results for P66



Annual probability of exceeding 8m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 5.4                  | 15            |
| <div></div> Existing site.                                                                       |  | 5.4                  | 16            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.0                  | 14            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |



WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

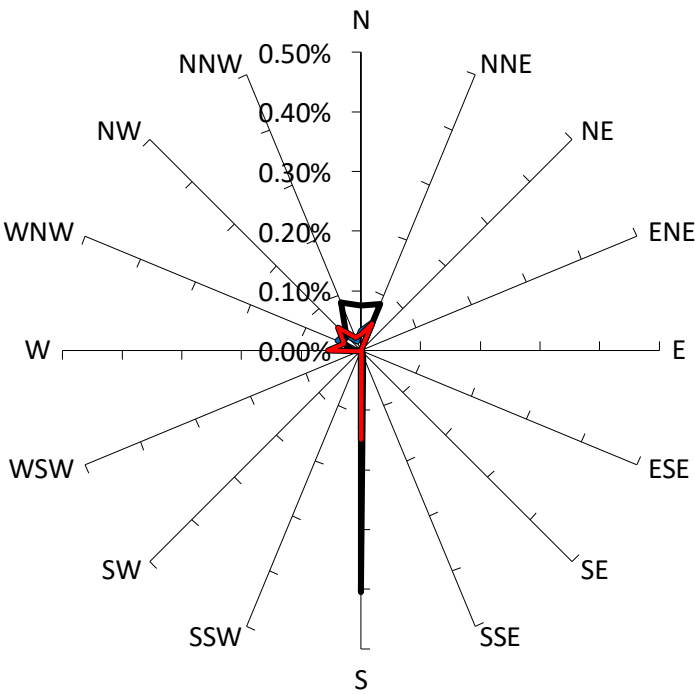


WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

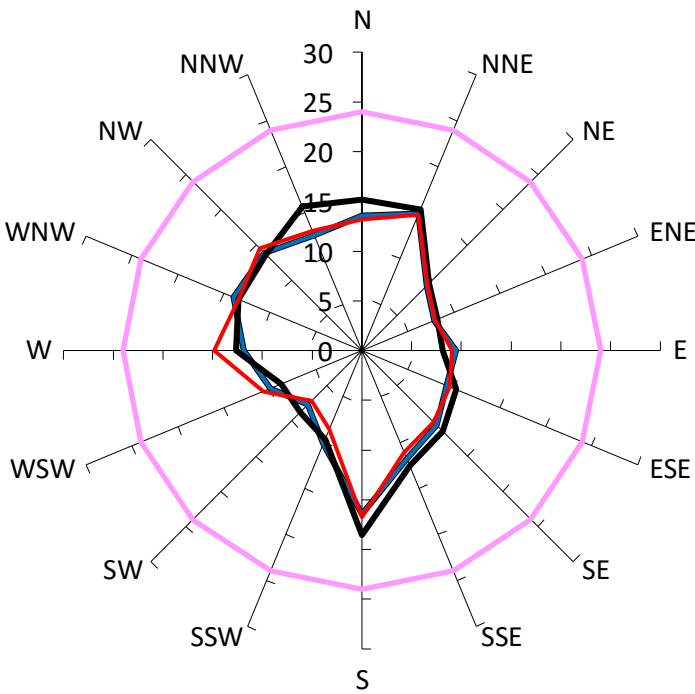


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Results for P70



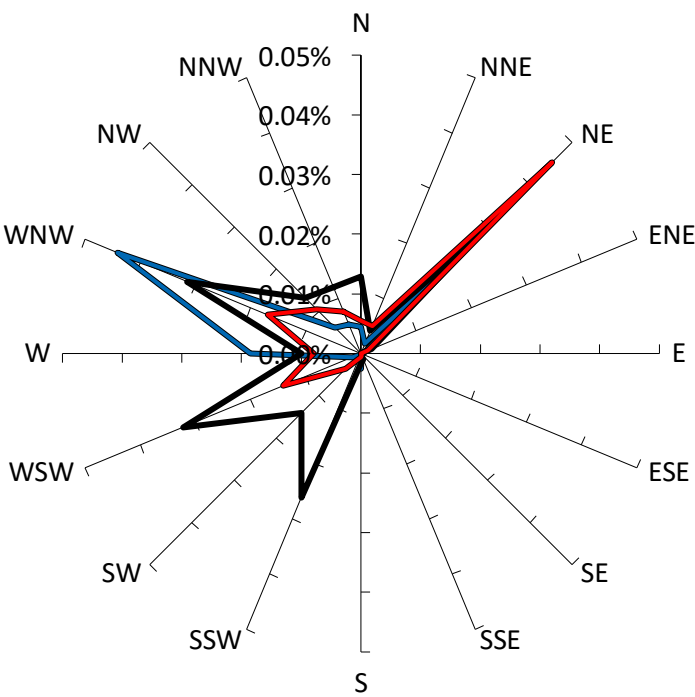
Annual probability of exceeding 8m/s (%)



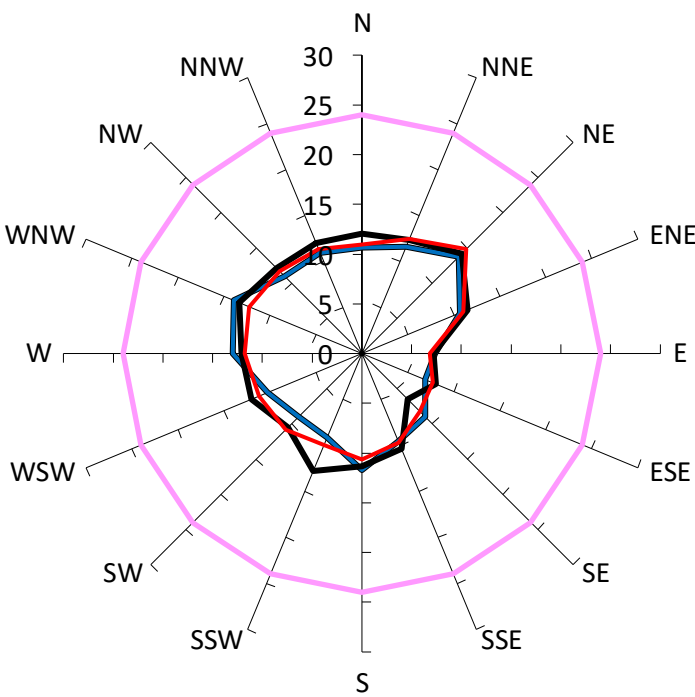
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 5.6                  | 16            |
| <div></div> Existing site.                                                                       |  | 6.1                  | 19            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.7                  | 17            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P71



Annual probability of exceeding 8m/s (%)



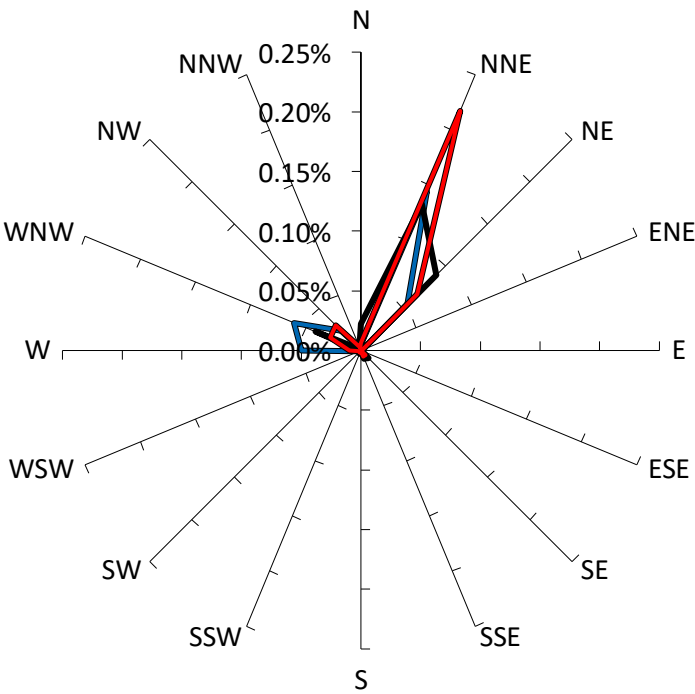
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 4.9                  | 14            |
| <div></div> Existing site.                                                                       |  | 5.3                  | 14            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.1                  | 15            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

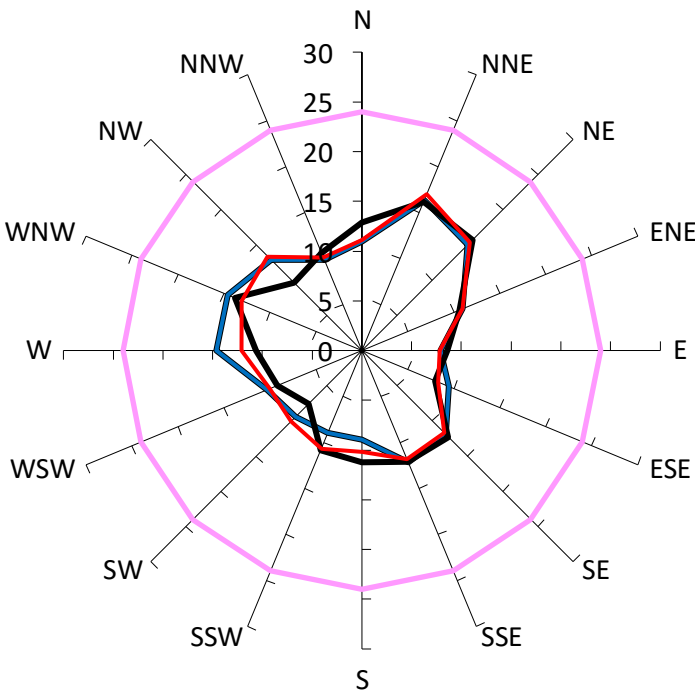


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Results for P73



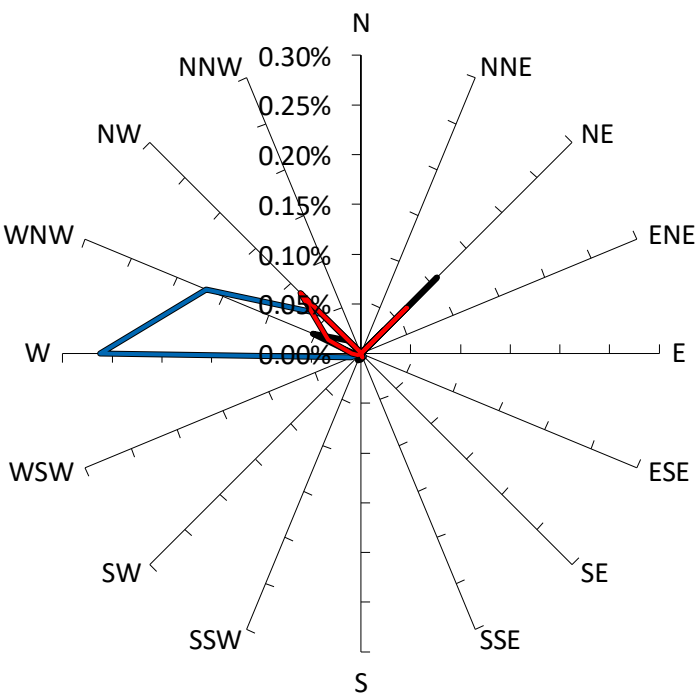
Annual probability of exceeding 8m/s (%)



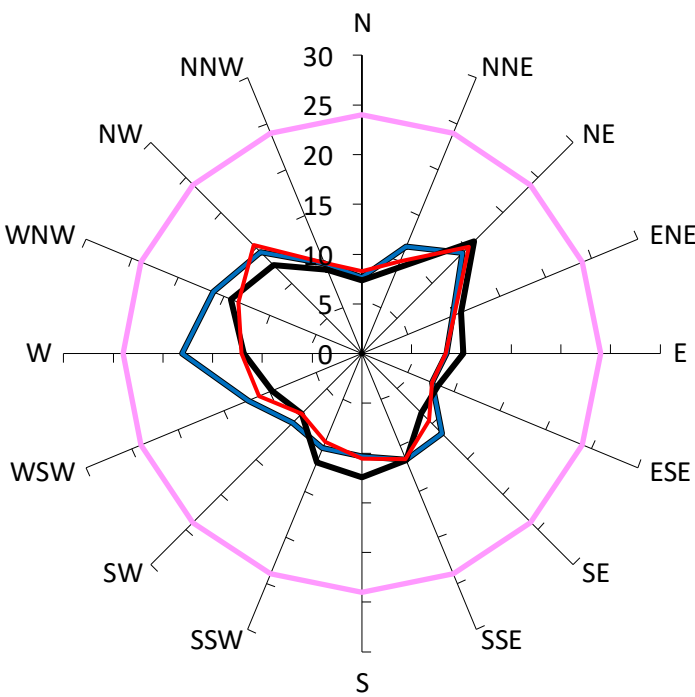
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 5.8                  | 16            |
| <div></div> Existing site.                                                                       |  | 5.7                  | 16            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.8                  | 17            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P74



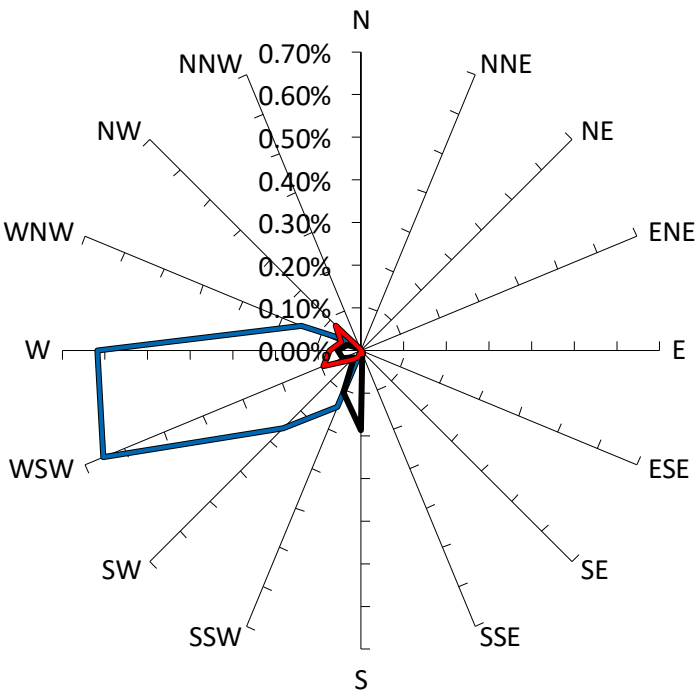
Annual probability of exceeding 8m/s (%)



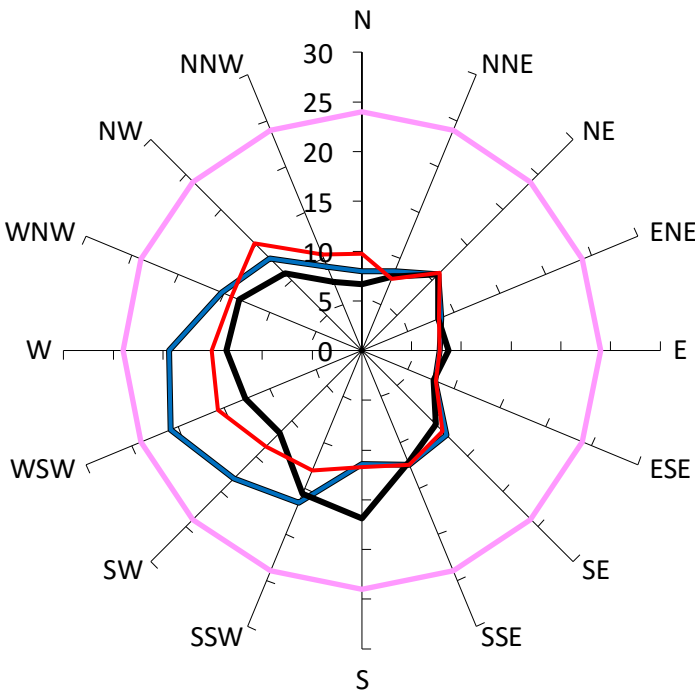
Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 5.5                  | 18            |
| <div></div> Existing site.                                                                       |  | 5.4                  | 16            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.2                  | 15            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

Results for P75



Annual probability of exceeding 8m/s (%)



Annual Maximum Gust (m/s)

| Description                                                                                      |  | GEM Wind Speed (m/s) | Peak Gust m/s |
|--------------------------------------------------------------------------------------------------|--|----------------------|---------------|
| <div></div> Criterion: Wind Comfort Standard for Walking Criterion (8m/s). Safety Limit (24m/s). |  | 8.0                  | 24            |
| <div></div> With development "as proposed", no vegetation or other treatments.                   |  | 6.6                  | 21            |
| <div></div> Existing site.                                                                       |  | 5.7                  | 17            |
| <div></div> With development "as approved", no vegetation or other treatments.                   |  | 5.3                  | 16            |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |
| <div></div>                                                                                      |  |                      |               |

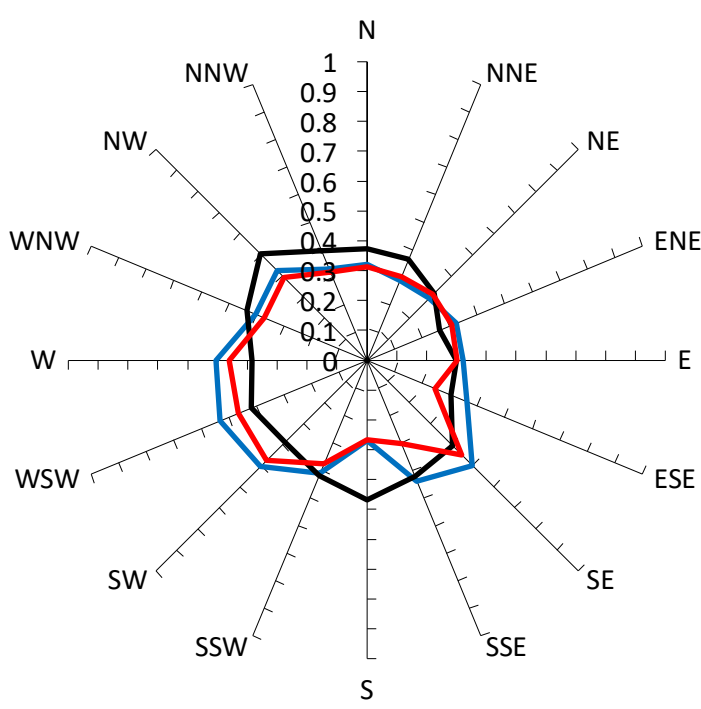


WJ346-02- 881-893 Bourke Street & 207-229 Young Street, Waterloo

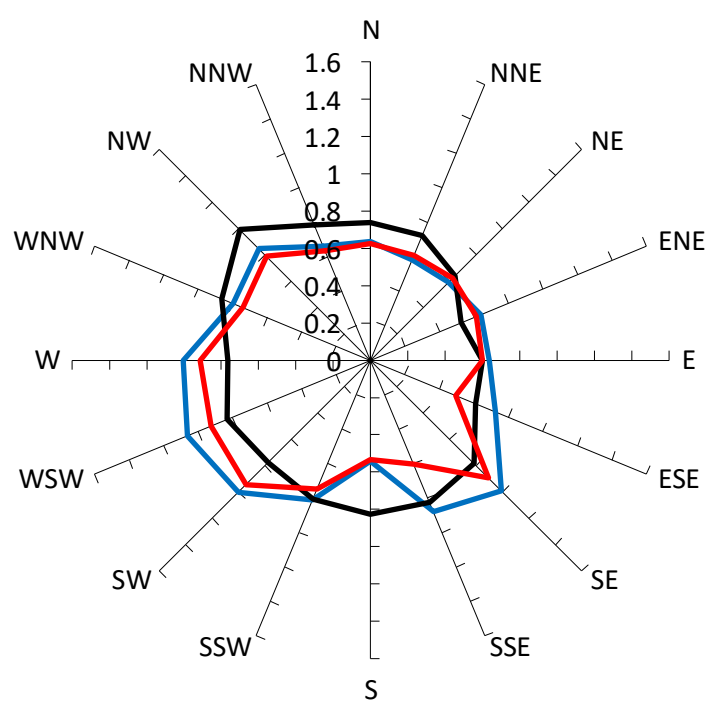


## APPENDIX D    DIRECTIONAL VELOCITY COEFFICIENT PLOTS

# Results for P01



GEM Velocity Coefficients



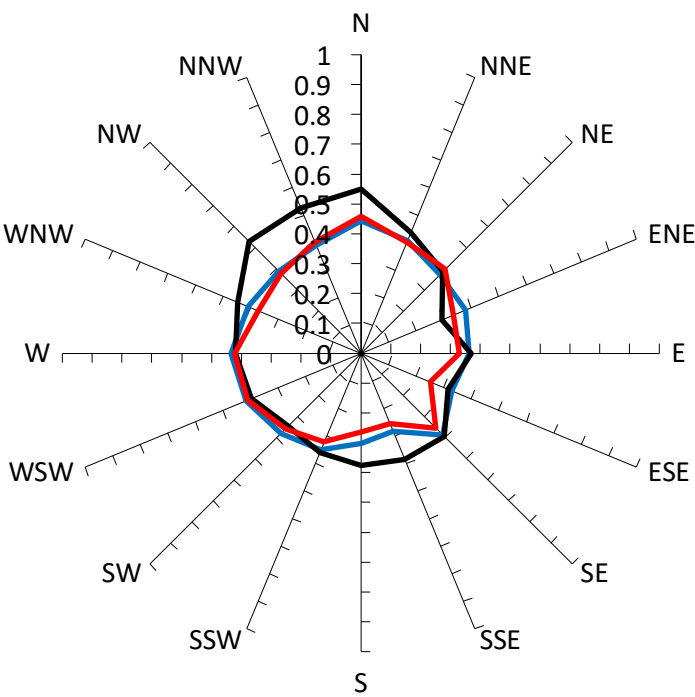
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

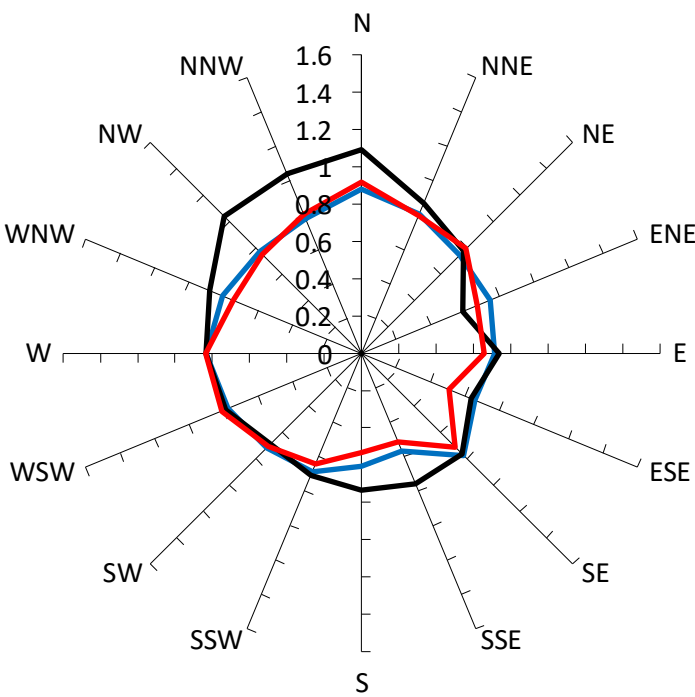
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P02



GEM Velocity Coefficients



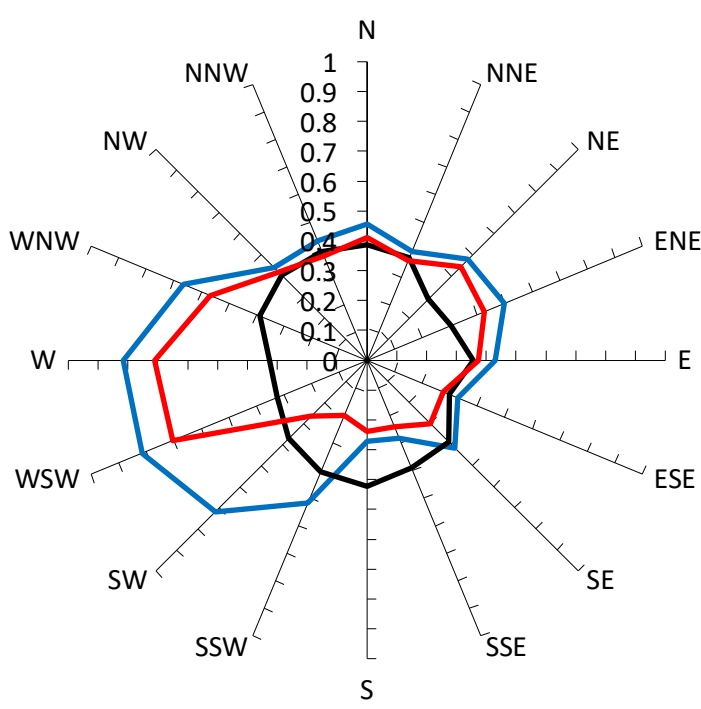
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

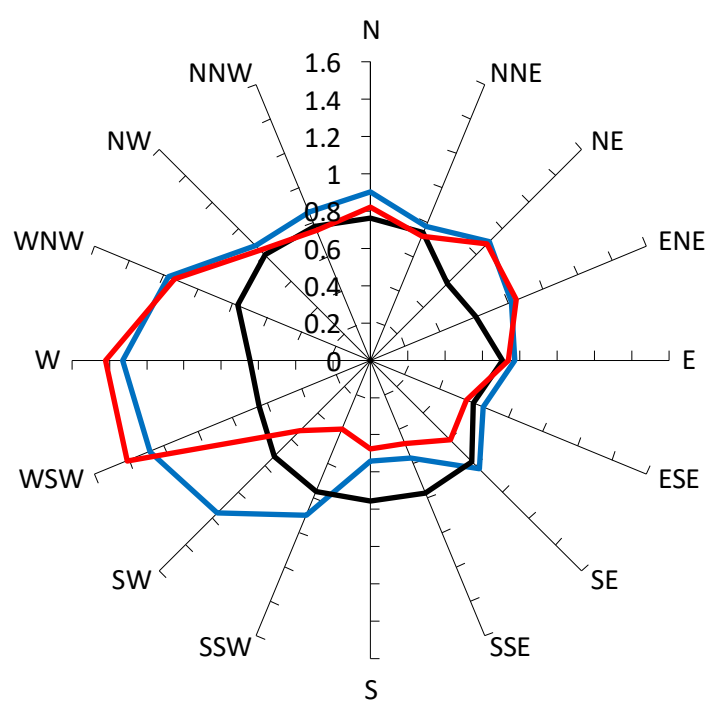
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P03



GEM Velocity Coefficients



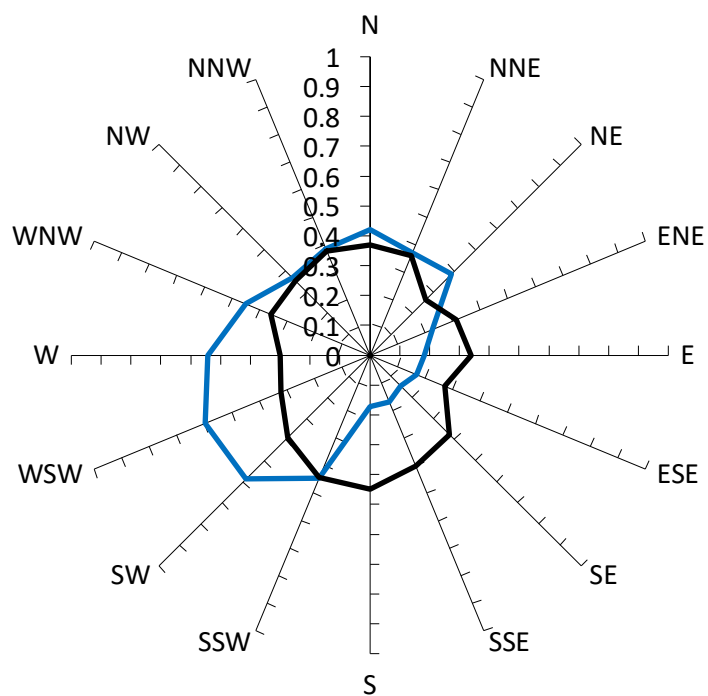
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

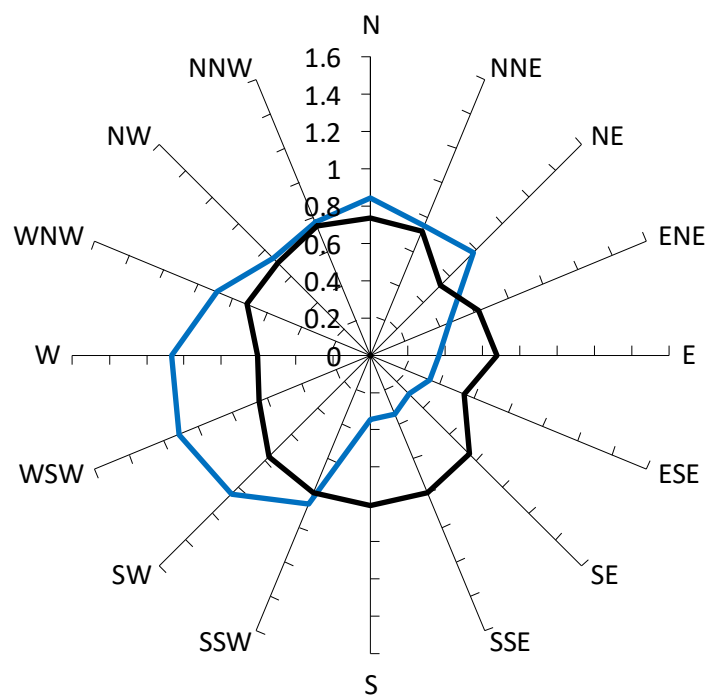
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P04



GEM Velocity Coefficients

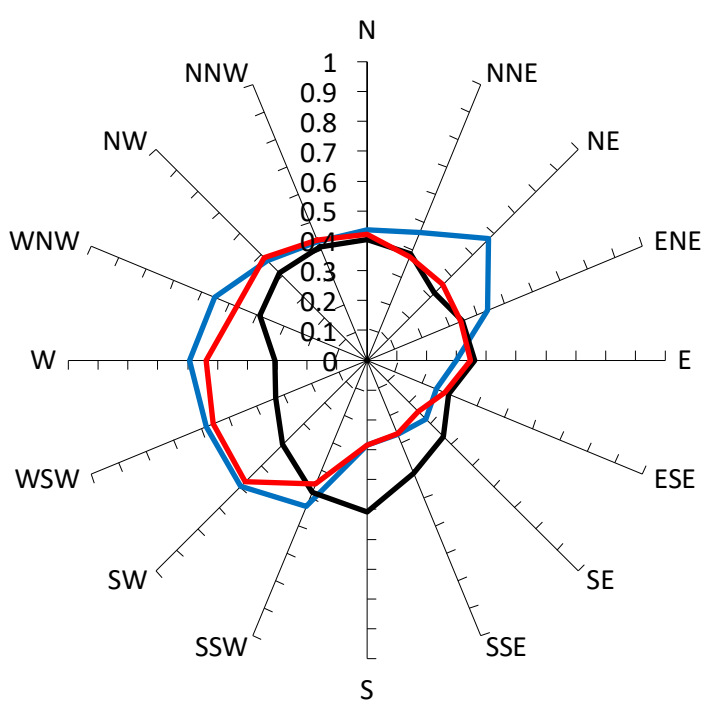


Gust Velocity Coefficients

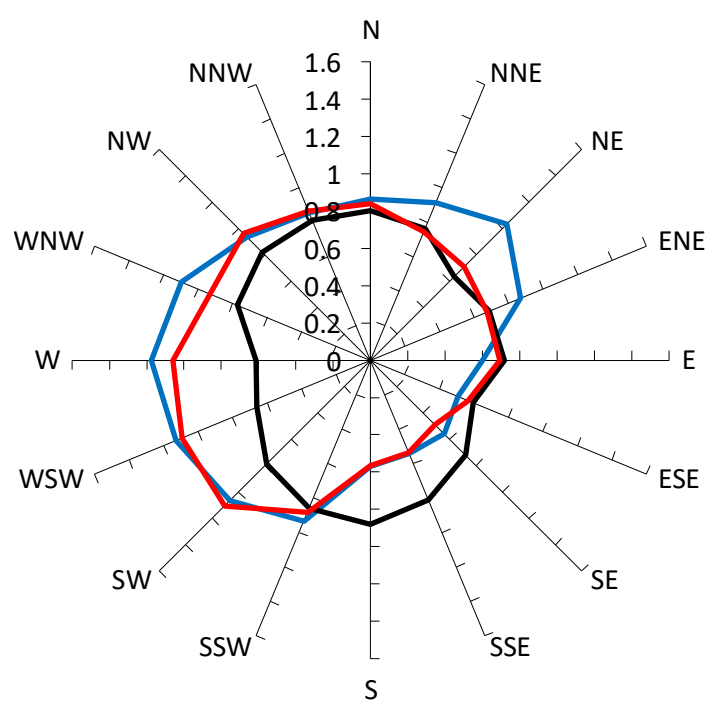
With development "as proposed", no vegetation or other treatments.

Existing site.

# Results for P05



GEM Velocity Coefficients



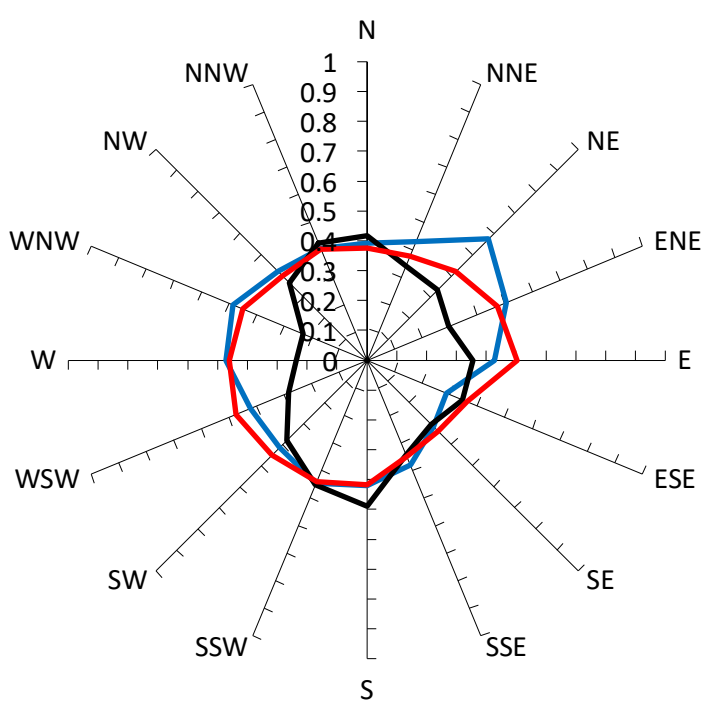
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

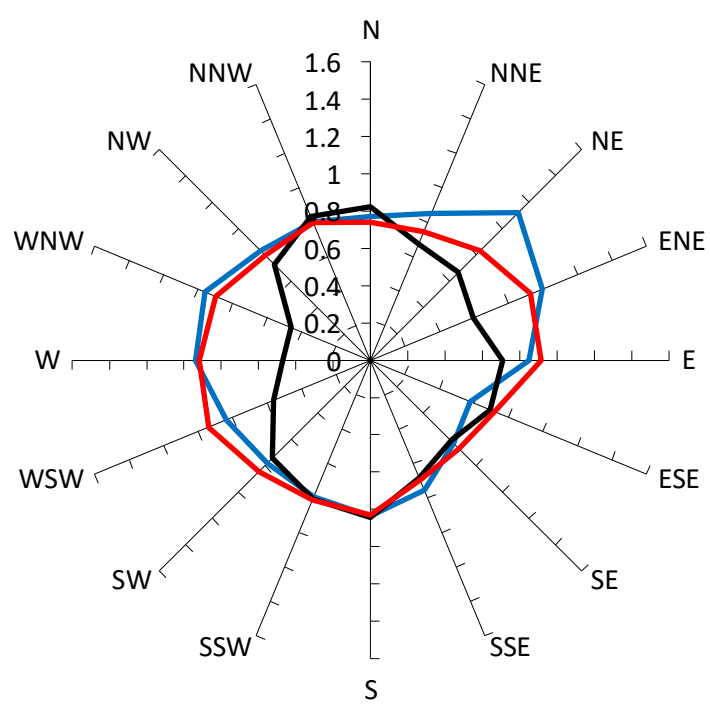
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P06



GEM Velocity Coefficients



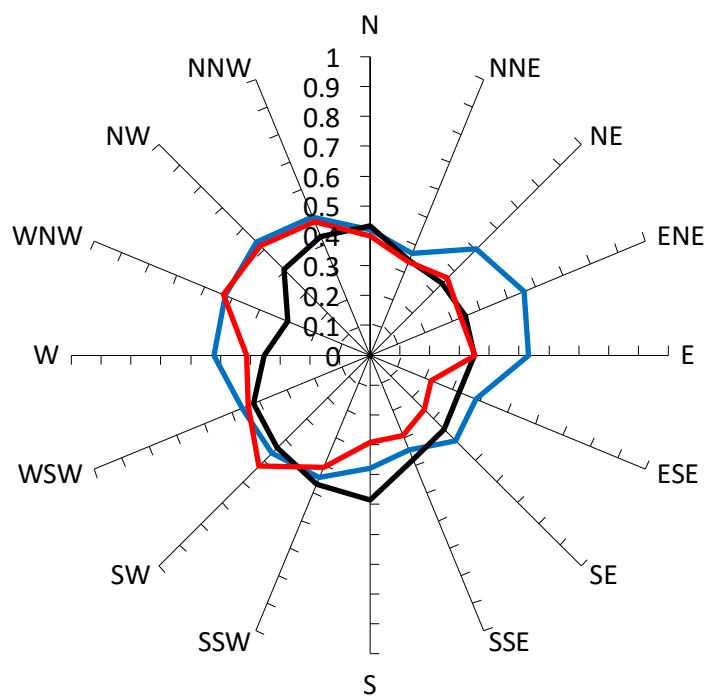
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

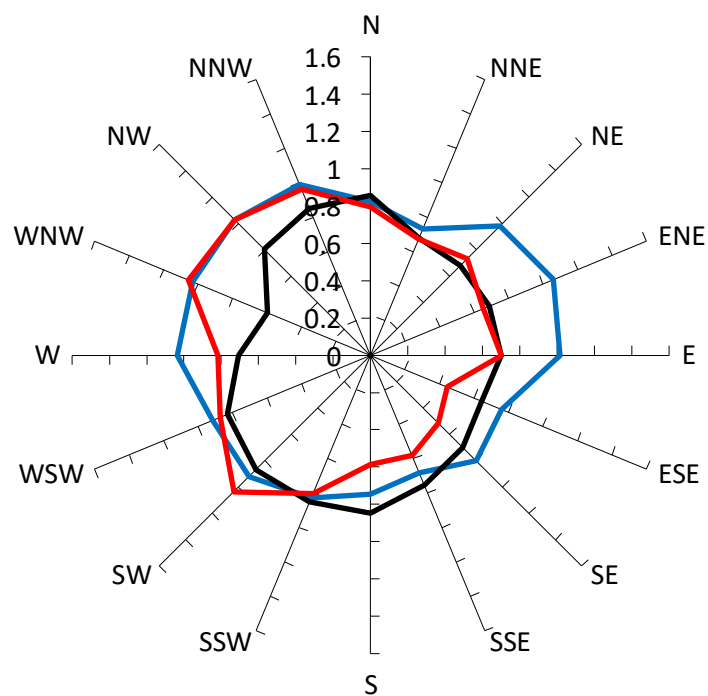
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P07



GEM Velocity Coefficients



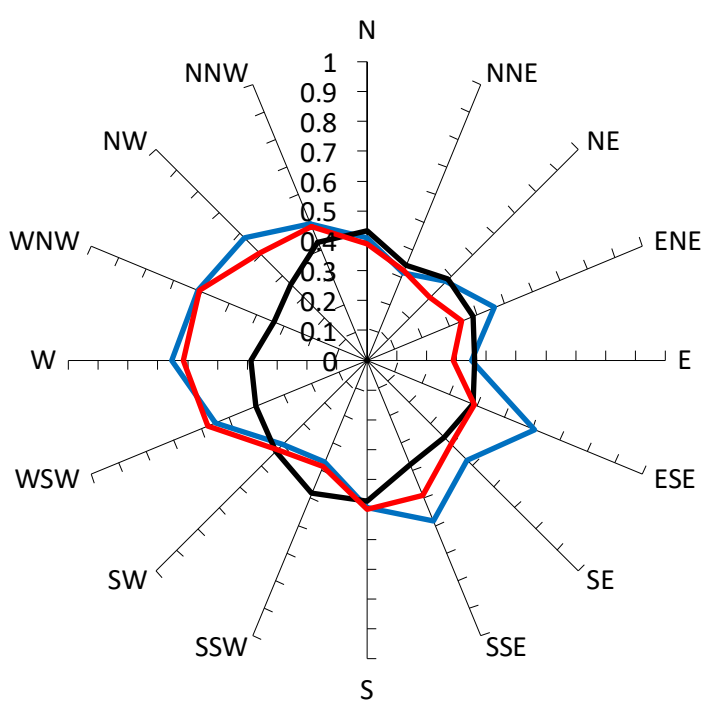
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

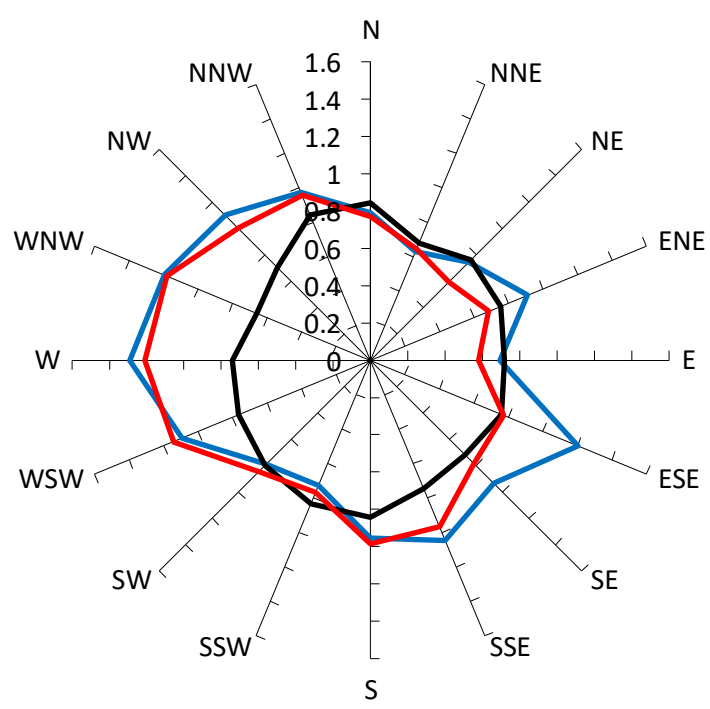
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P08



GEM Velocity Coefficients



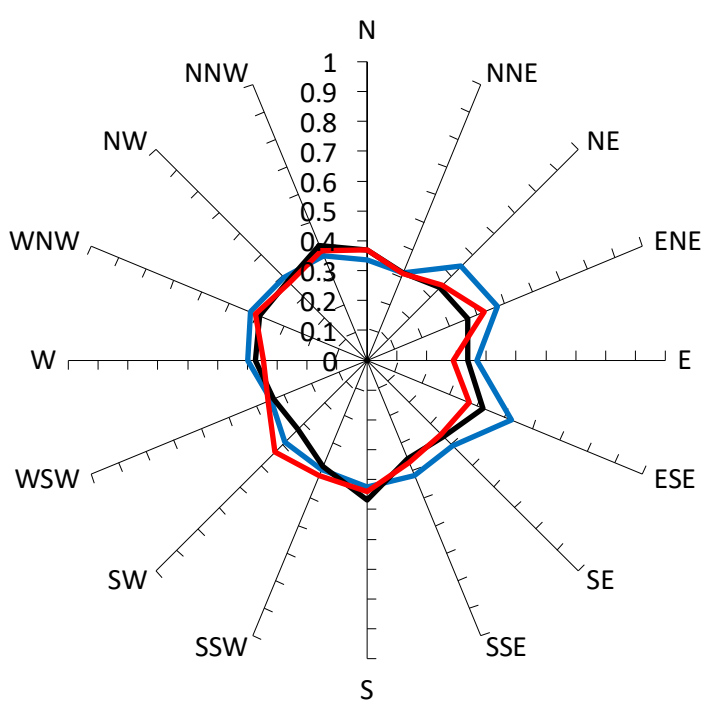
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

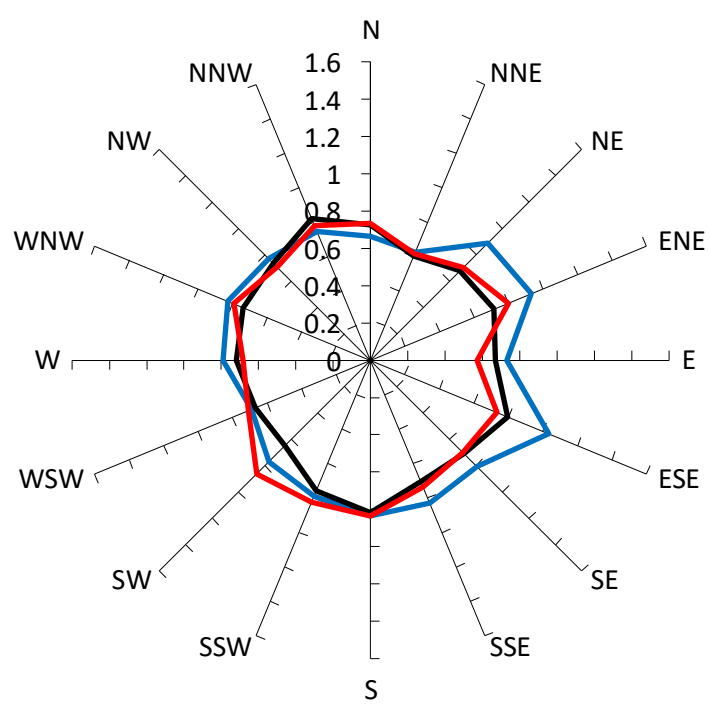
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P09



GEM Velocity Coefficients



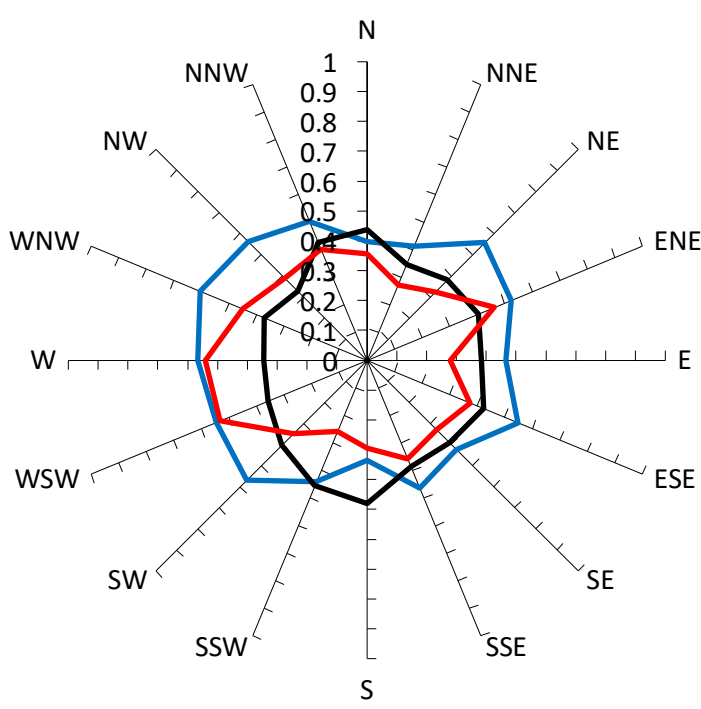
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

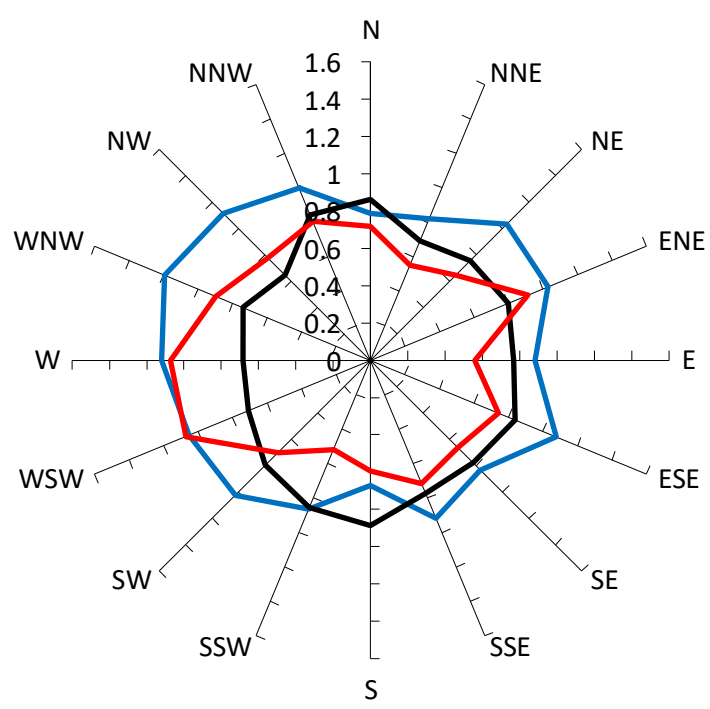
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P10



GEM Velocity Coefficients



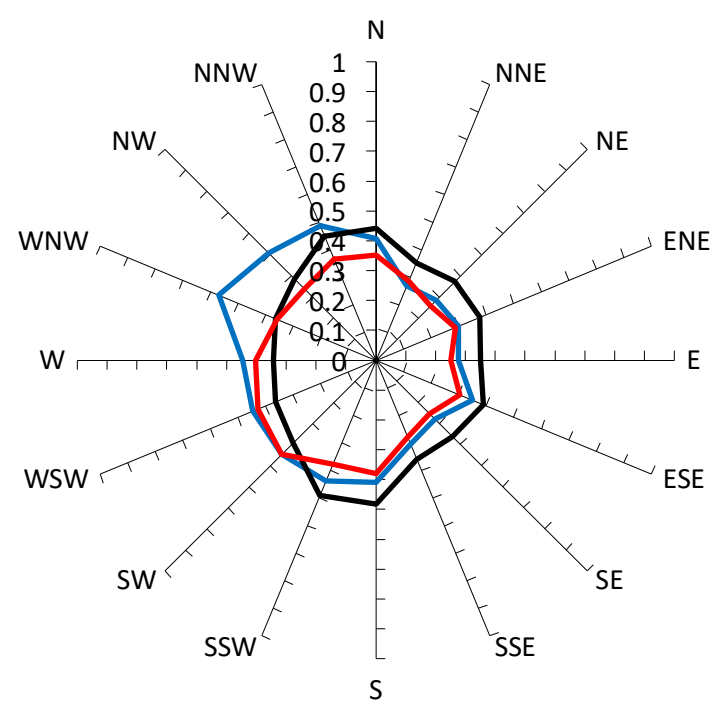
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

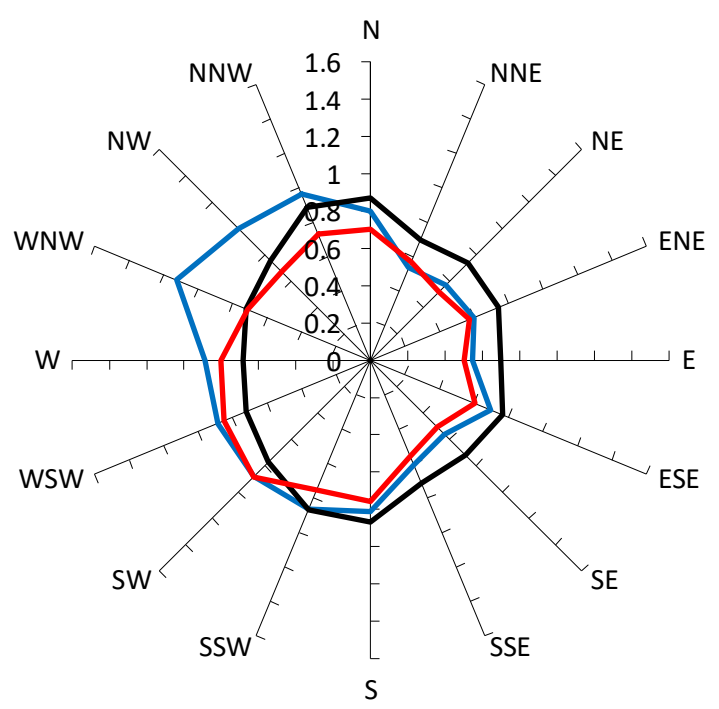
Existing site.

With development "as approved", no vegetation or other treatments.

Results for P11



GEM Velocity Coefficients



Gust Velocity Coefficients

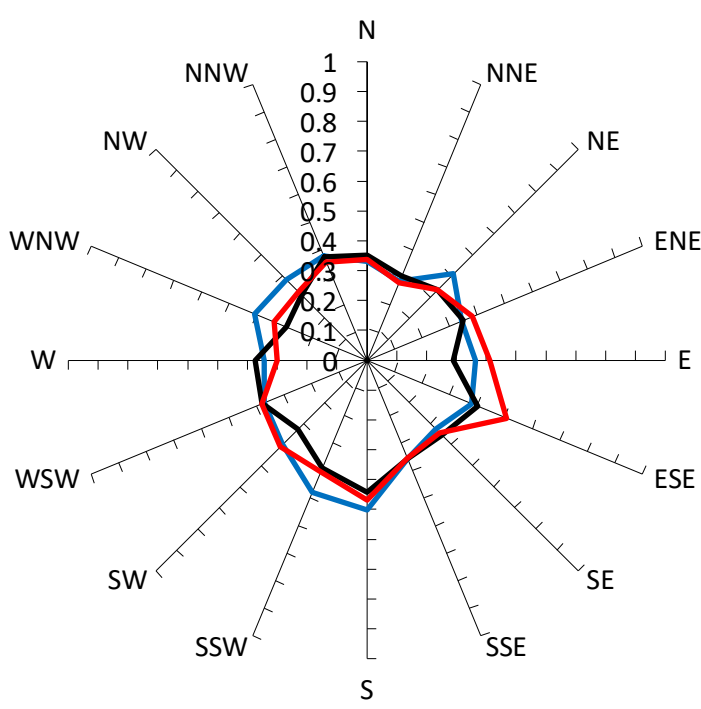


With development "as proposed", no vegetation or other treatments.

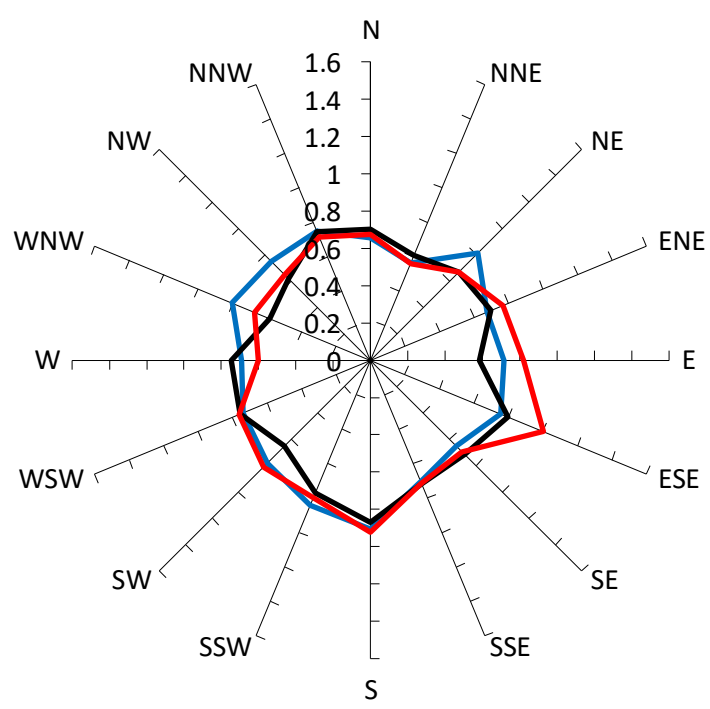
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P12



GEM Velocity Coefficients



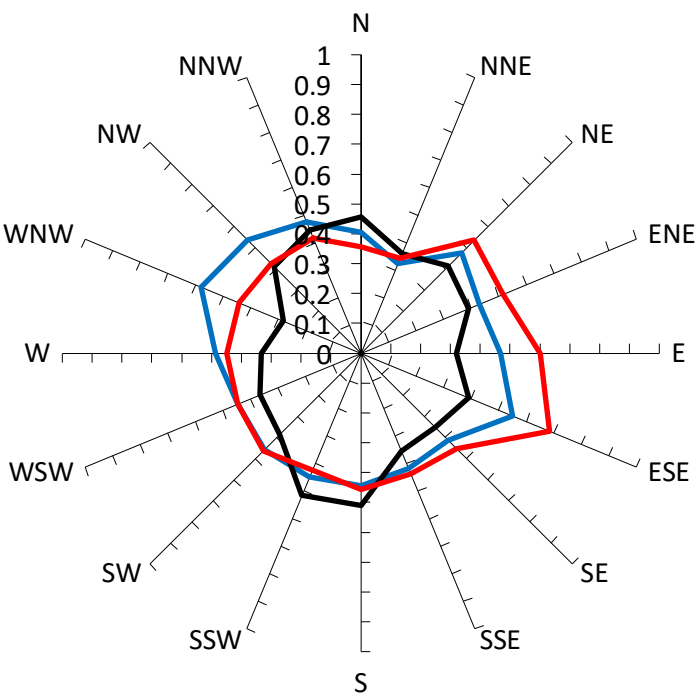
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

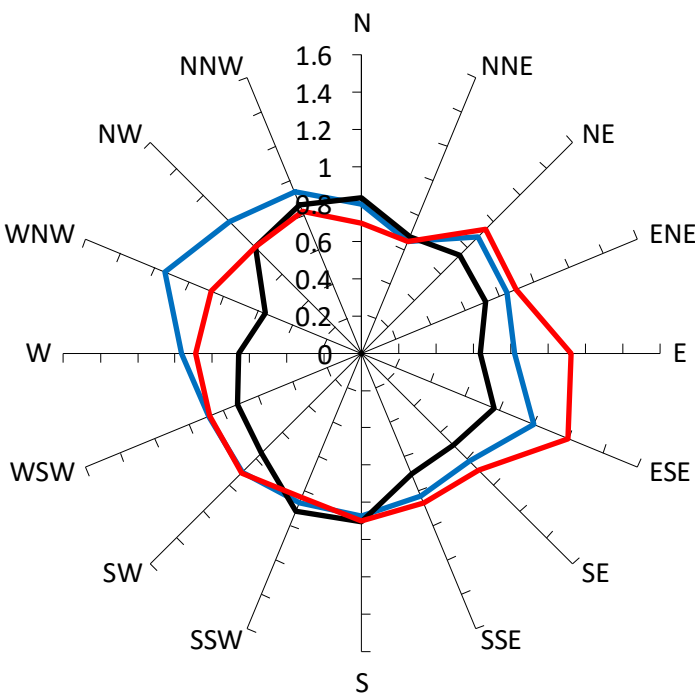
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P13



GEM Velocity Coefficients



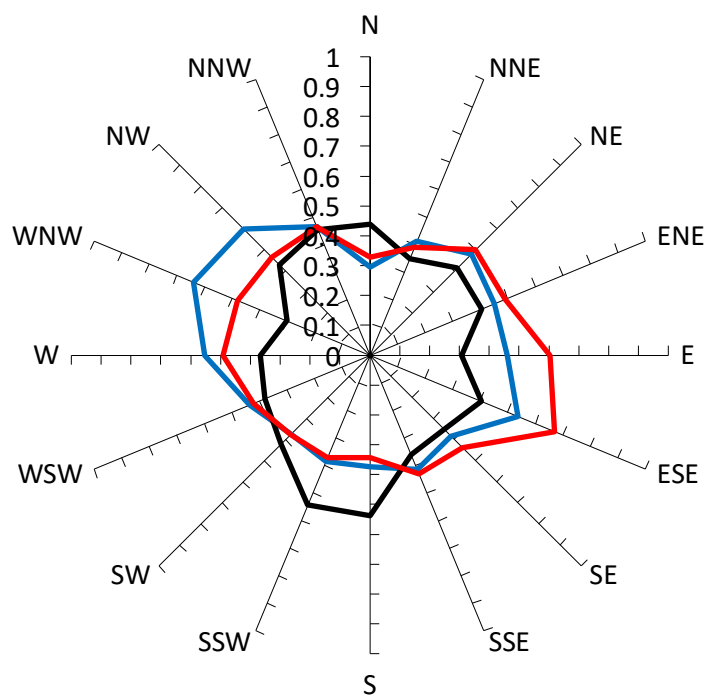
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

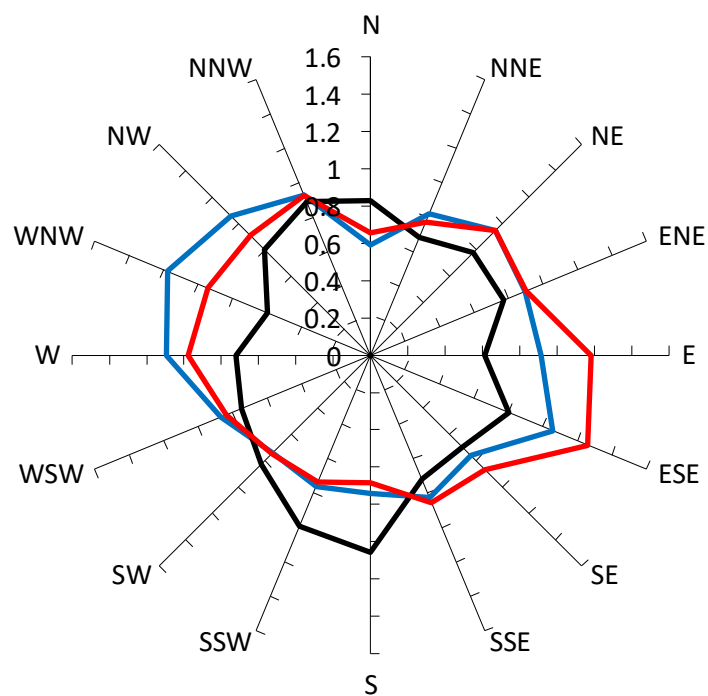
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P14



GEM Velocity Coefficients



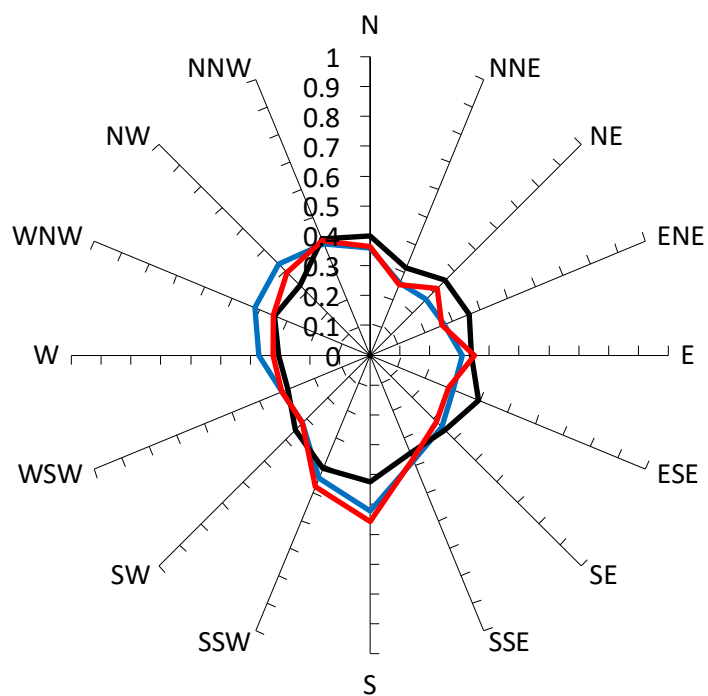
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

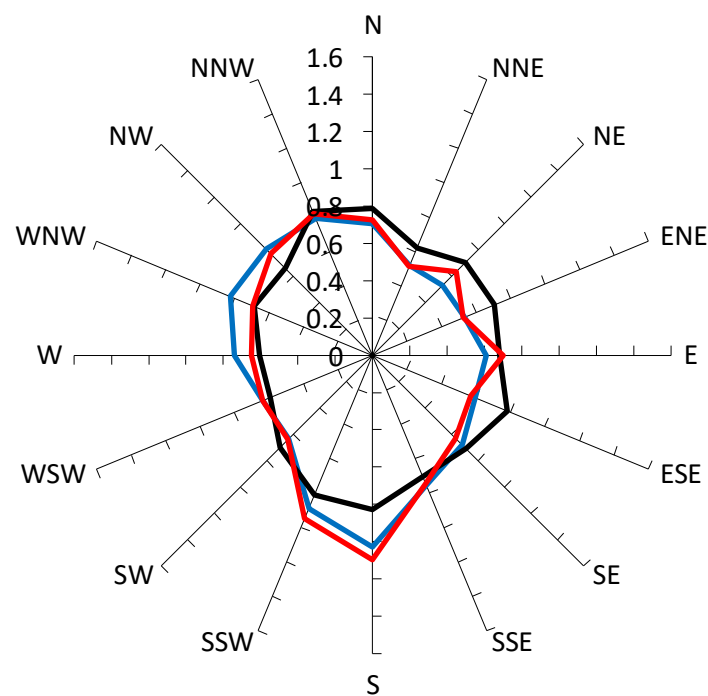
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P15



GEM Velocity Coefficients



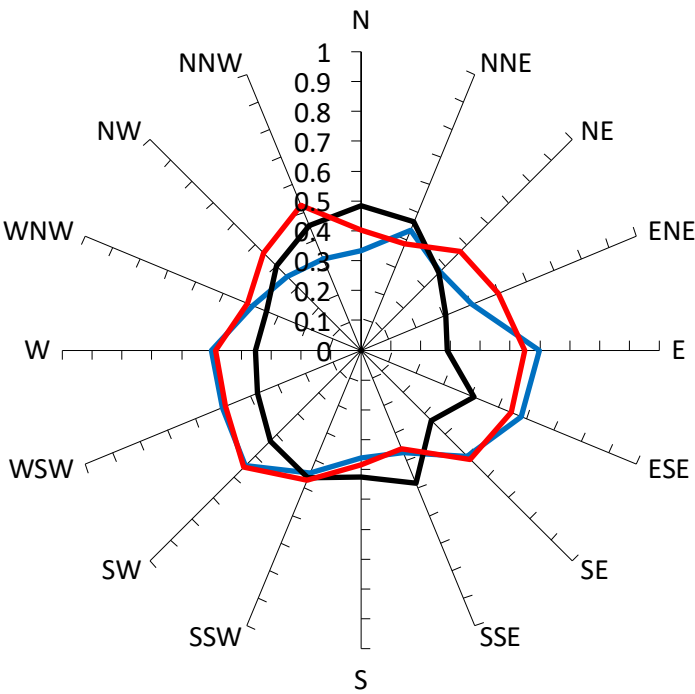
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

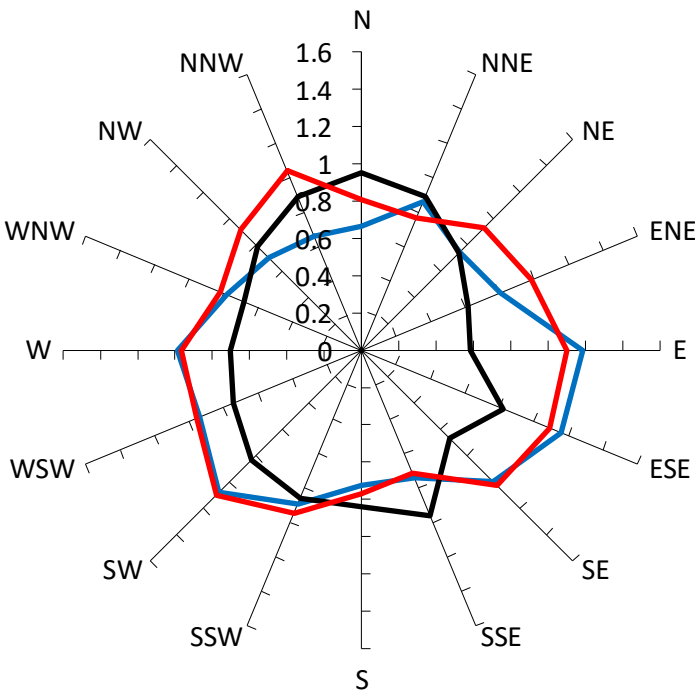
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P16



GEM Velocity Coefficients



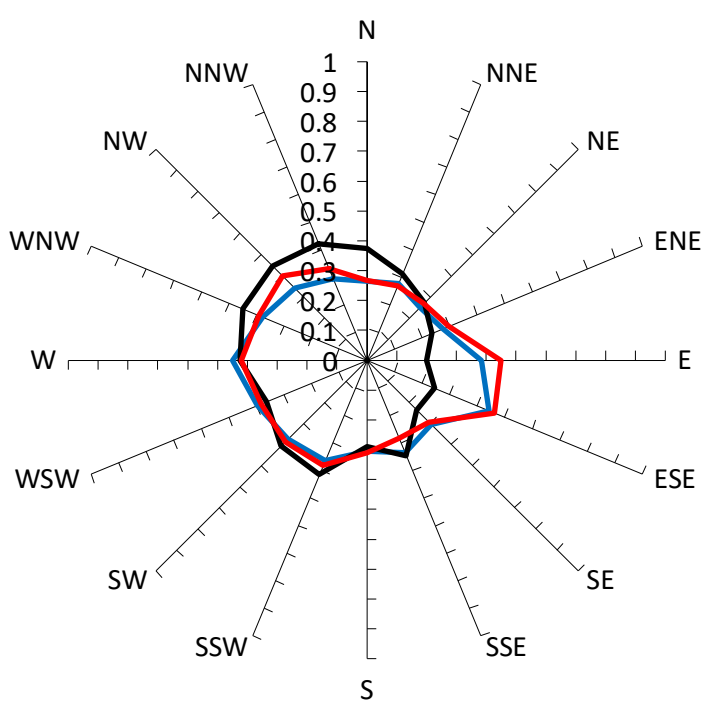
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

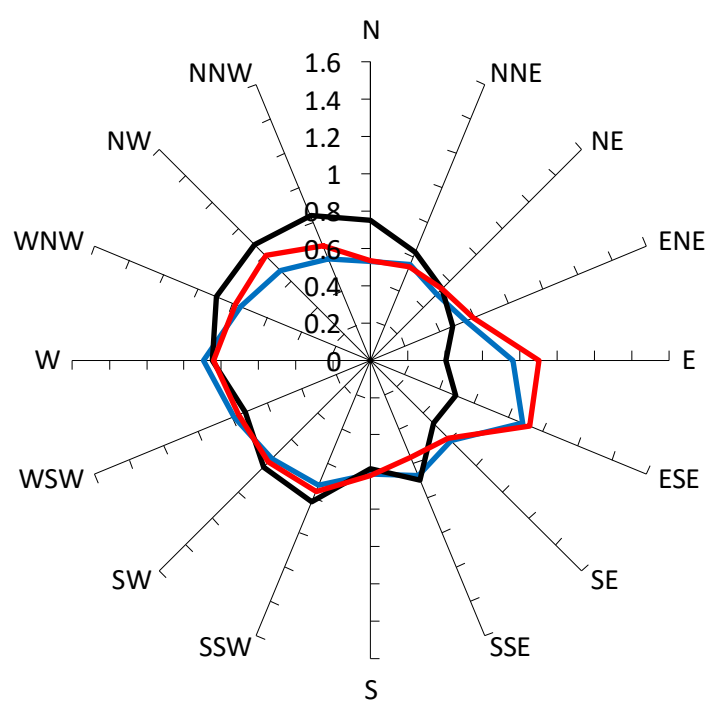
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P17



GEM Velocity Coefficients



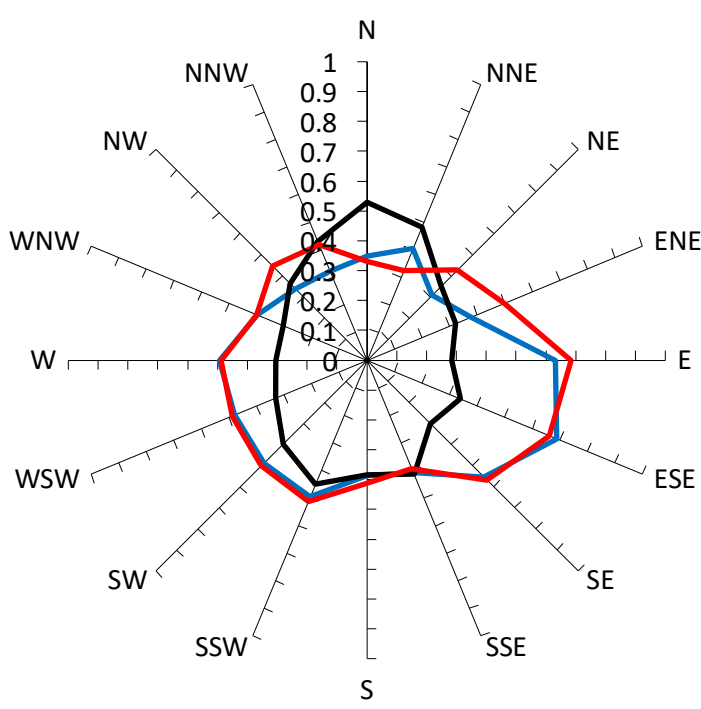
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

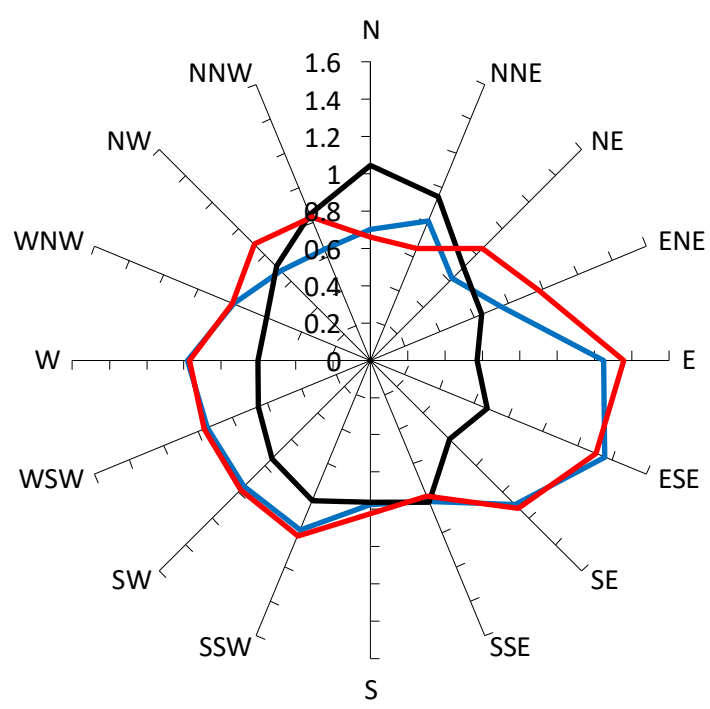
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P18



GEM Velocity Coefficients



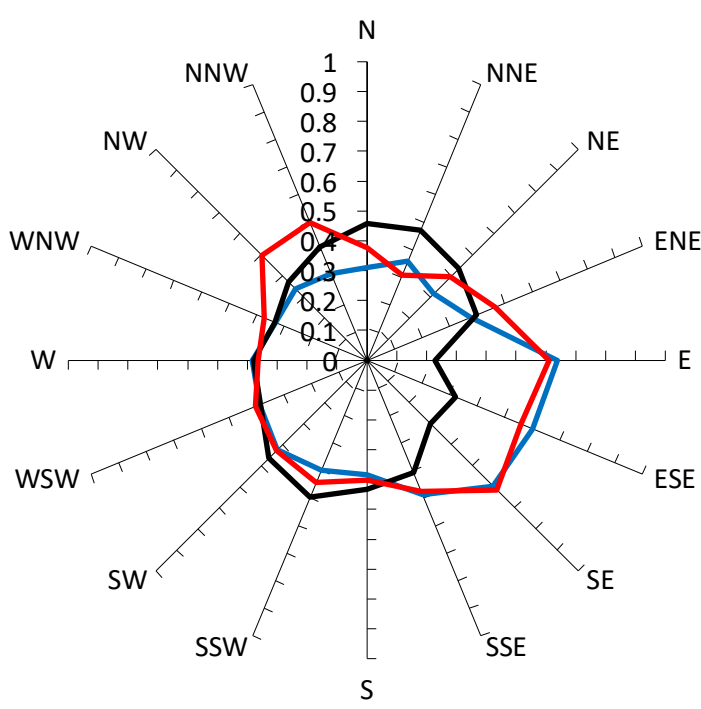
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

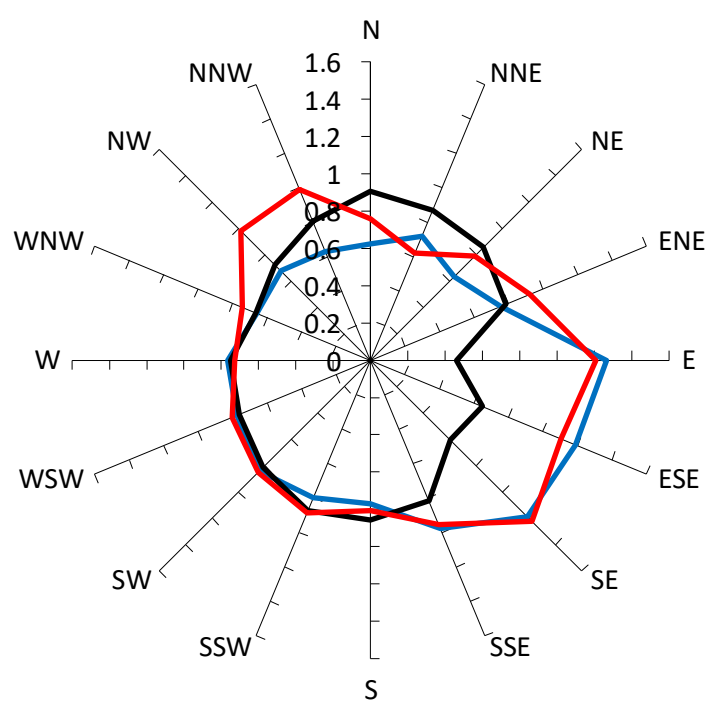
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P19



GEM Velocity Coefficients



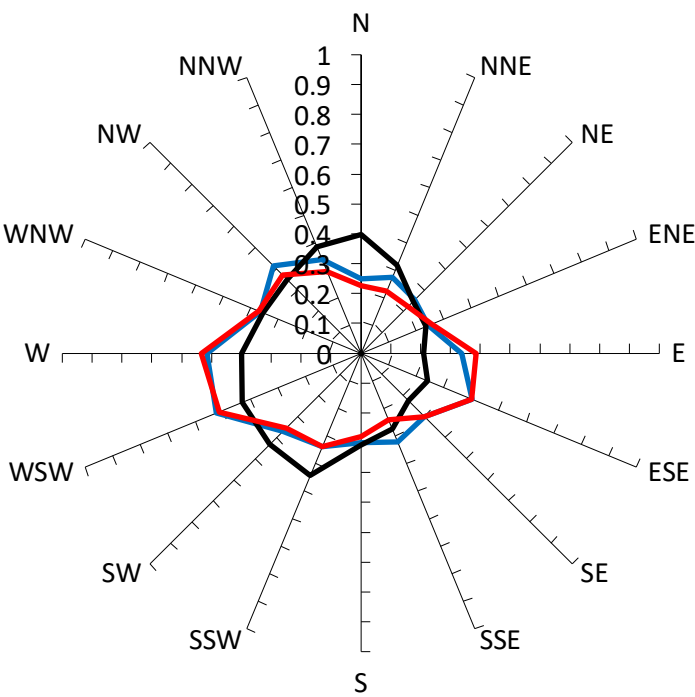
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

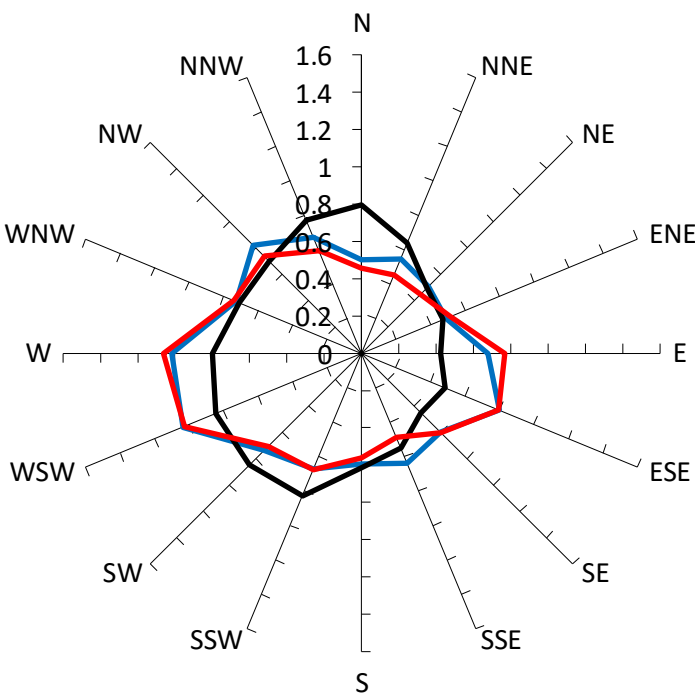
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P20



GEM Velocity Coefficients



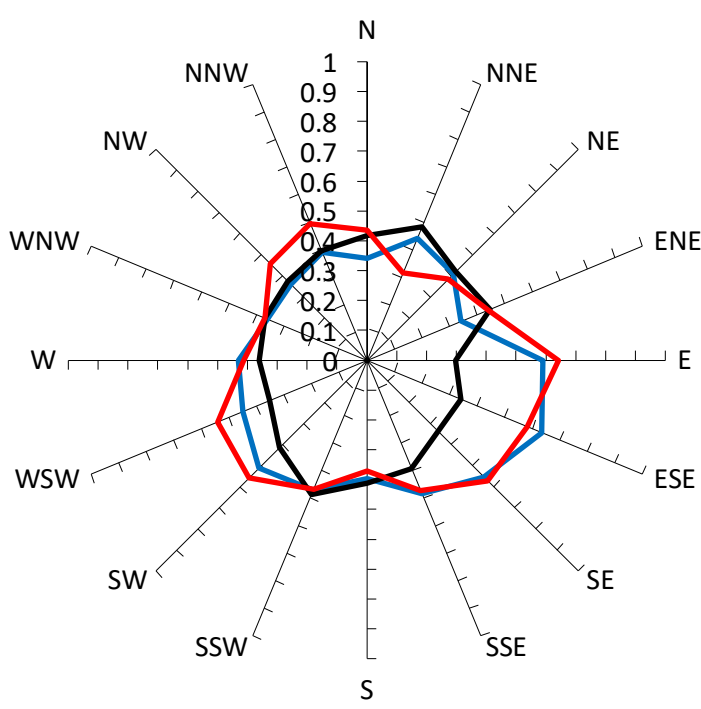
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

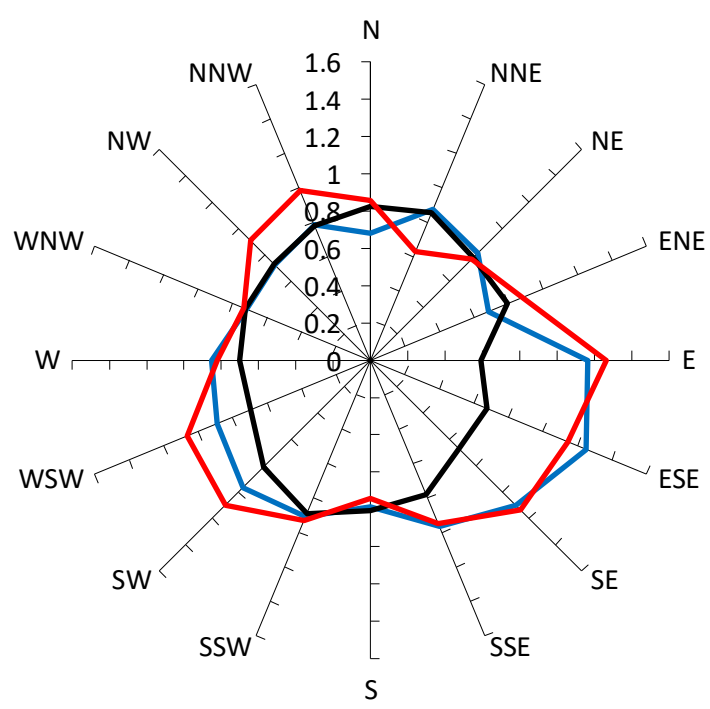
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P21



GEM Velocity Coefficients



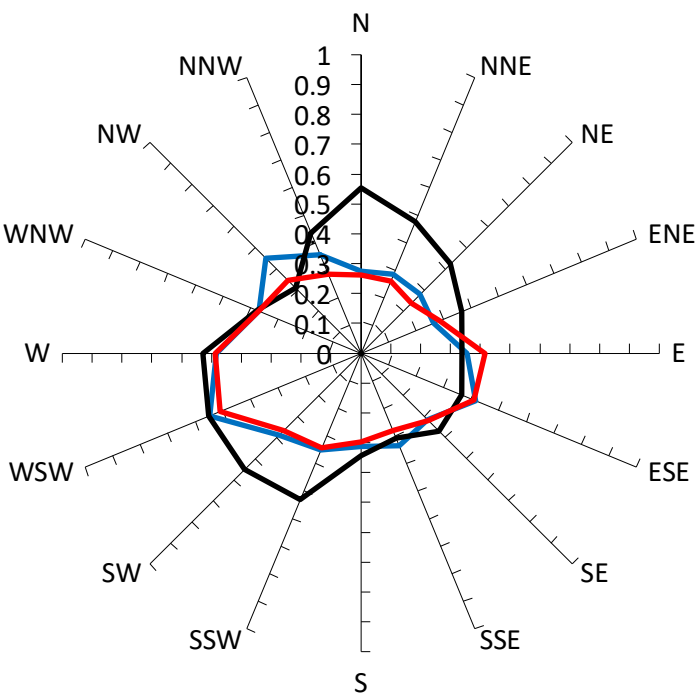
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

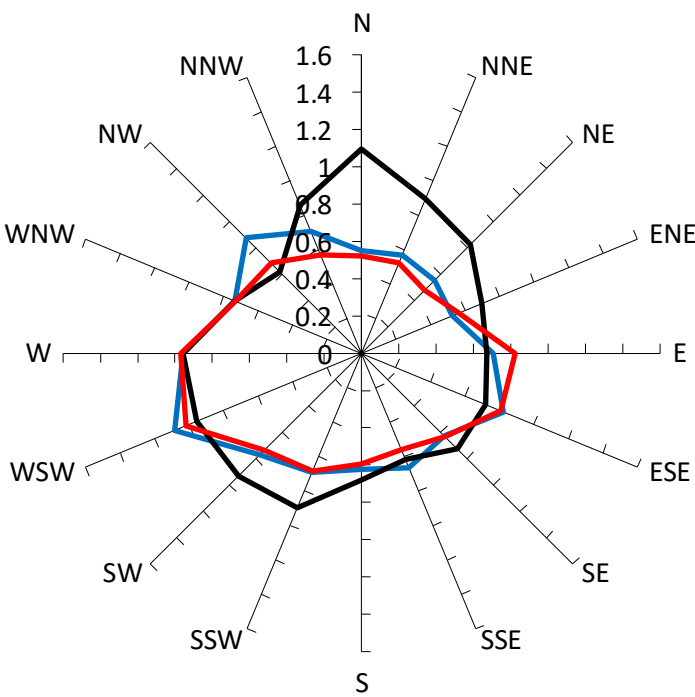
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P22



GEM Velocity Coefficients



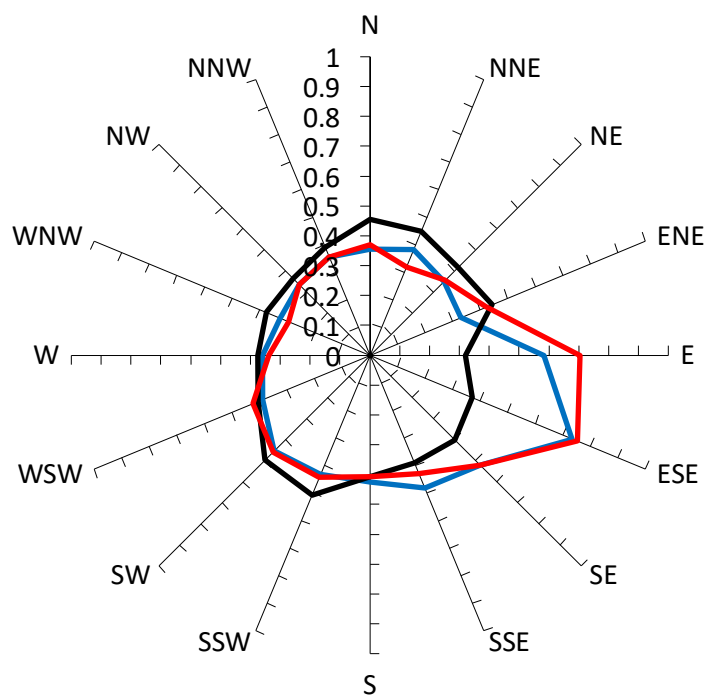
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

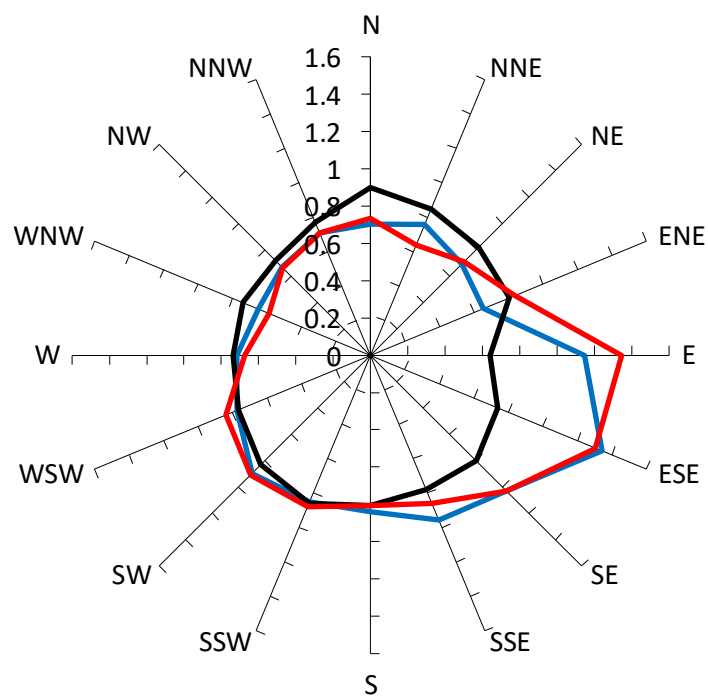
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P23



GEM Velocity Coefficients



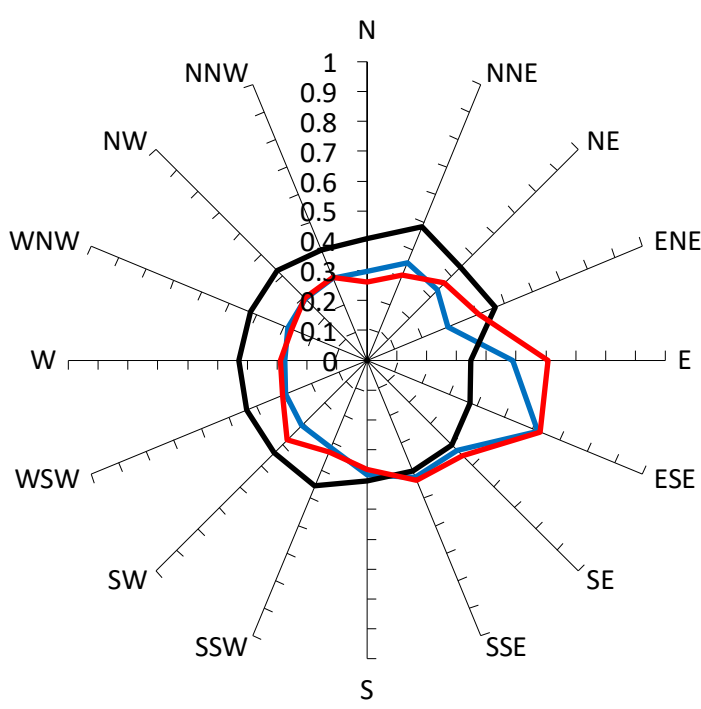
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

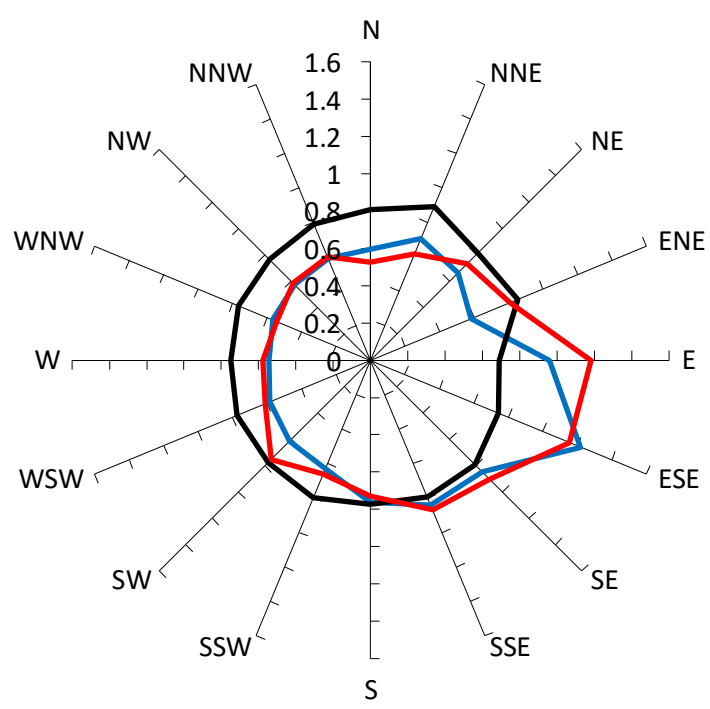
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P24



GEM Velocity Coefficients



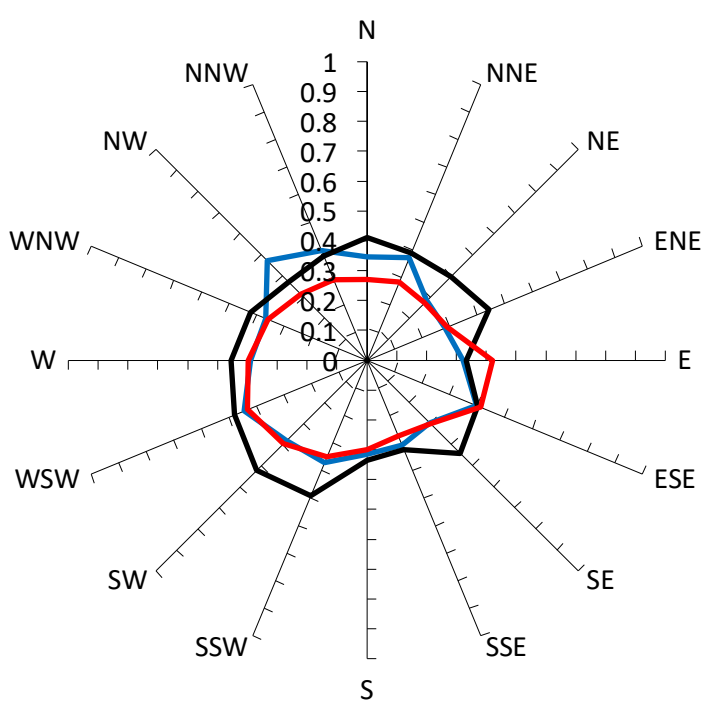
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

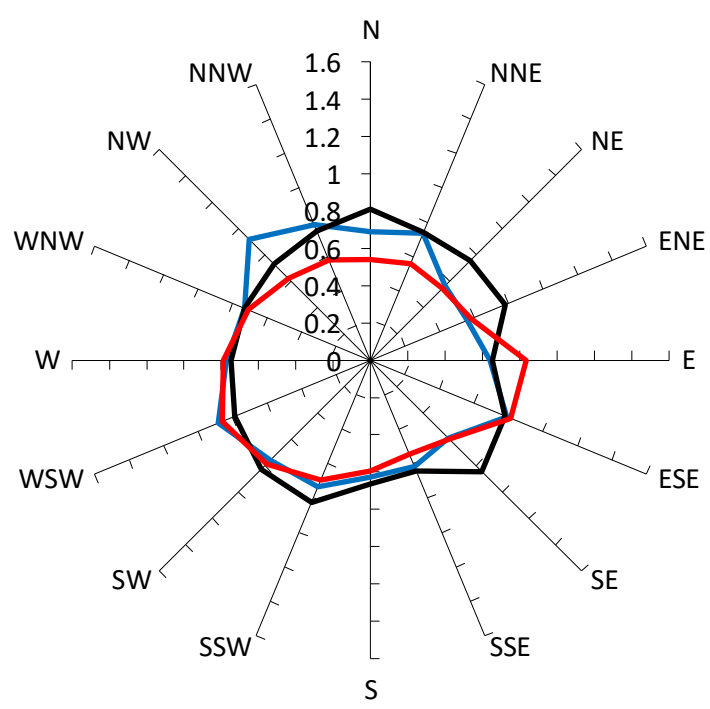
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P25



GEM Velocity Coefficients



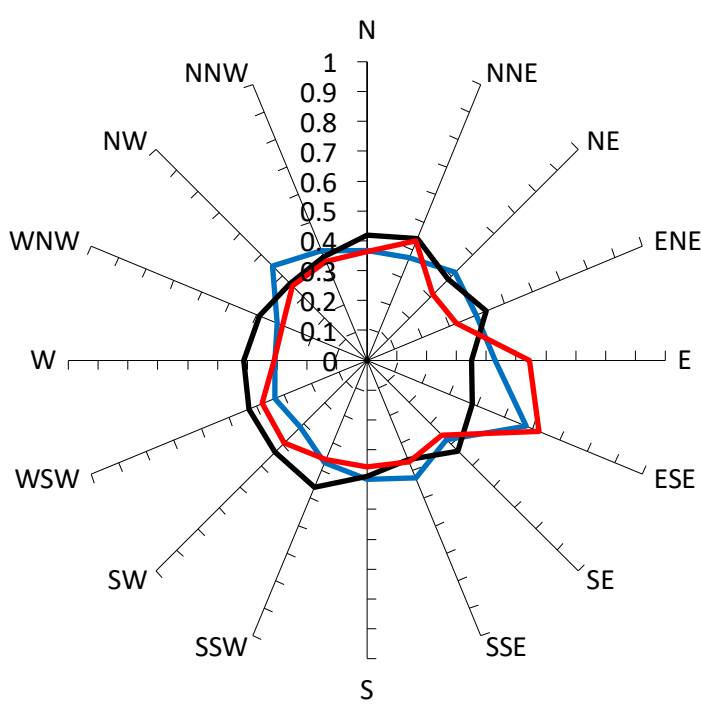
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

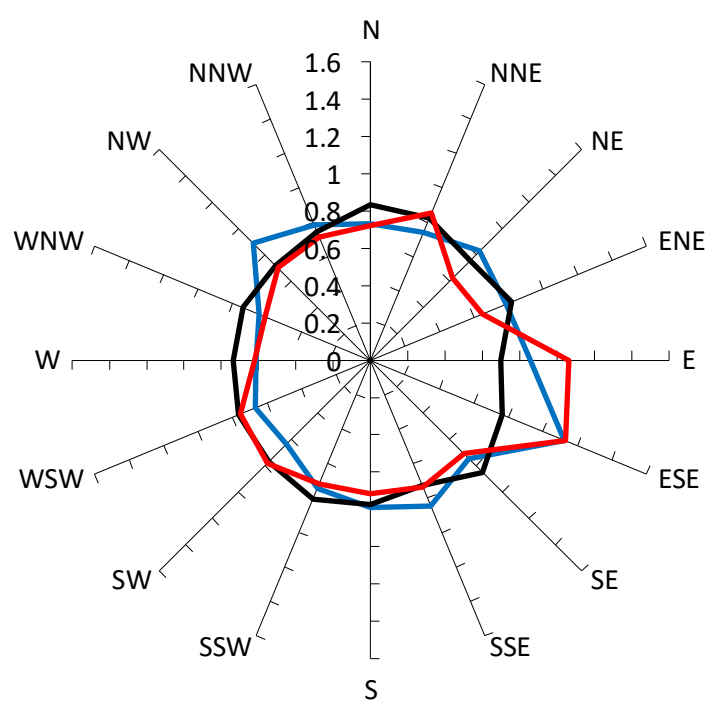
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P26



GEM Velocity Coefficients



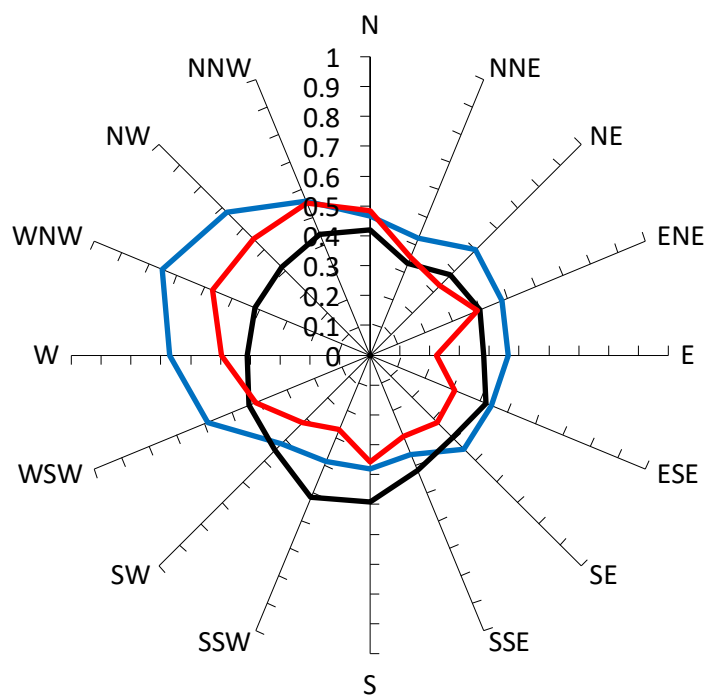
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

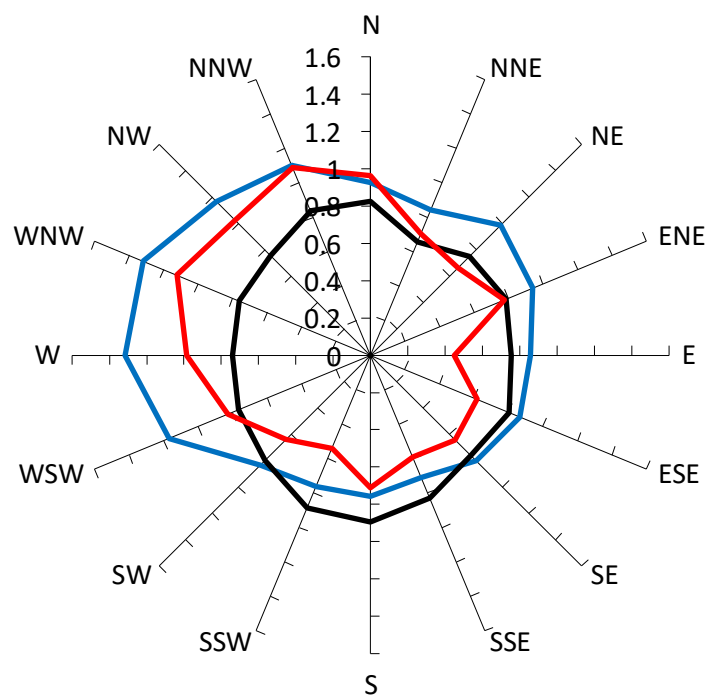
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P27



GEM Velocity Coefficients



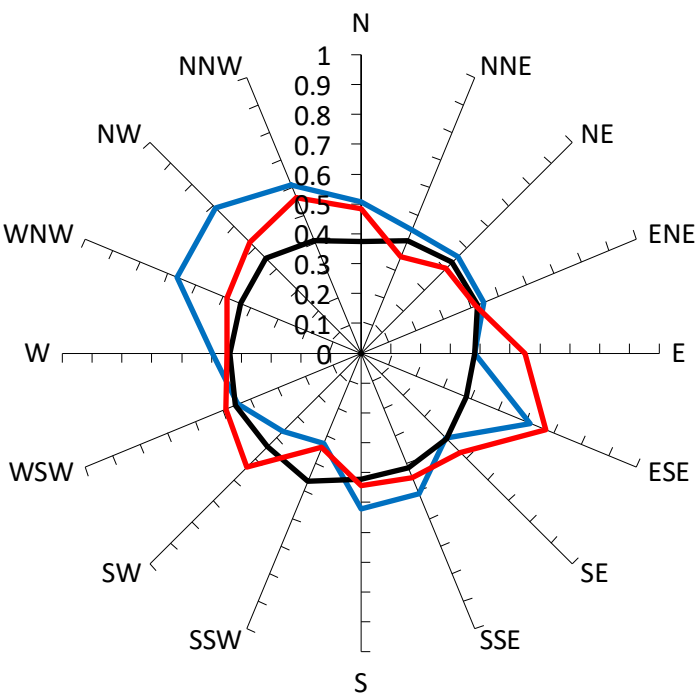
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

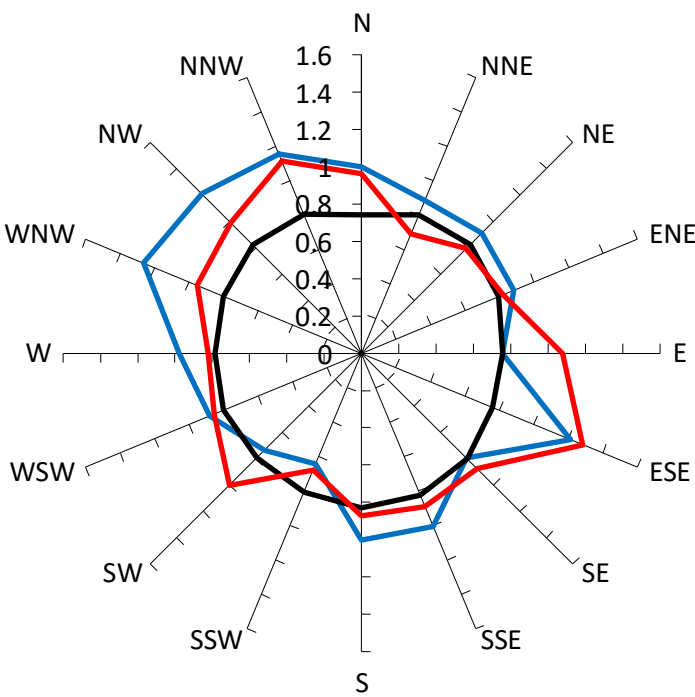
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P28



GEM Velocity Coefficients



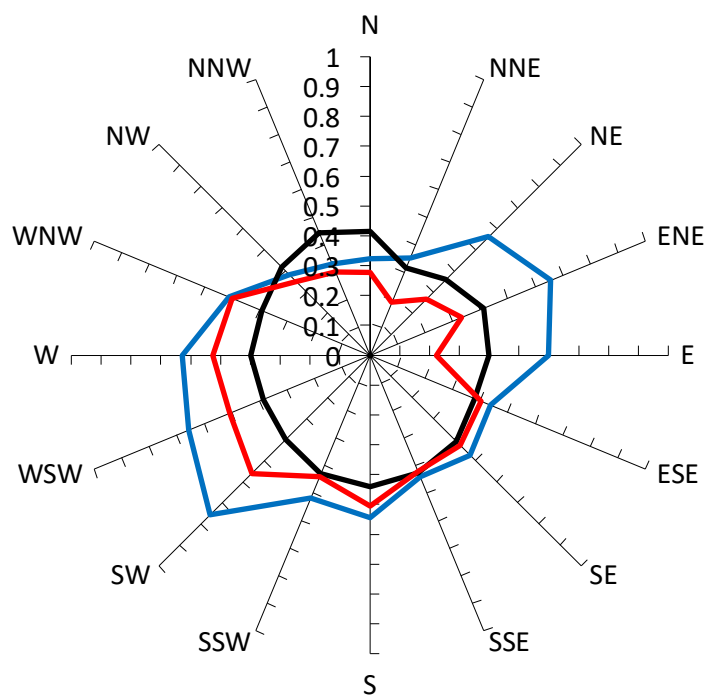
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

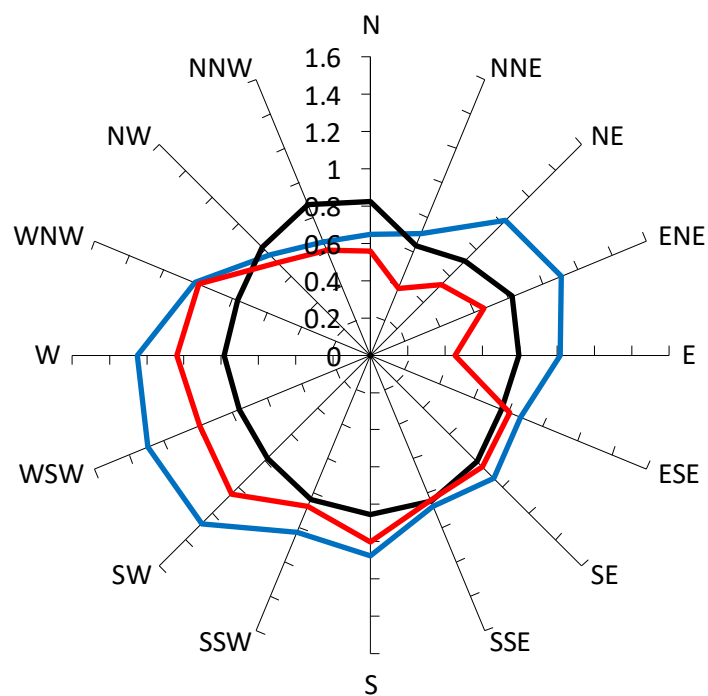
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P29



GEM Velocity Coefficients



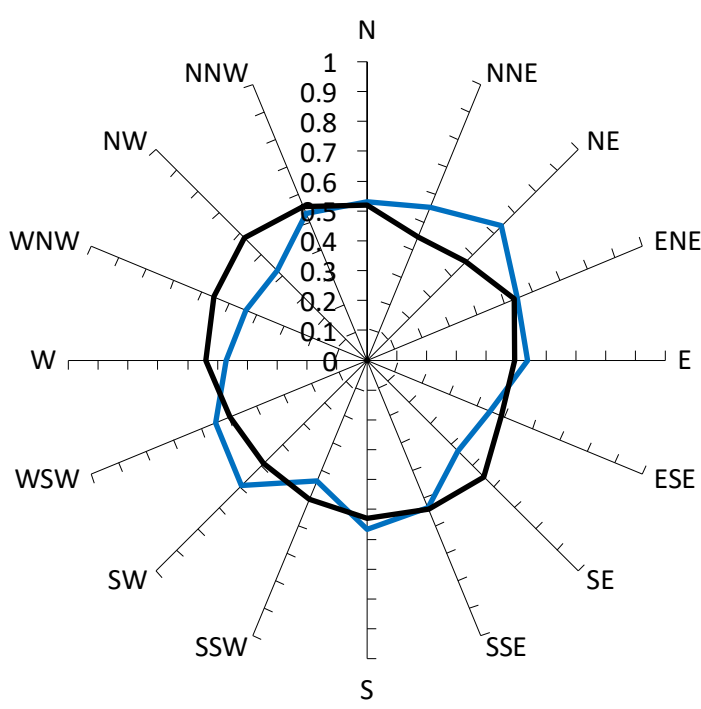
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

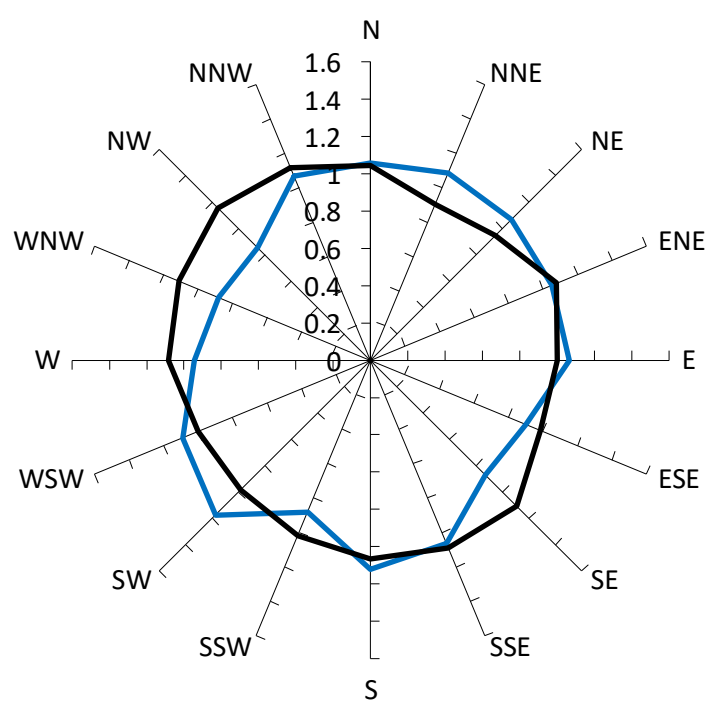
Existing site.

With development "as approved", no vegetation or other treatments.

Results for P30



GEM Velocity Coefficients

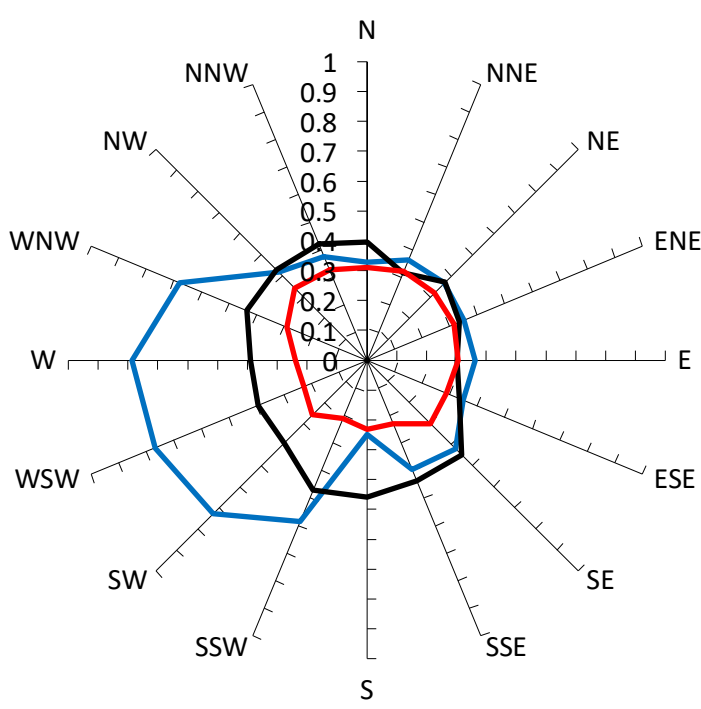


Gust Velocity Coefficients

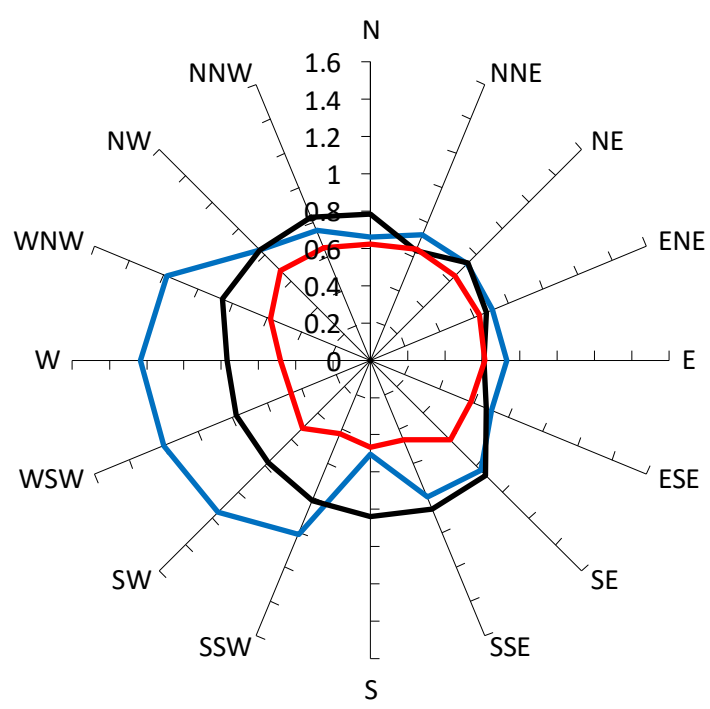
With development "as proposed", no vegetation or other treatments.

Existing site.

# Results for P31



GEM Velocity Coefficients



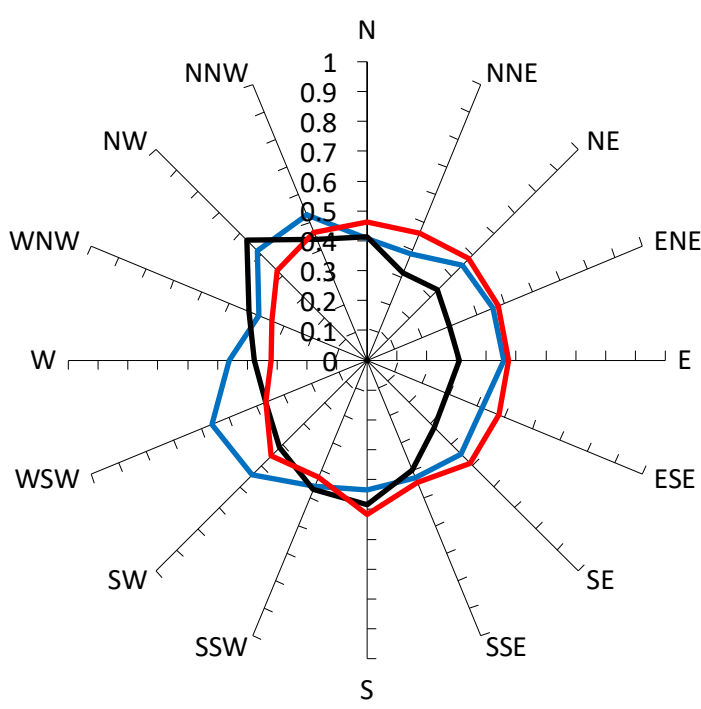
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

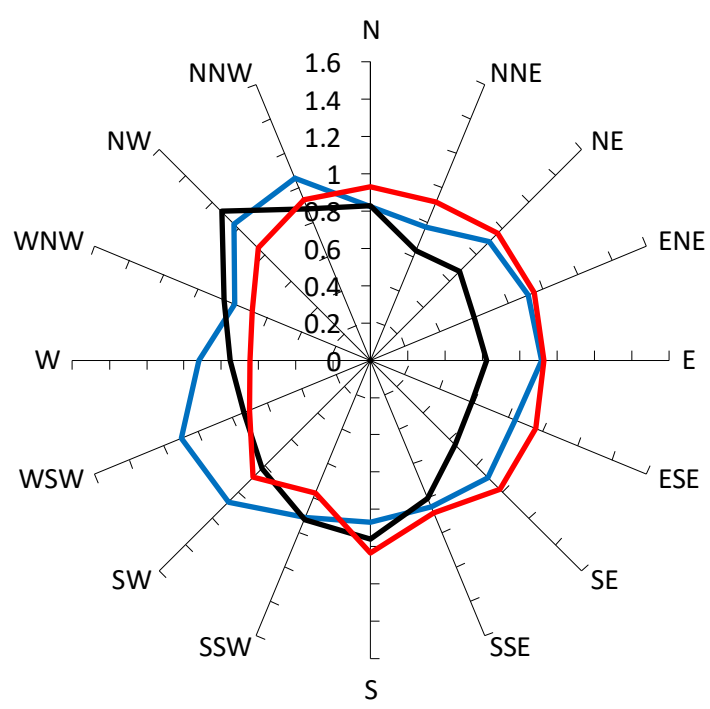
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P32



GEM Velocity Coefficients



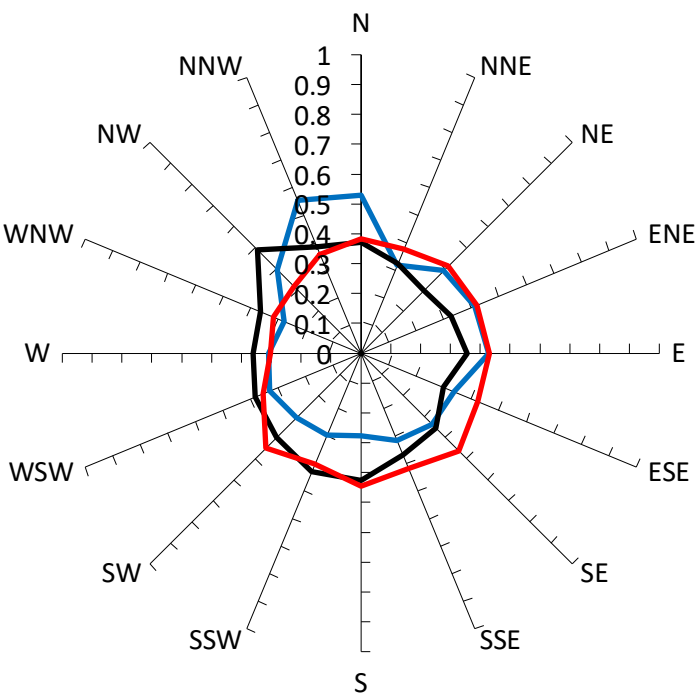
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

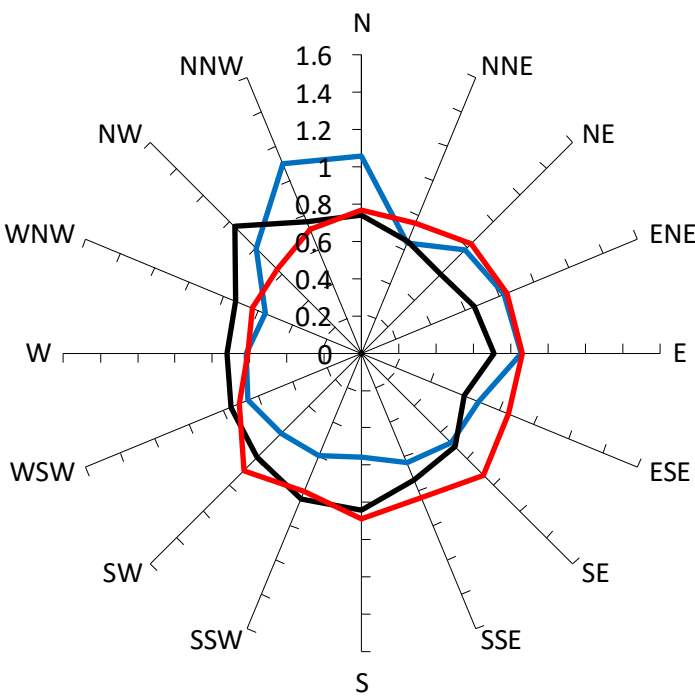
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P33



GEM Velocity Coefficients



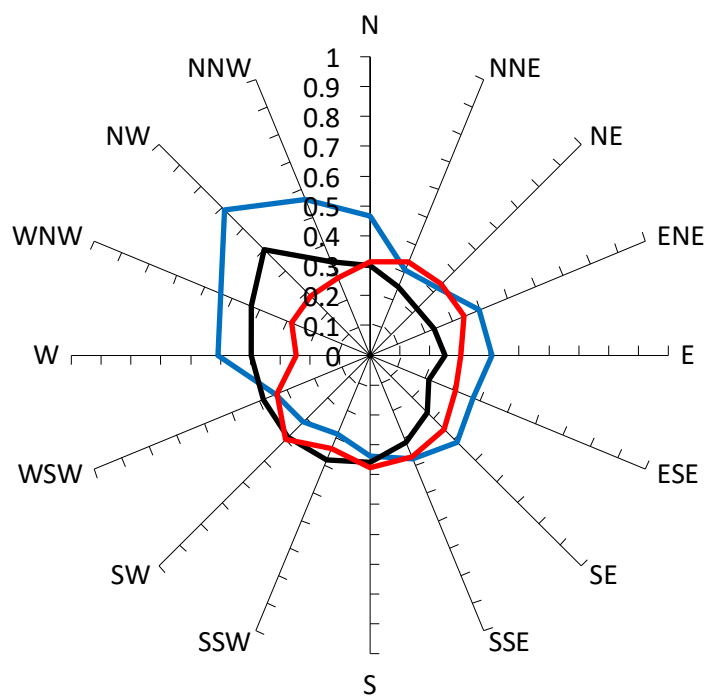
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

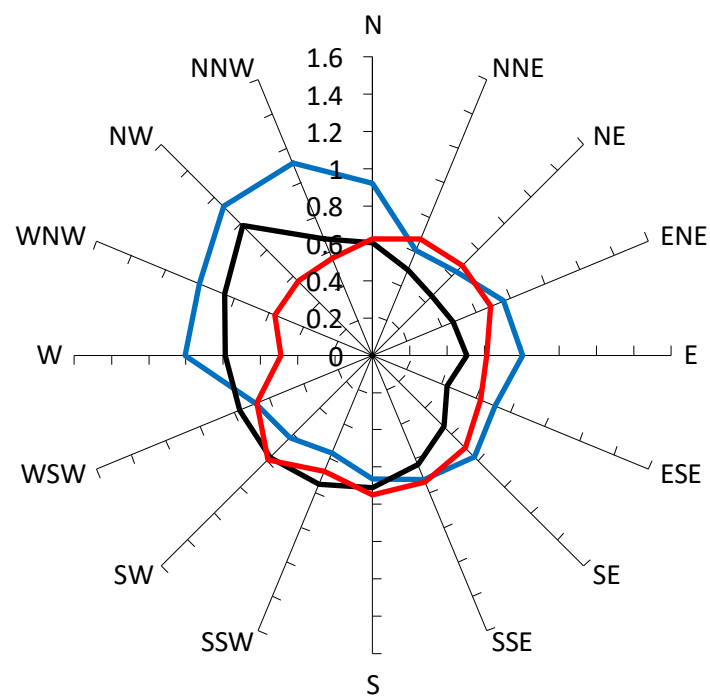
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P34



GEM Velocity Coefficients



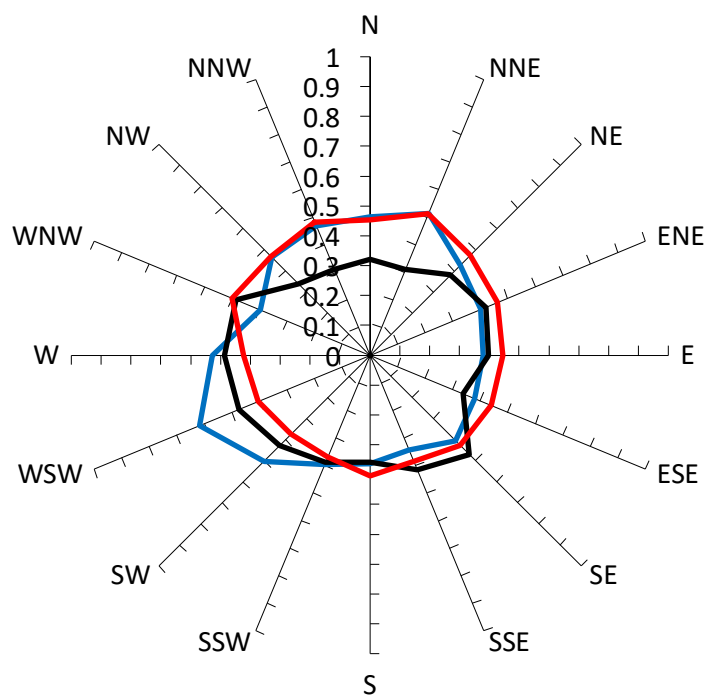
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

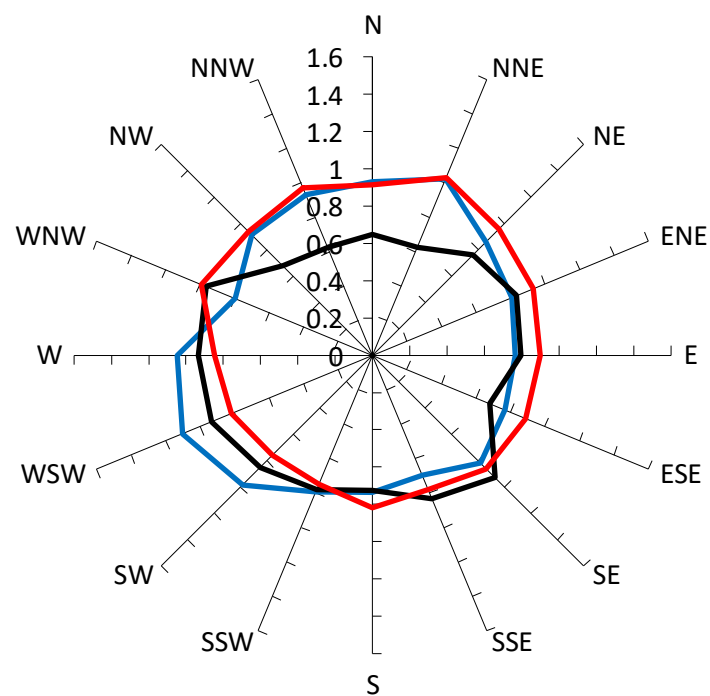
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P35



GEM Velocity Coefficients



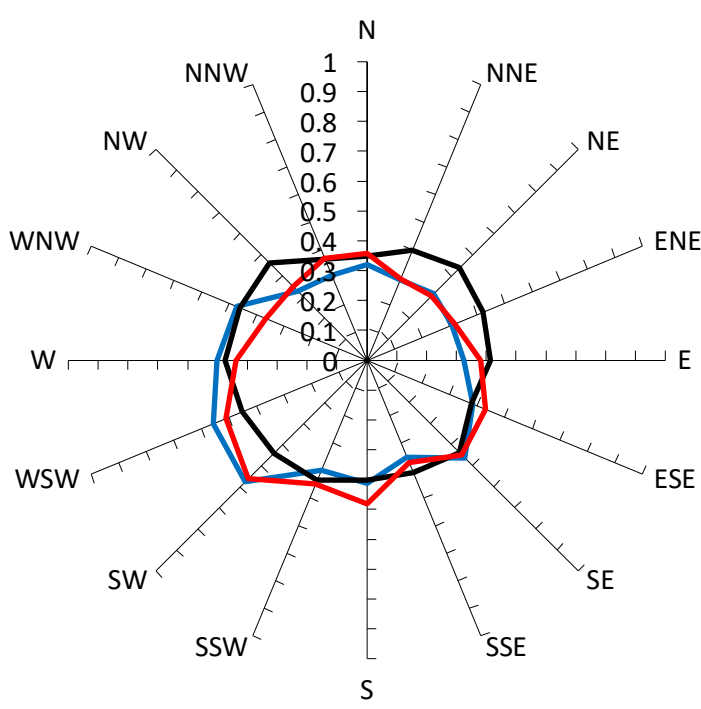
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

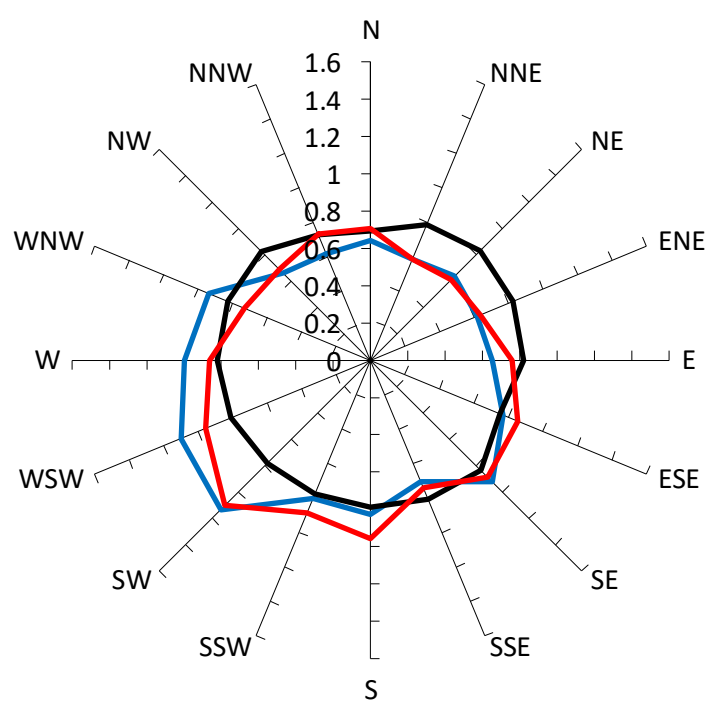
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P36



GEM Velocity Coefficients



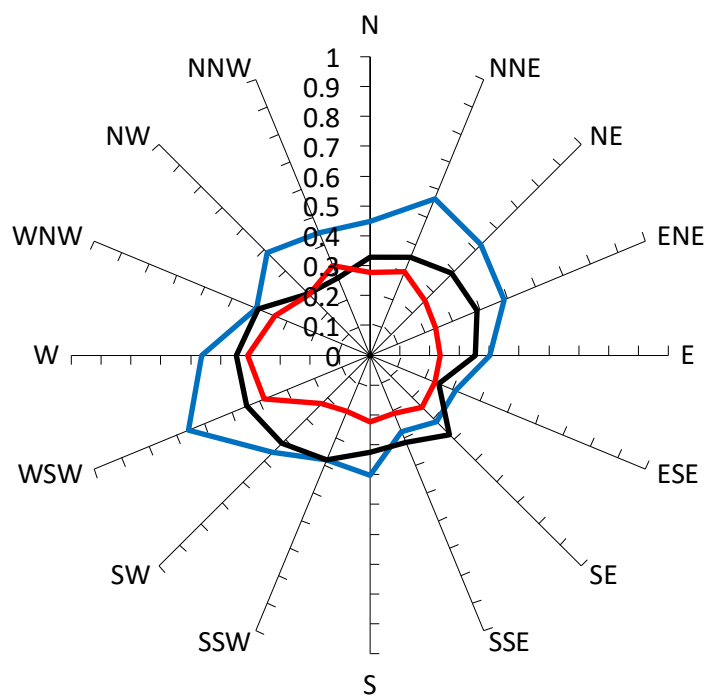
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

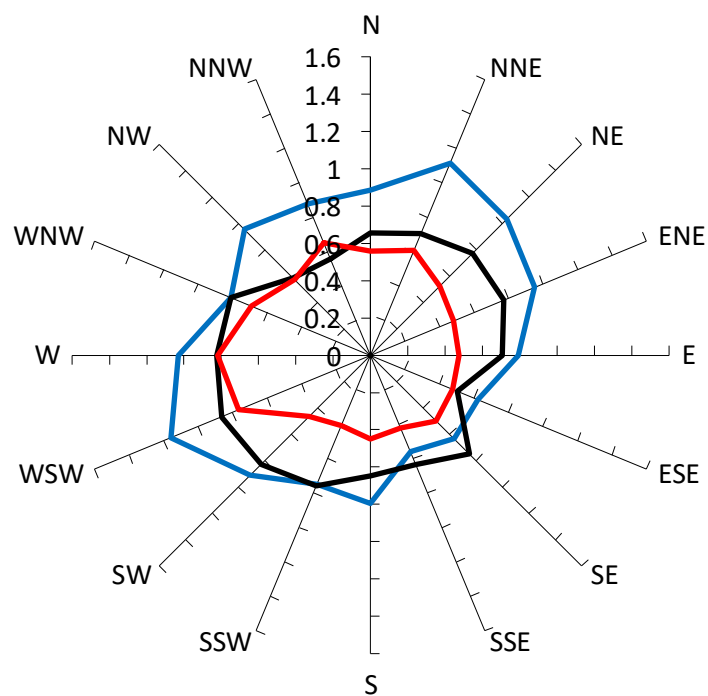
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P37



GEM Velocity Coefficients



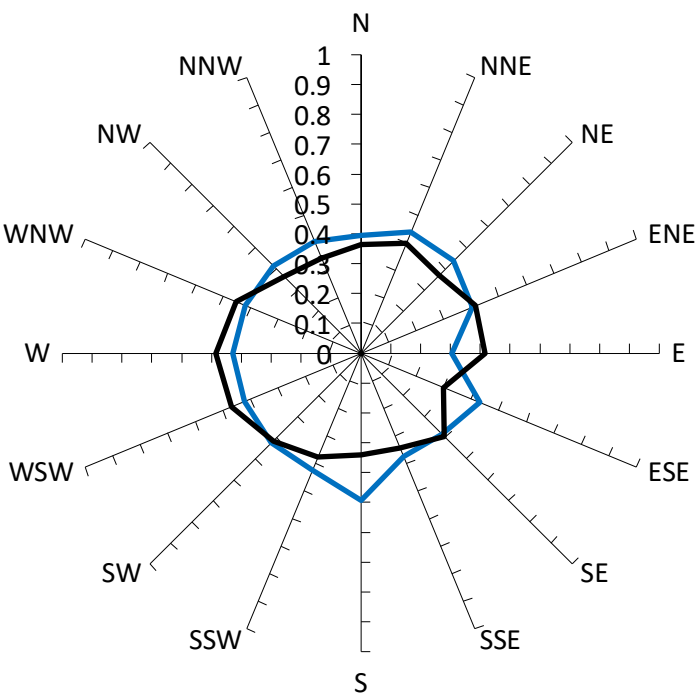
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

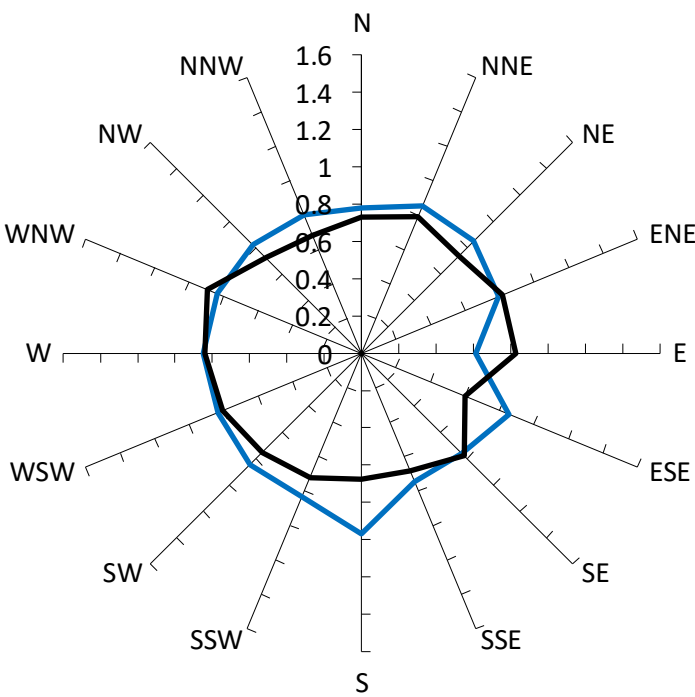
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P38



GEM Velocity Coefficients

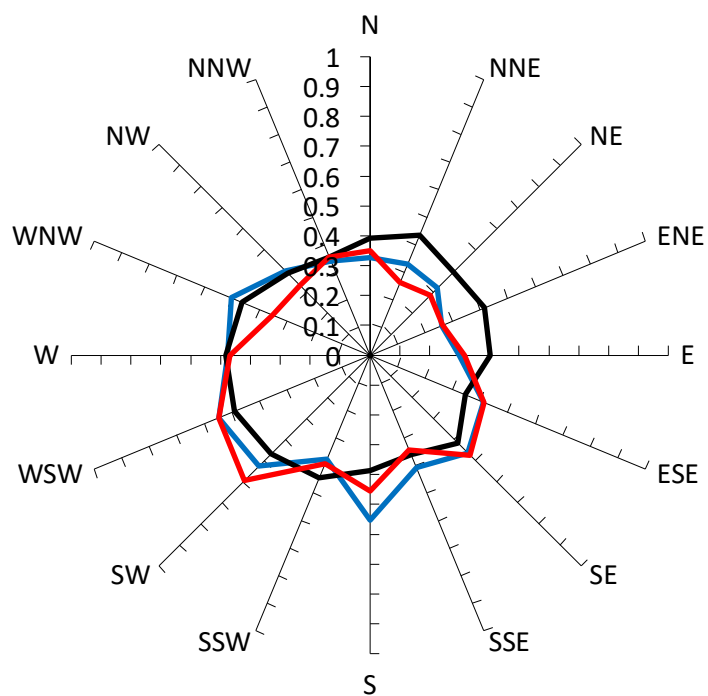


Gust Velocity Coefficients

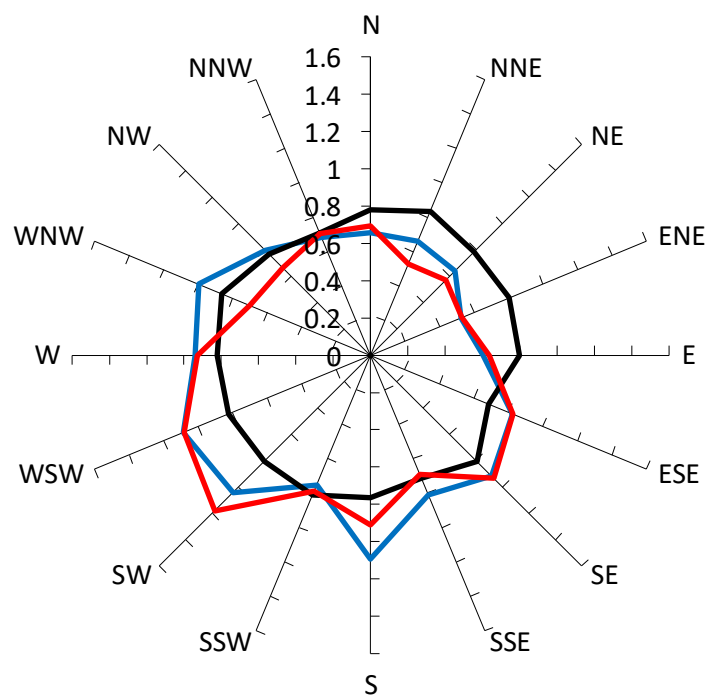
With development "as proposed", no vegetation or other treatments.

Existing site.

# Results for P39



GEM Velocity Coefficients



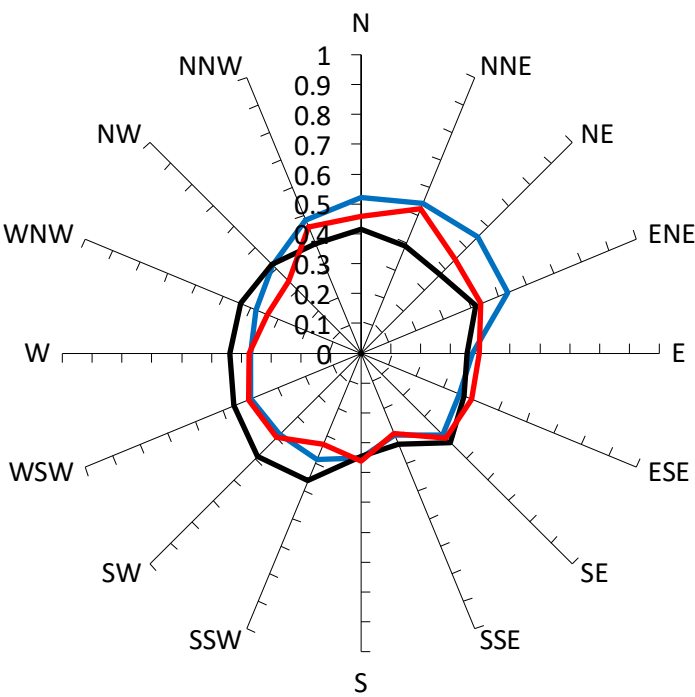
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

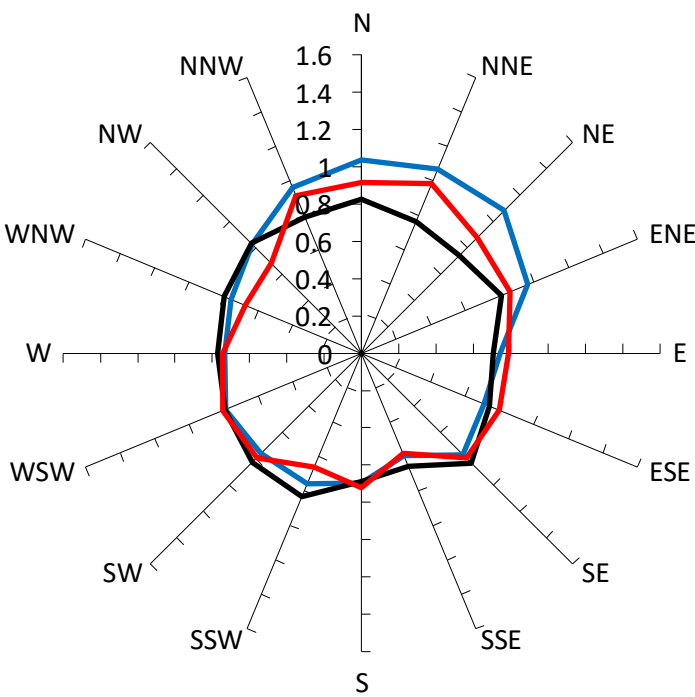
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P40



GEM Velocity Coefficients



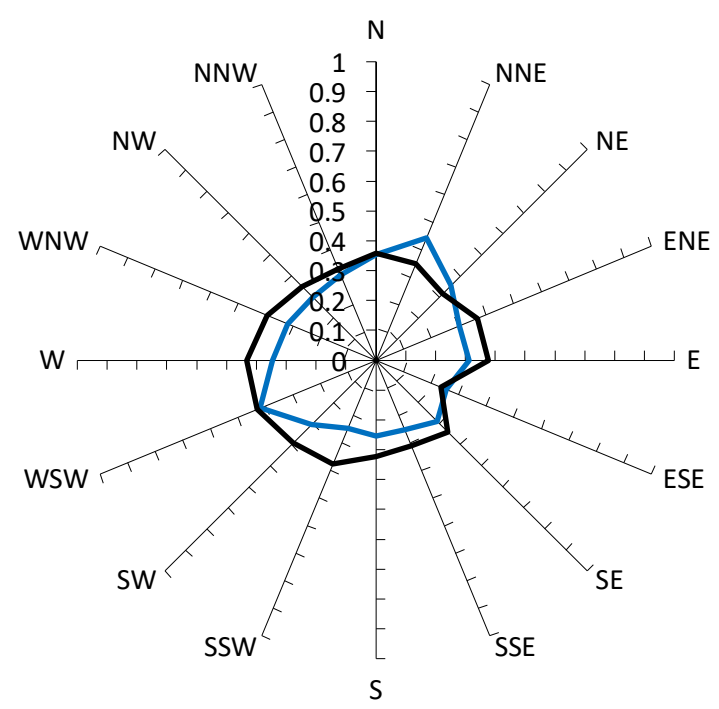
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

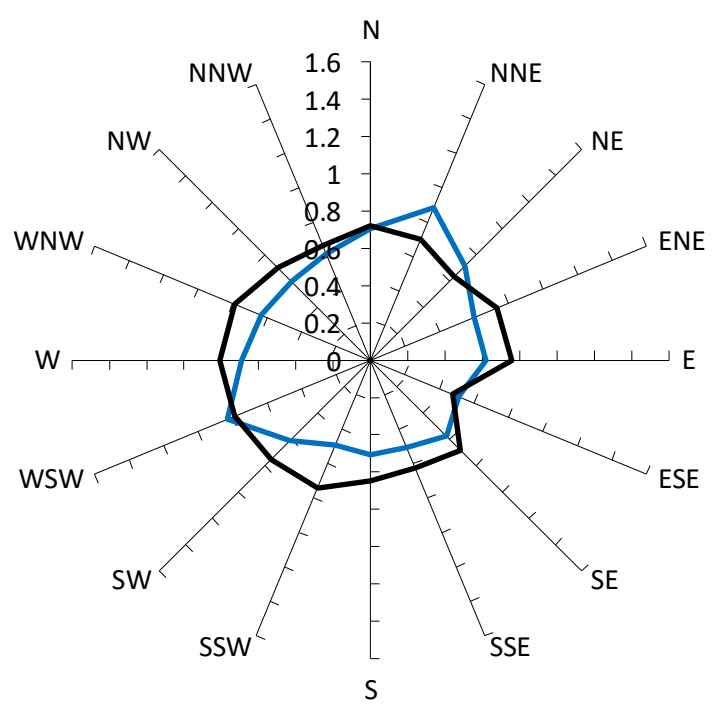
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P41



GEM Velocity Coefficients

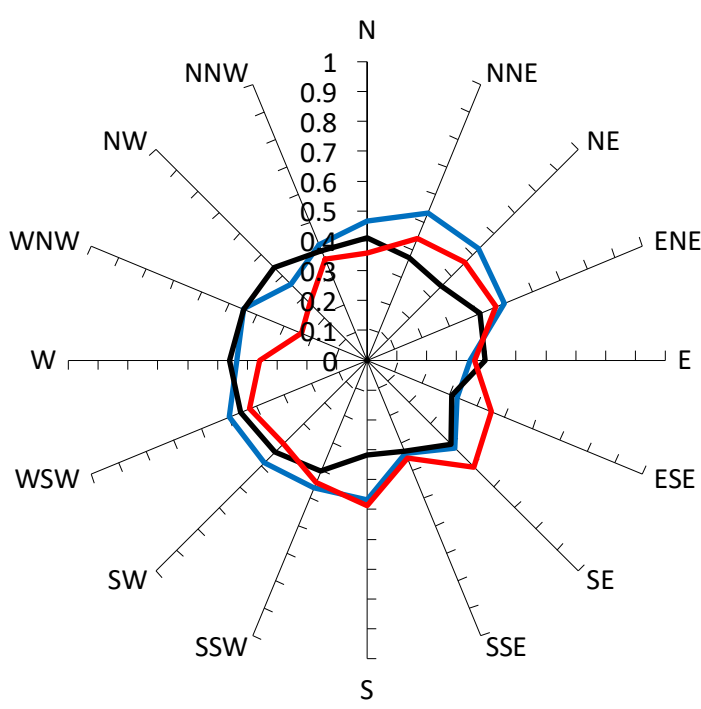


Gust Velocity Coefficients

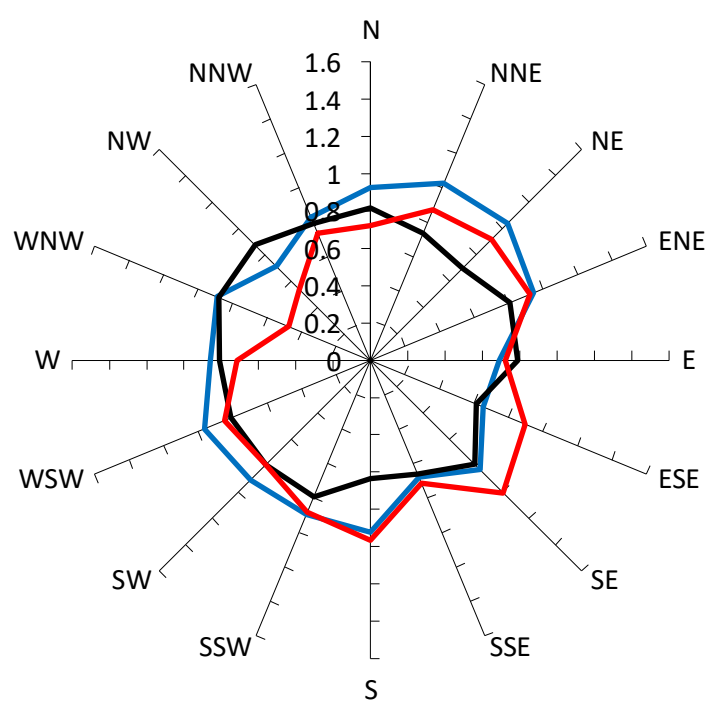
With development "as proposed", no vegetation or other treatments.

Existing site.

# Results for P42



GEM Velocity Coefficients



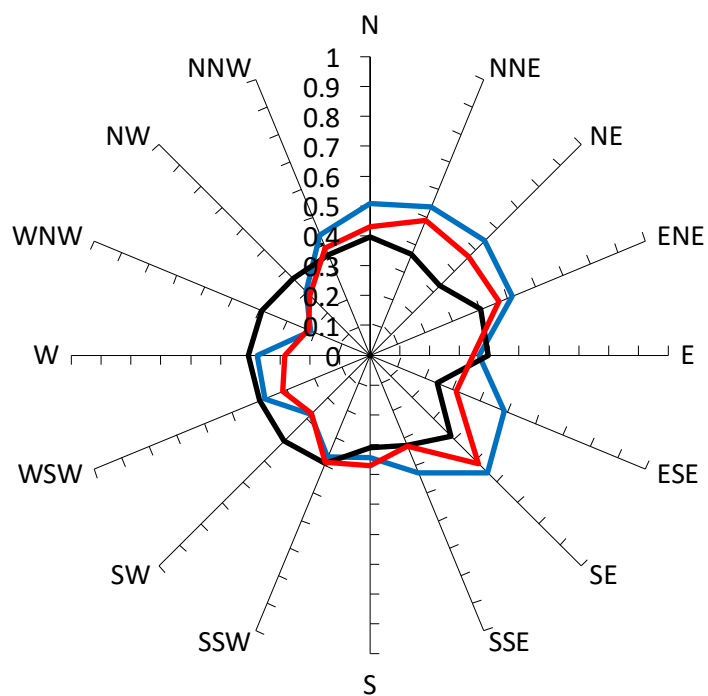
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

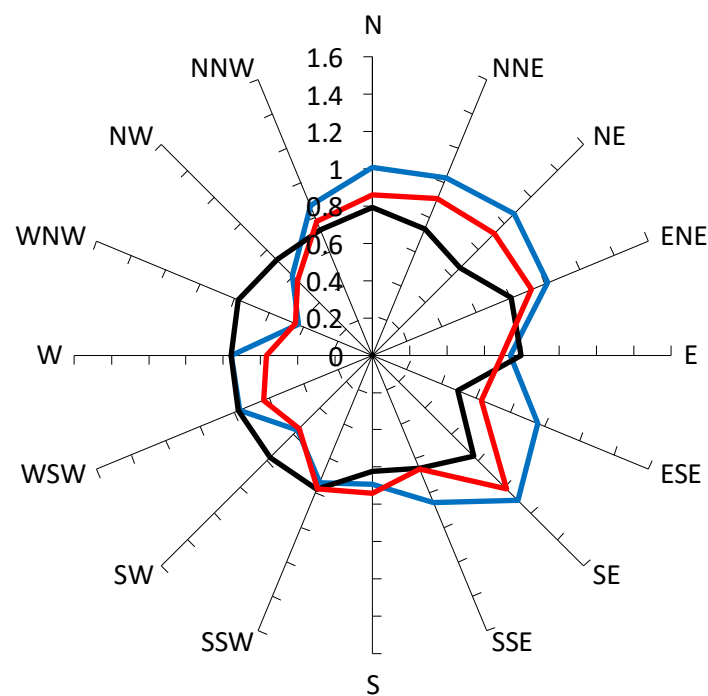
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P43



GEM Velocity Coefficients



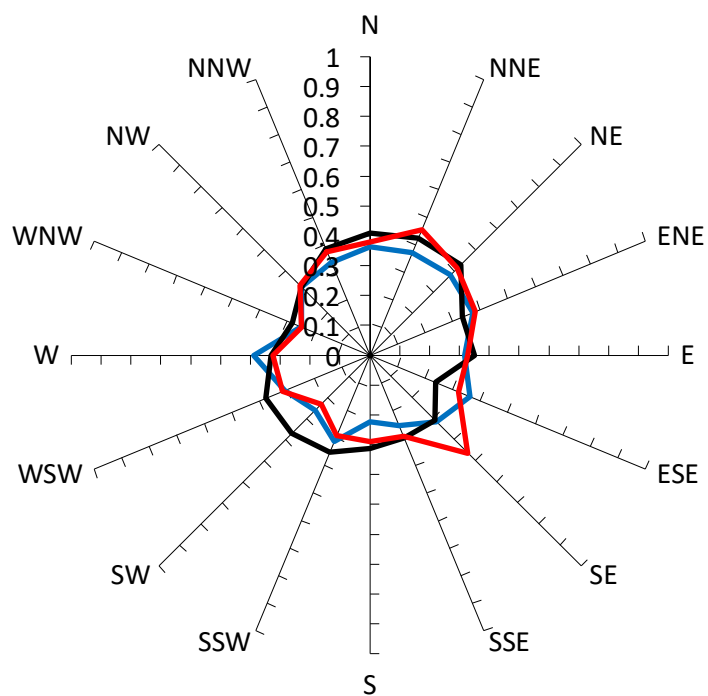
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

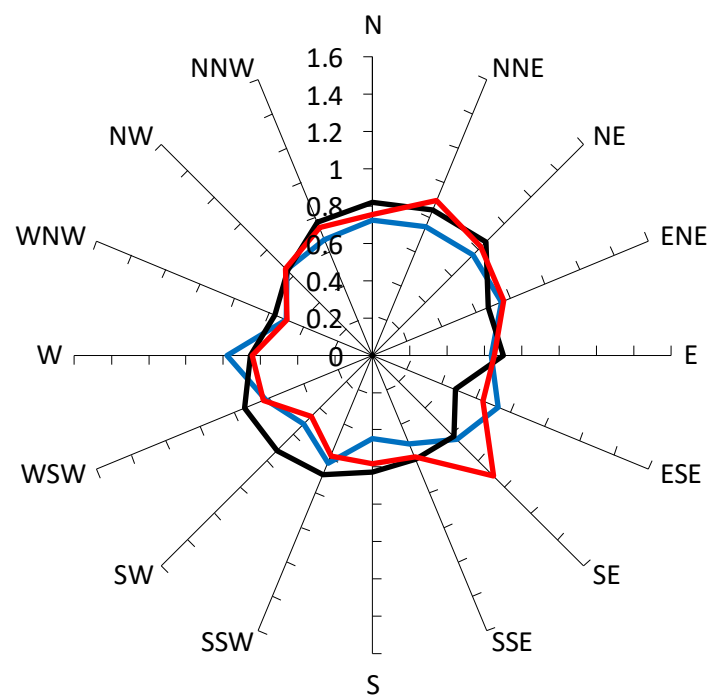
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P44



GEM Velocity Coefficients



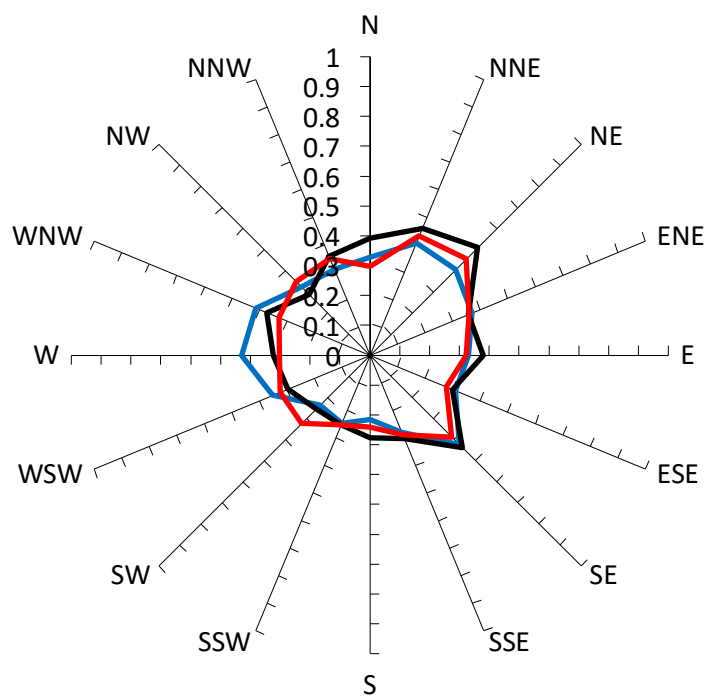
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

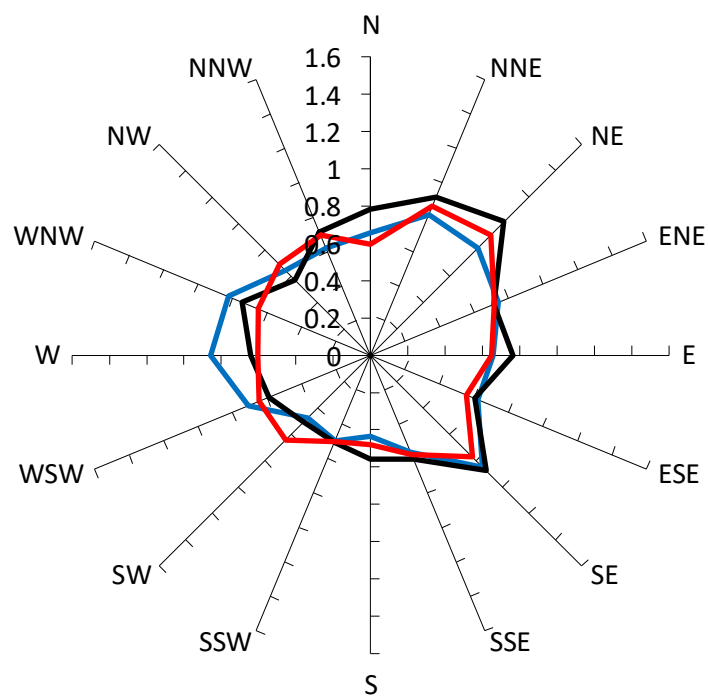
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P45



GEM Velocity Coefficients



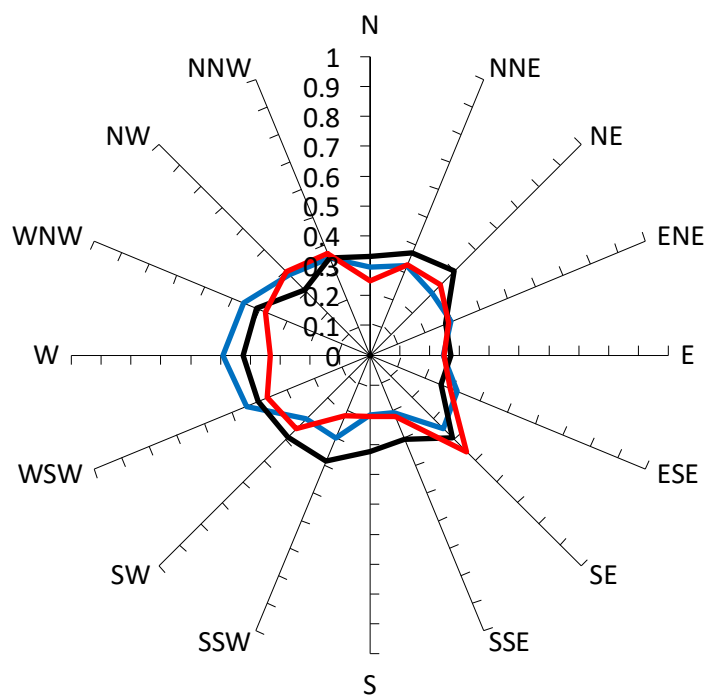
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

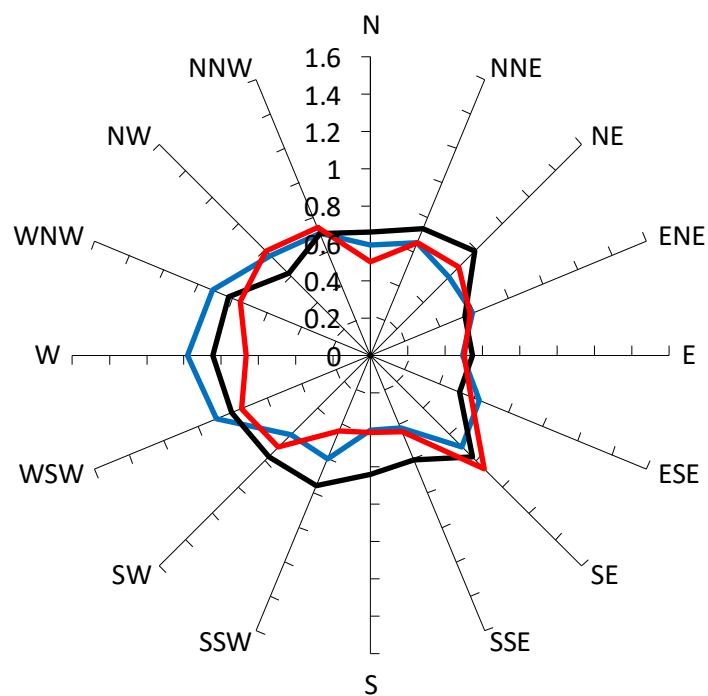
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P46



GEM Velocity Coefficients



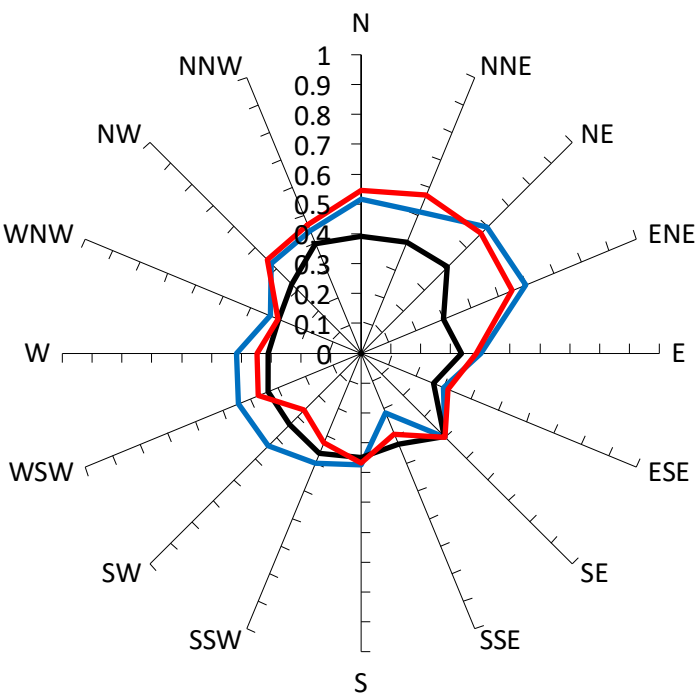
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

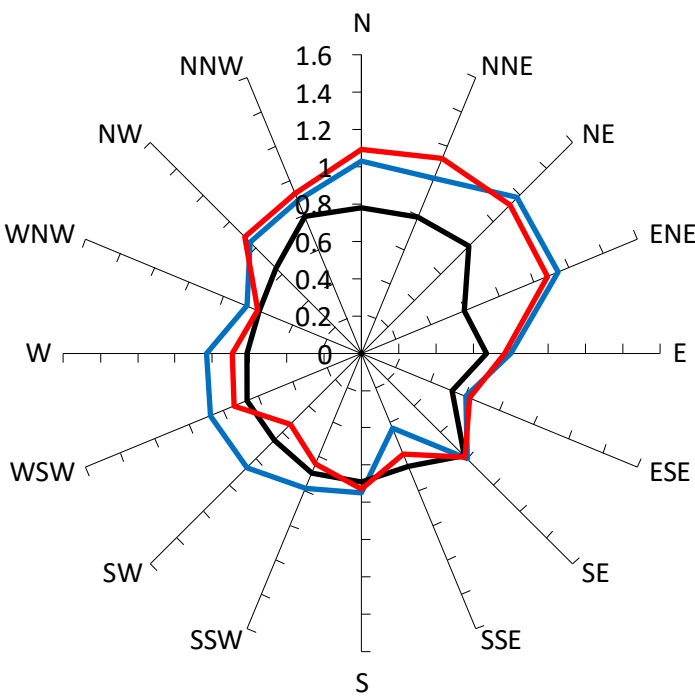
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P47



GEM Velocity Coefficients



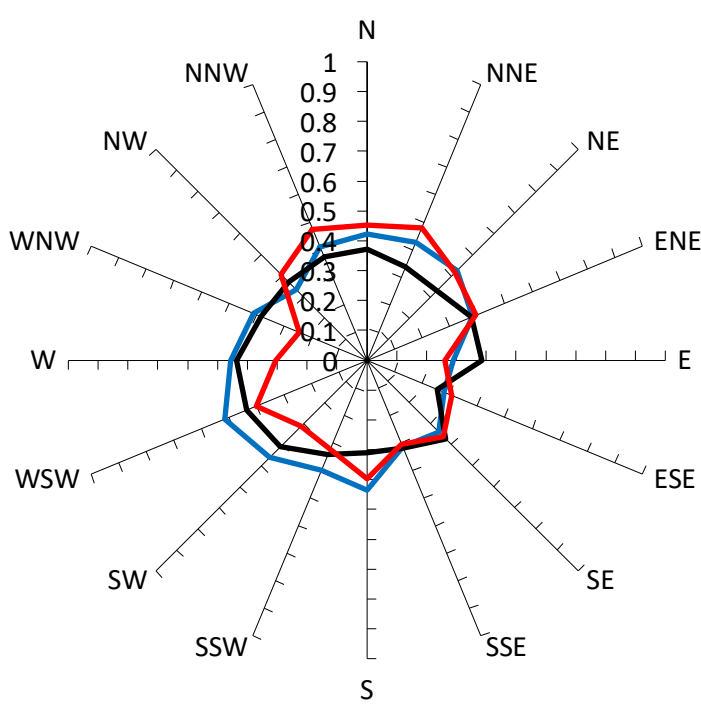
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

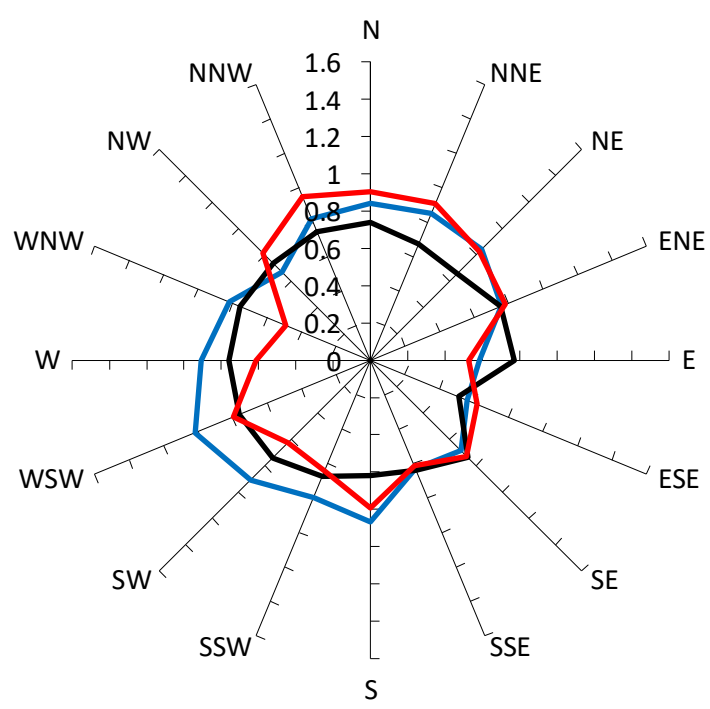
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P48



GEM Velocity Coefficients



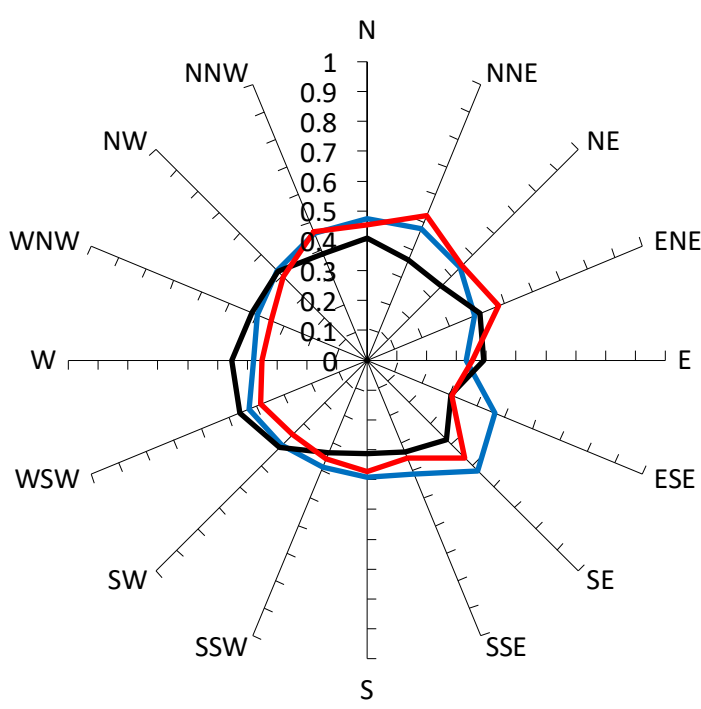
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

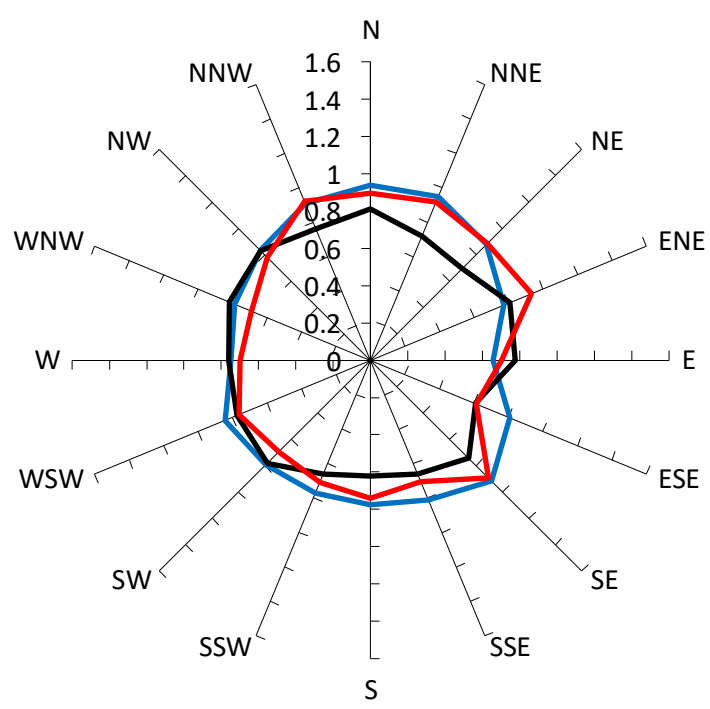
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P49



GEM Velocity Coefficients



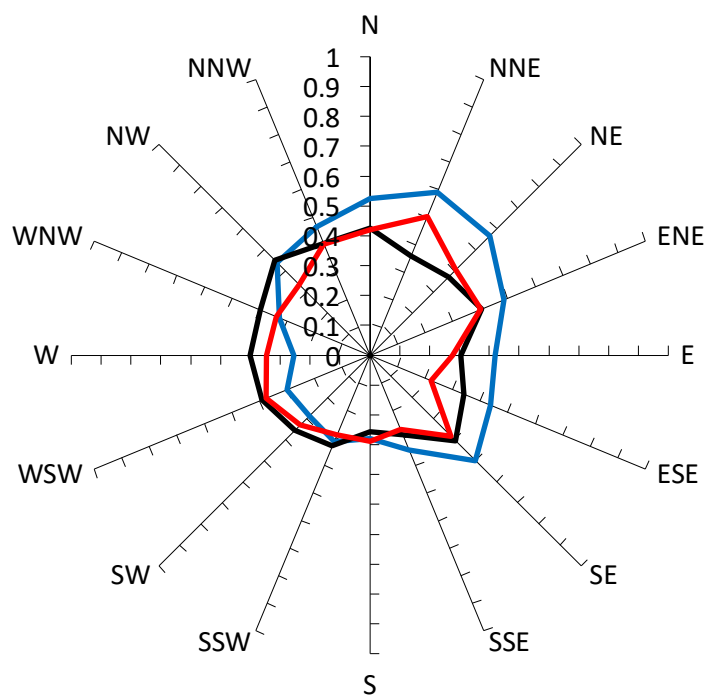
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

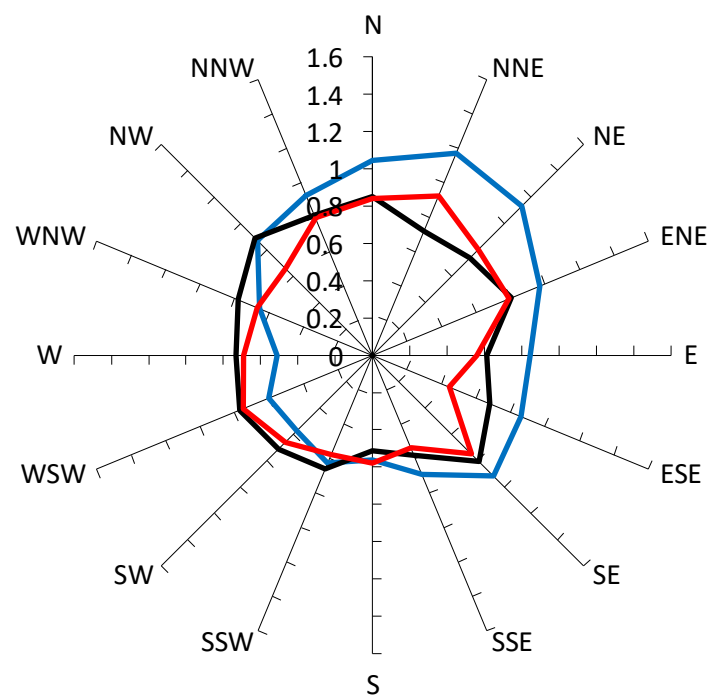
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P50



GEM Velocity Coefficients



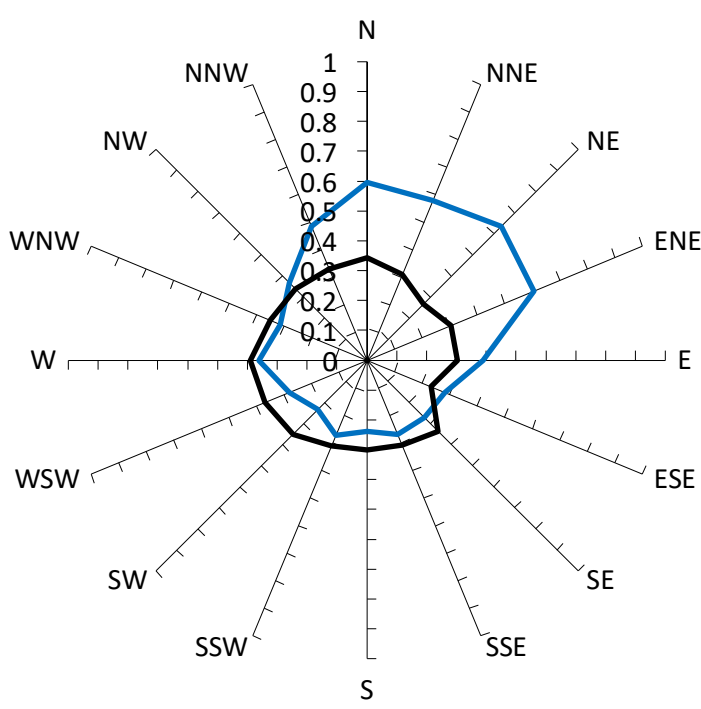
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

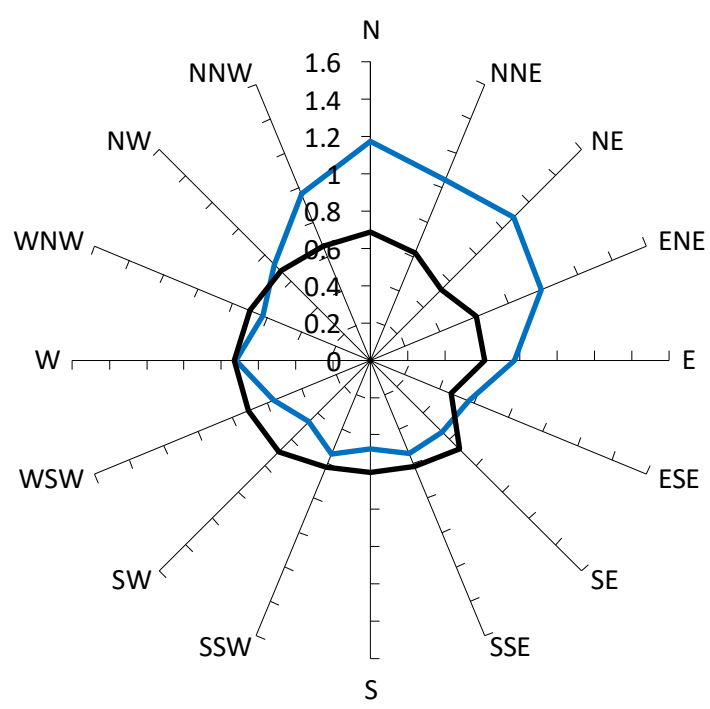
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P51



GEM Velocity Coefficients

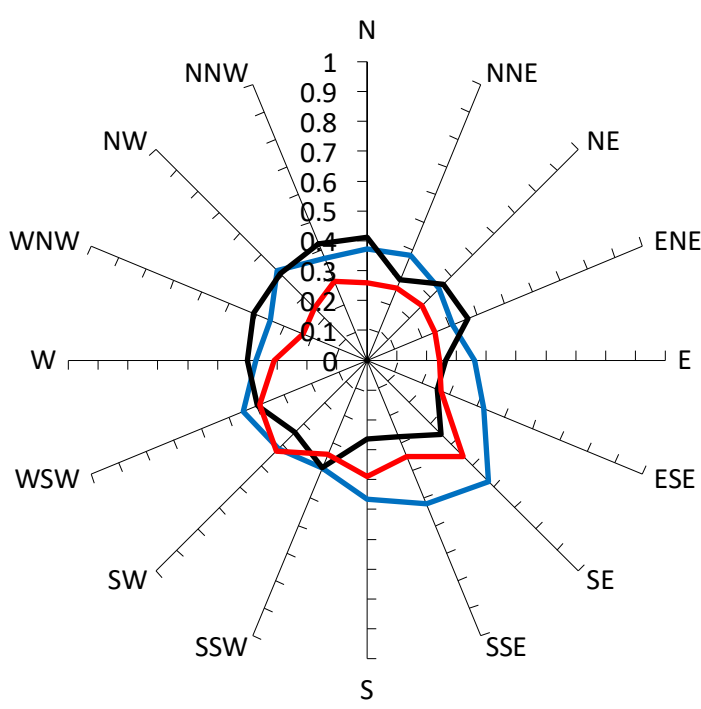


Gust Velocity Coefficients

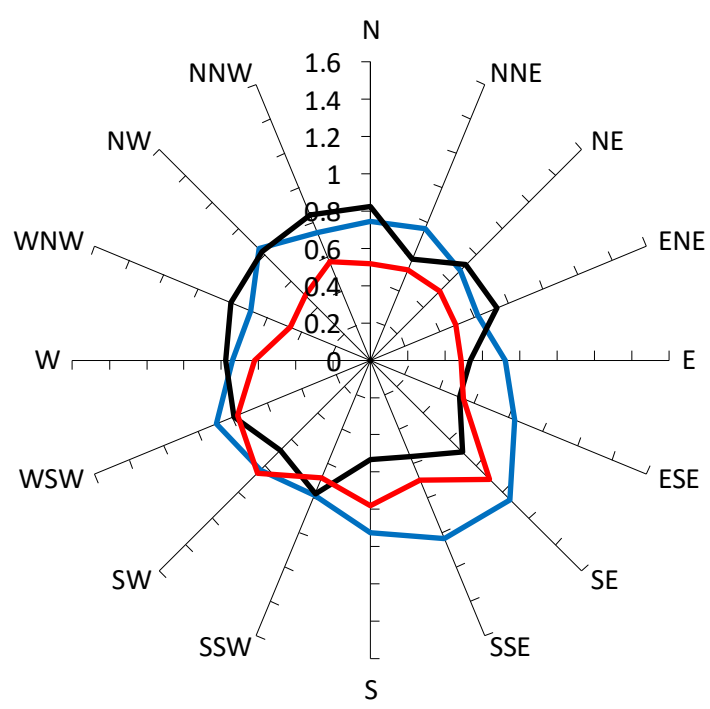
With development "as proposed", no vegetation or other treatments.

Existing site.

# Results for P52



GEM Velocity Coefficients



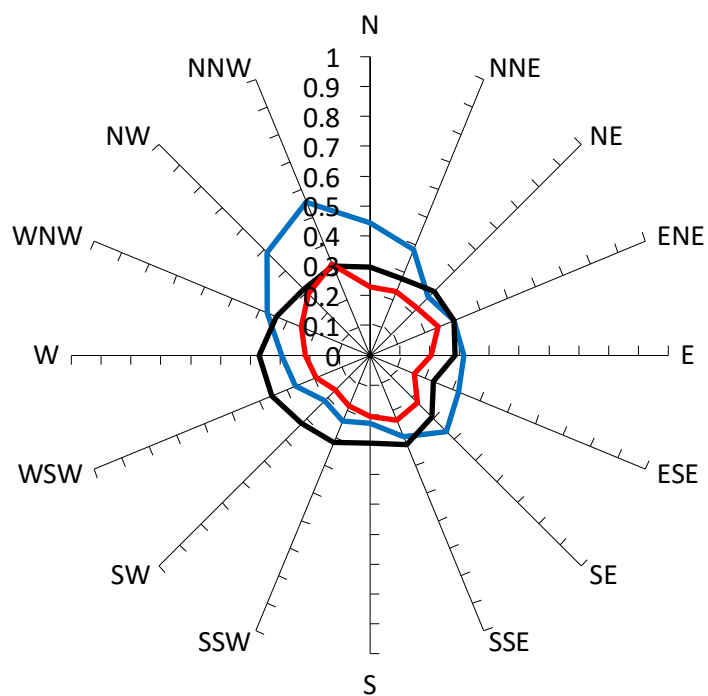
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

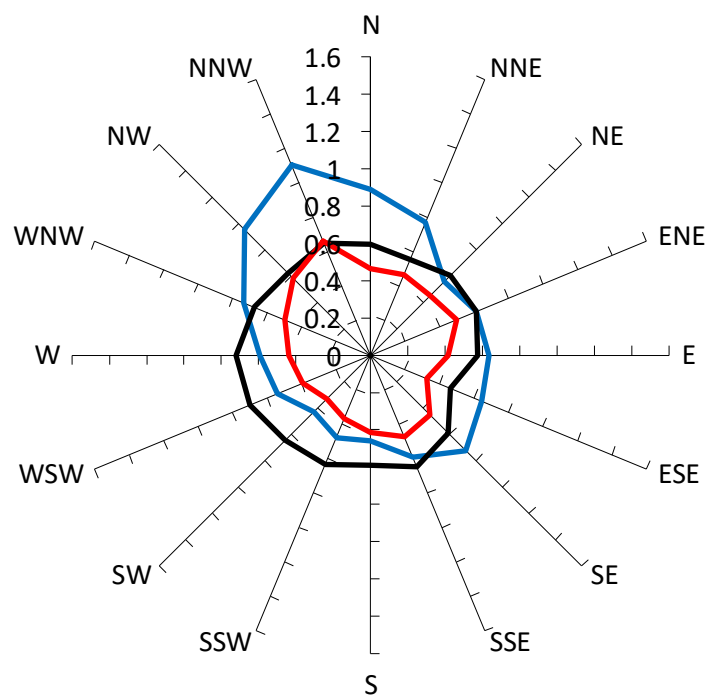
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P53



GEM Velocity Coefficients



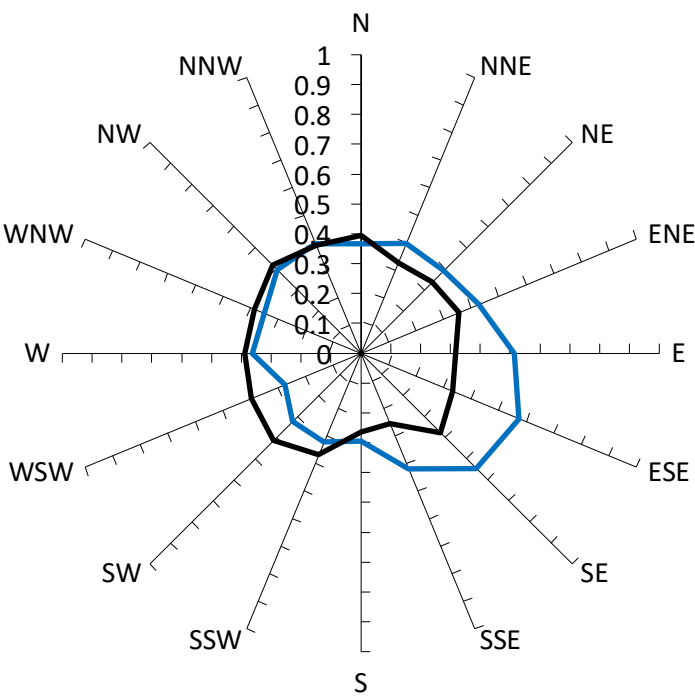
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

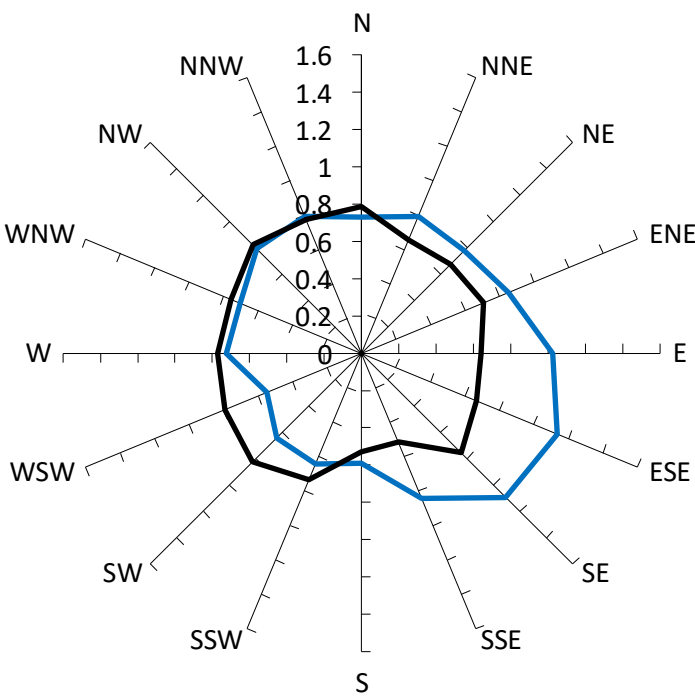
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P54



GEM Velocity Coefficients

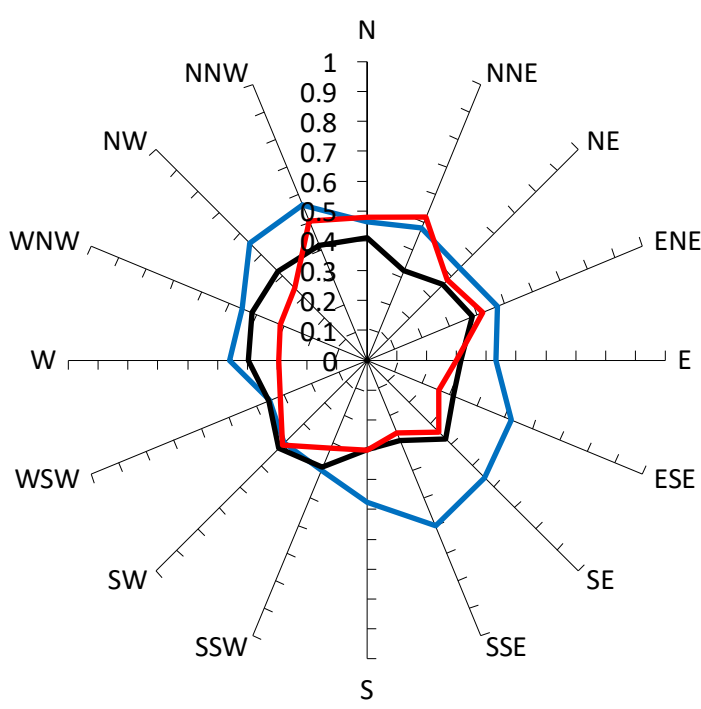


Gust Velocity Coefficients

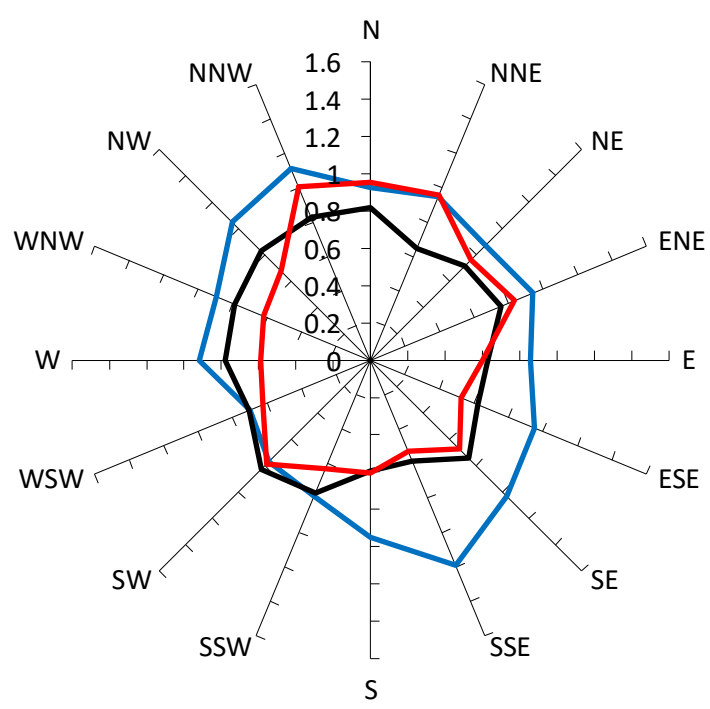
With development "as proposed", no vegetation or other treatments.

Existing site.

# Results for P55



GEM Velocity Coefficients



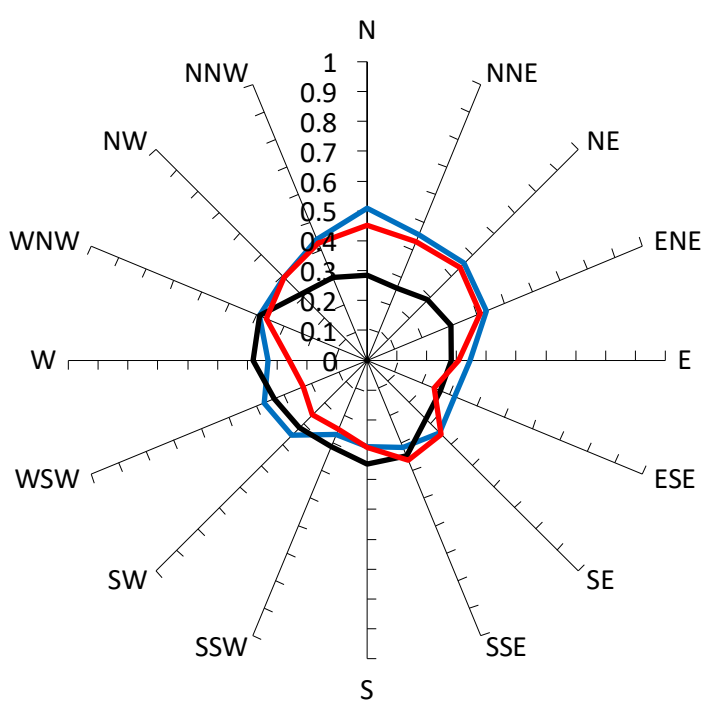
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

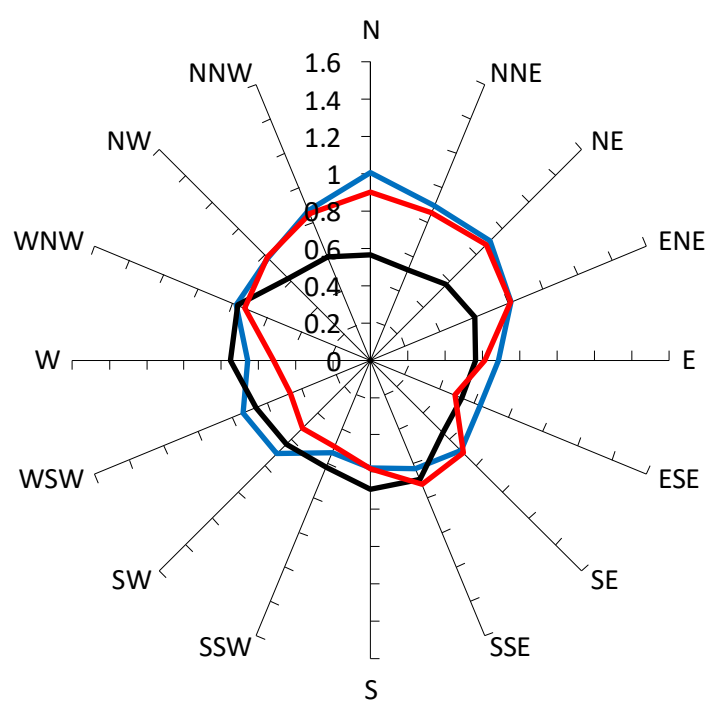
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P56



GEM Velocity Coefficients



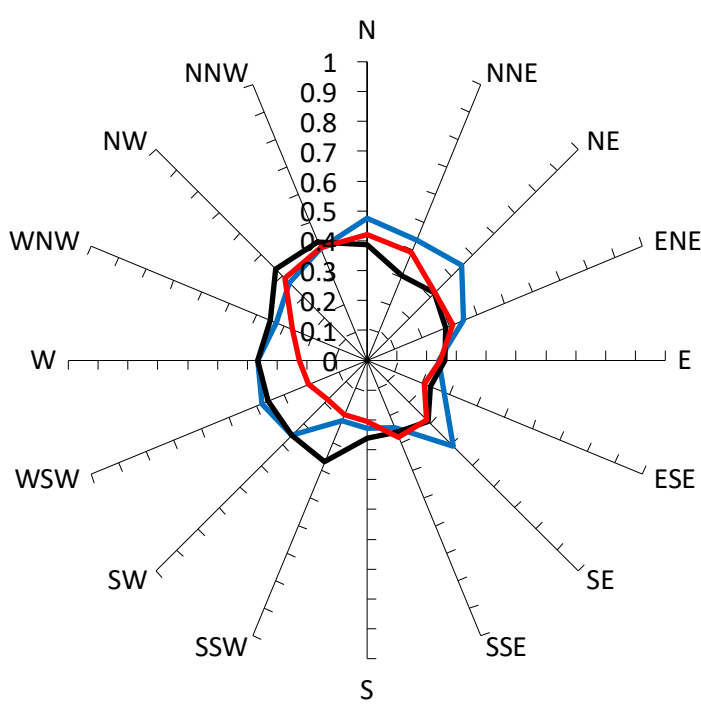
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

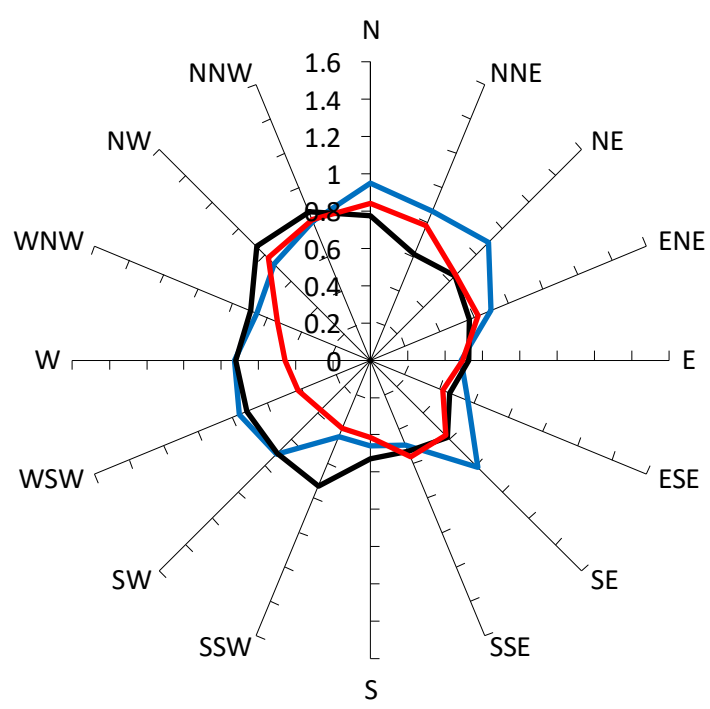
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P57



GEM Velocity Coefficients



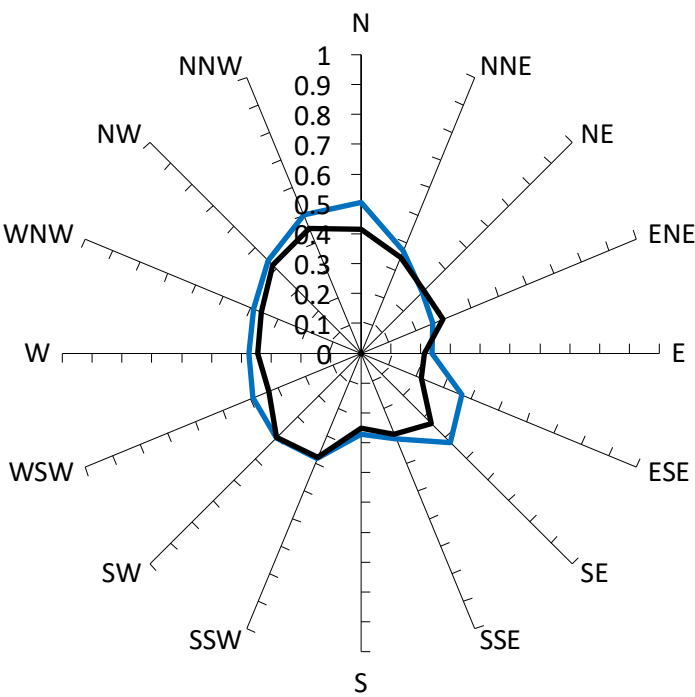
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

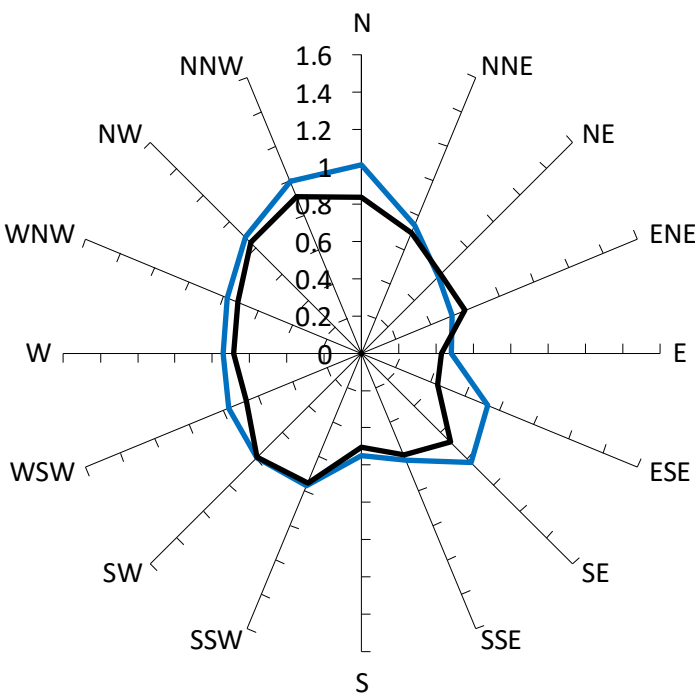
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P58



GEM Velocity Coefficients

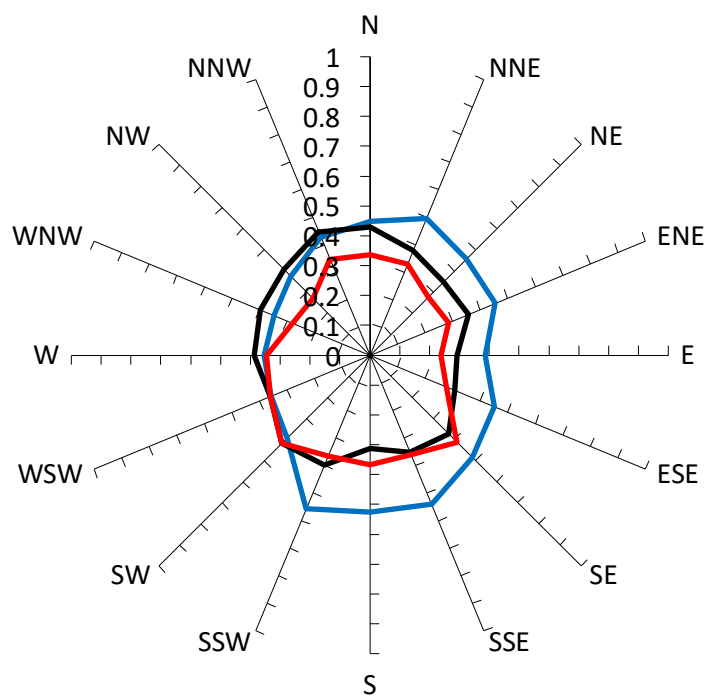


Gust Velocity Coefficients

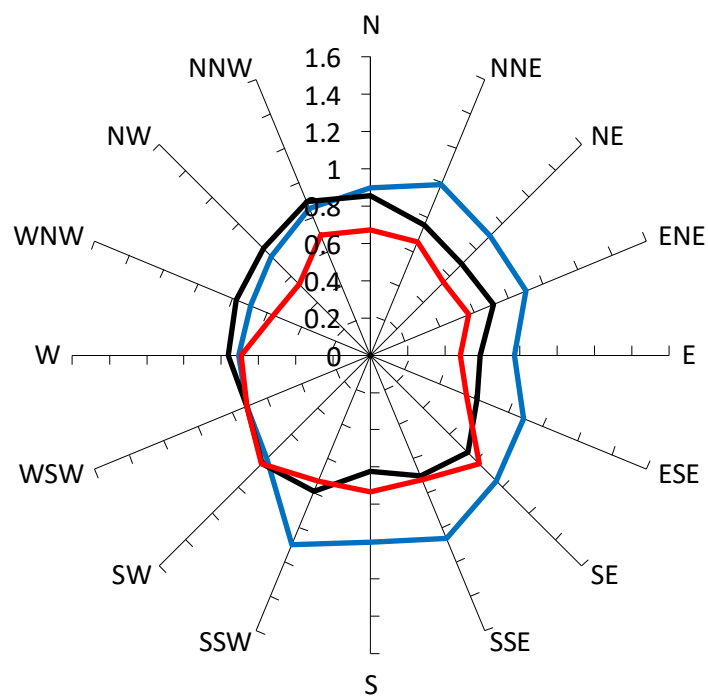
With development "as proposed", no vegetation or other treatments.

Existing site.

# Results for P59



GEM Velocity Coefficients



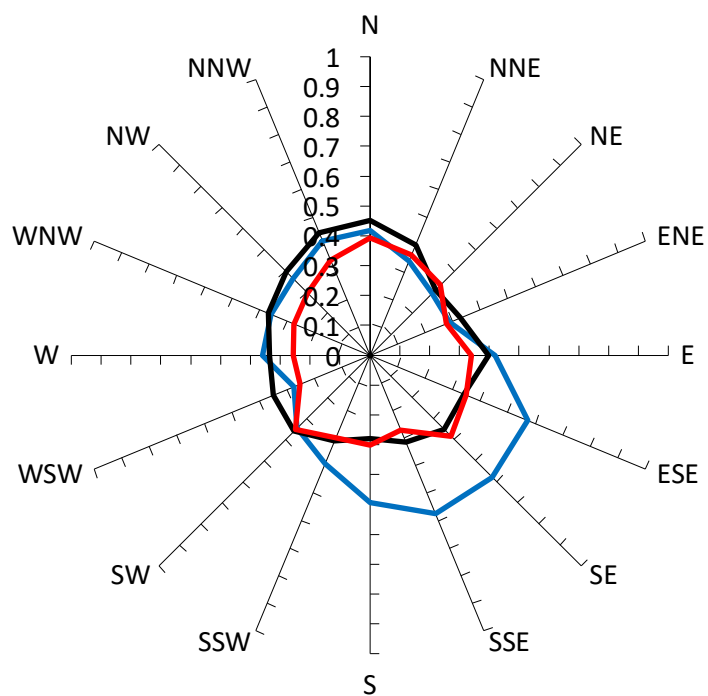
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

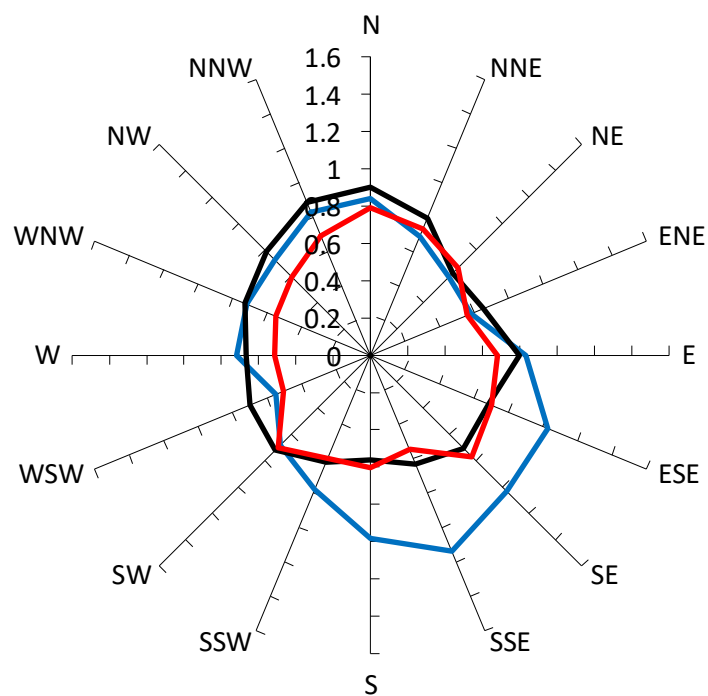
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P60



GEM Velocity Coefficients



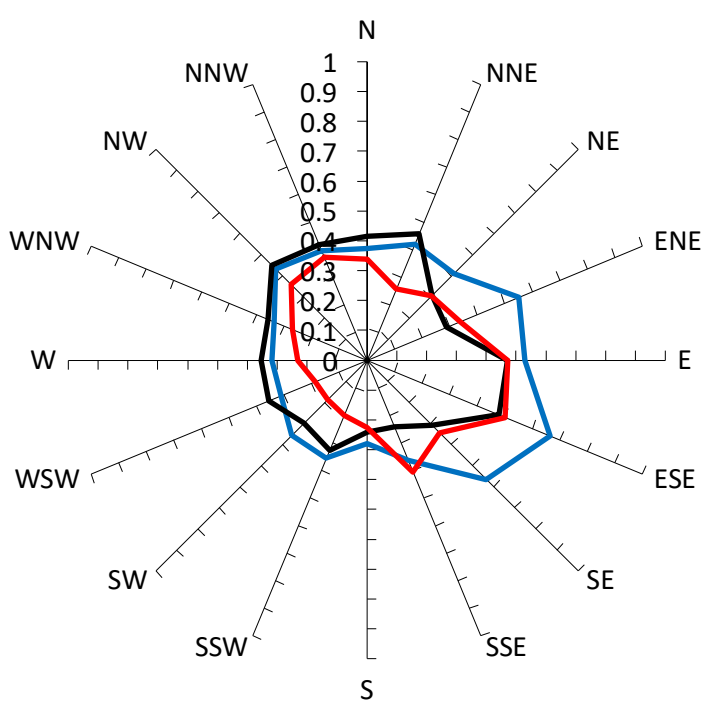
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

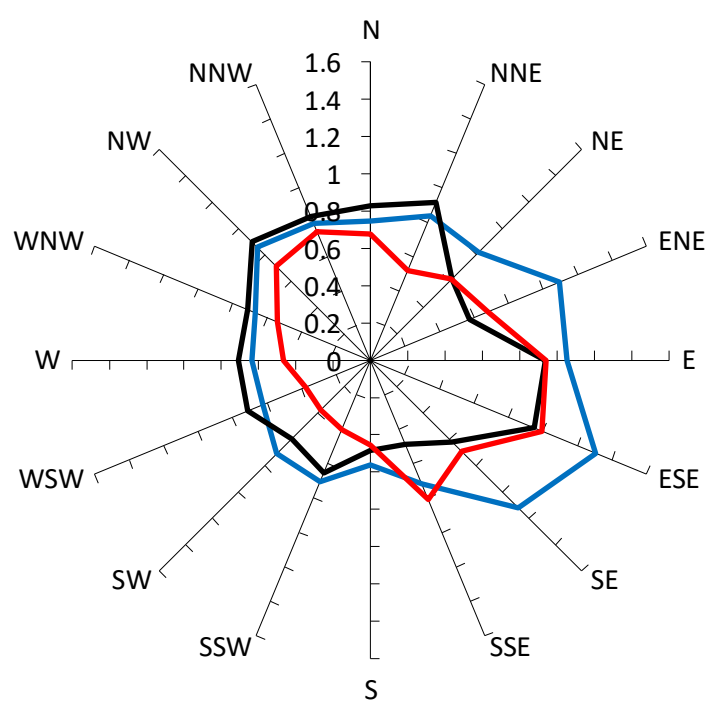
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P61



GEM Velocity Coefficients



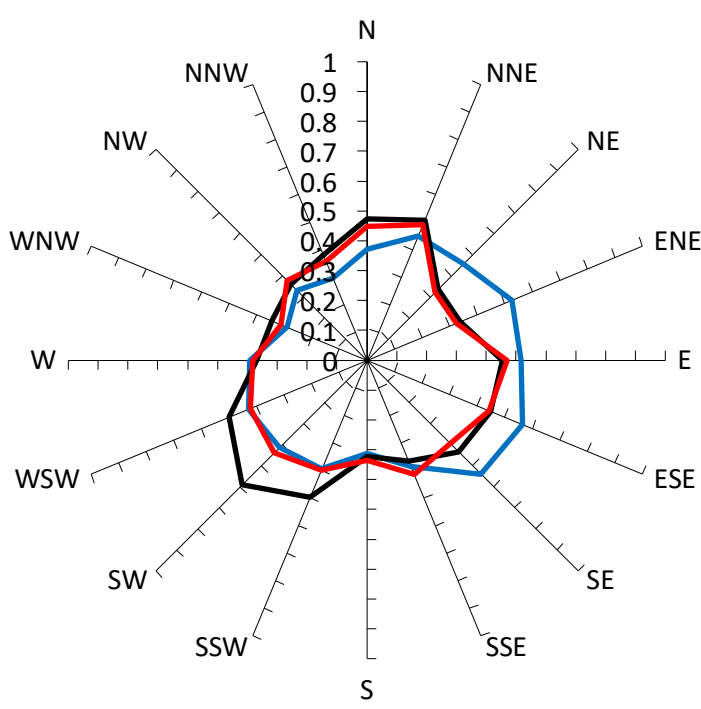
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

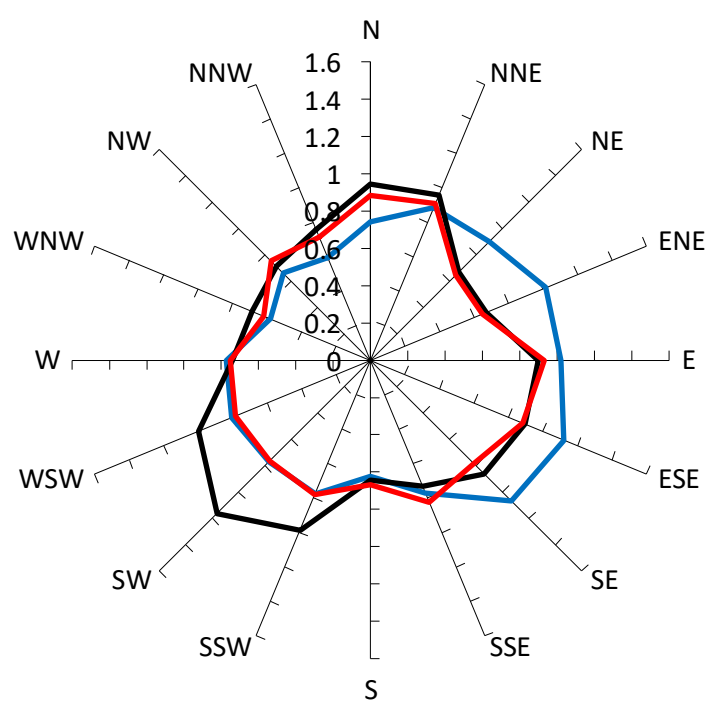
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P62



GEM Velocity Coefficients



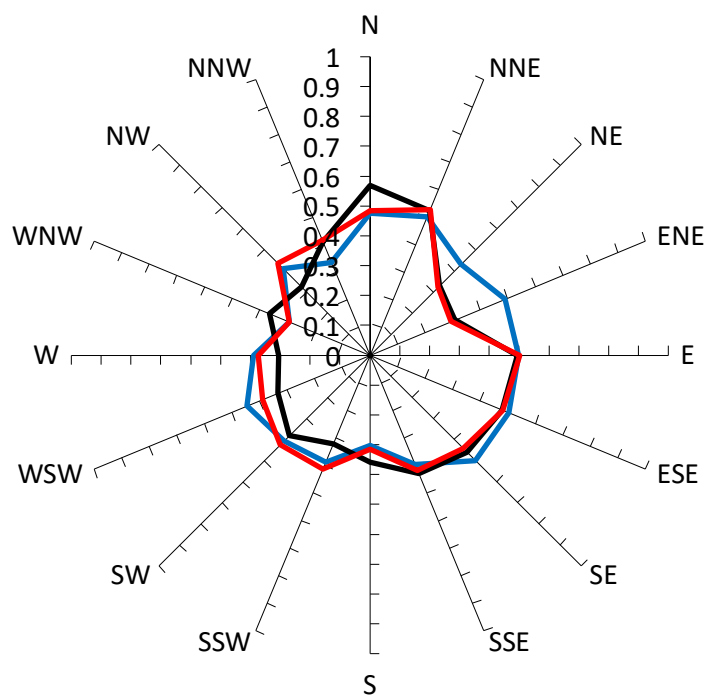
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

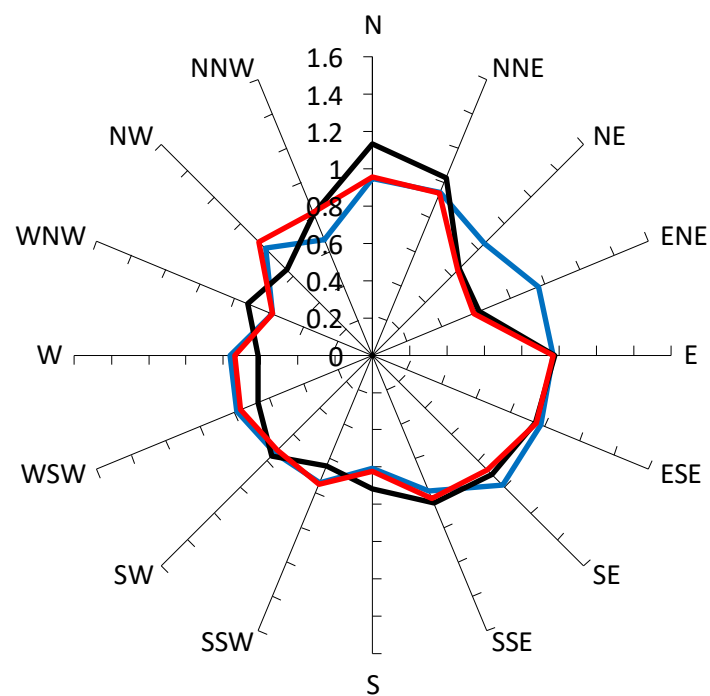
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P63



GEM Velocity Coefficients



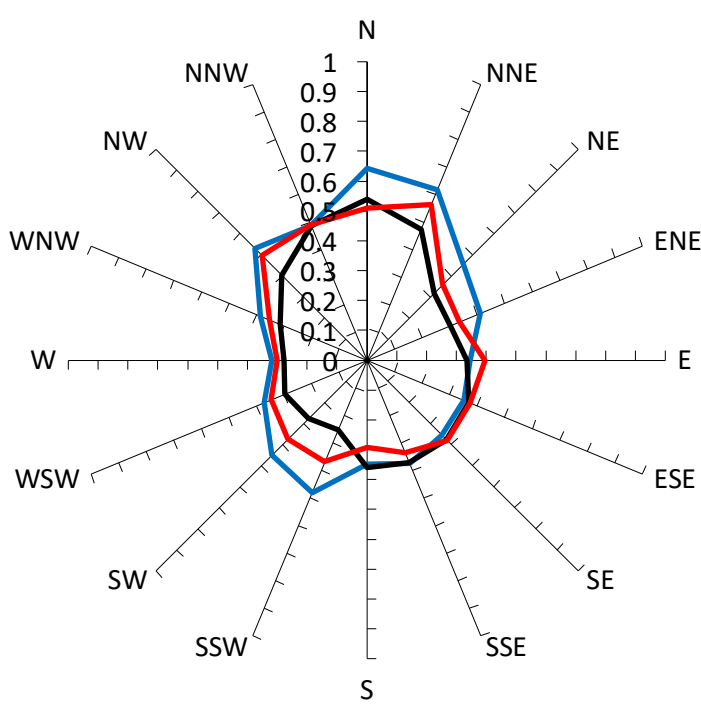
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

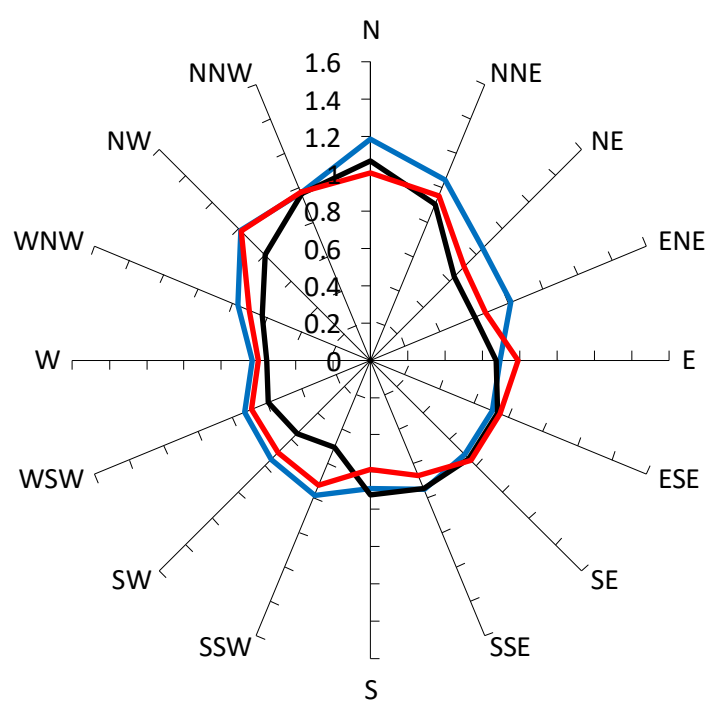
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P64



GEM Velocity Coefficients



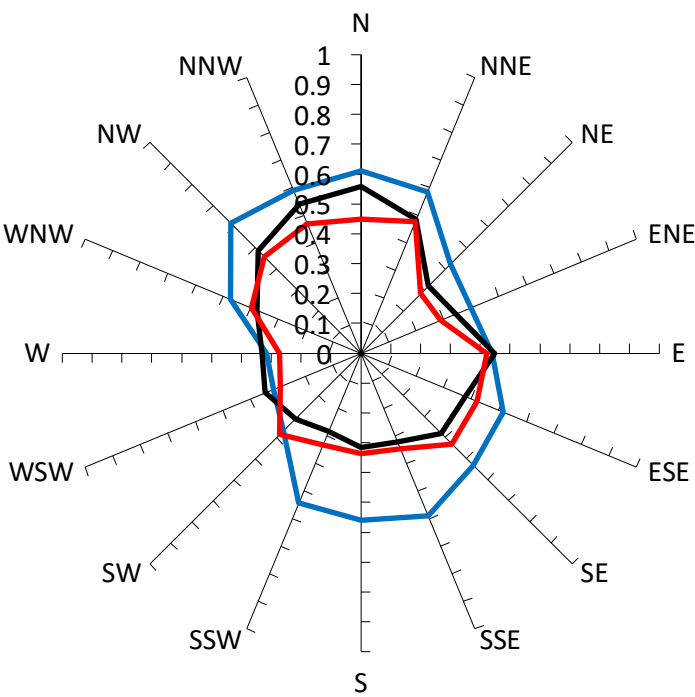
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

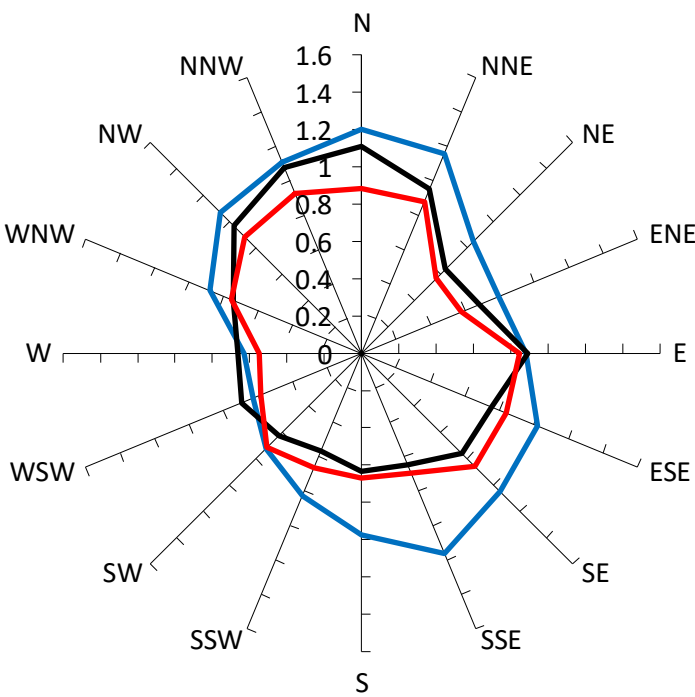
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P65



GEM Velocity Coefficients



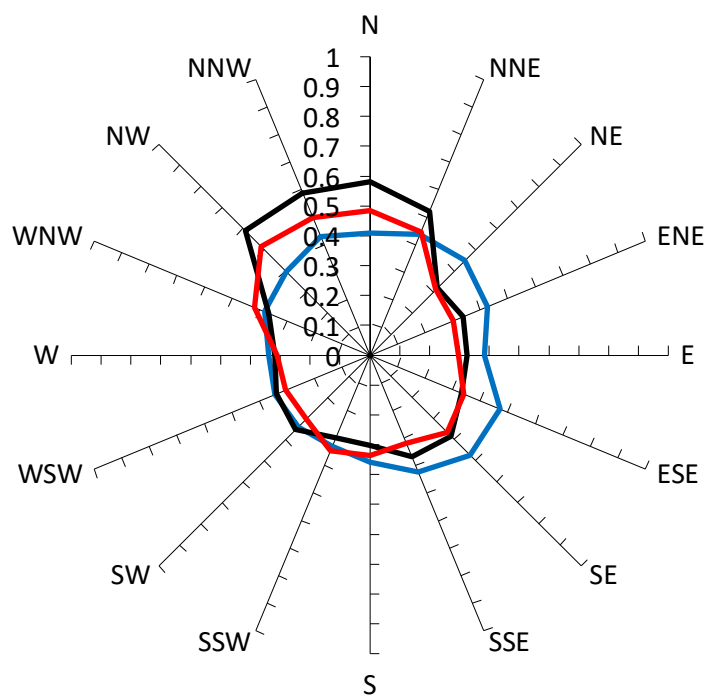
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

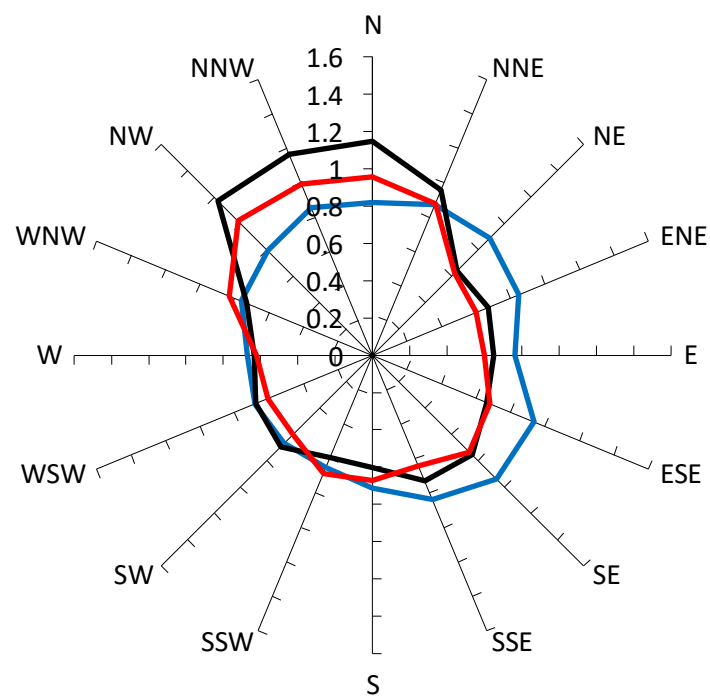
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P66



GEM Velocity Coefficients



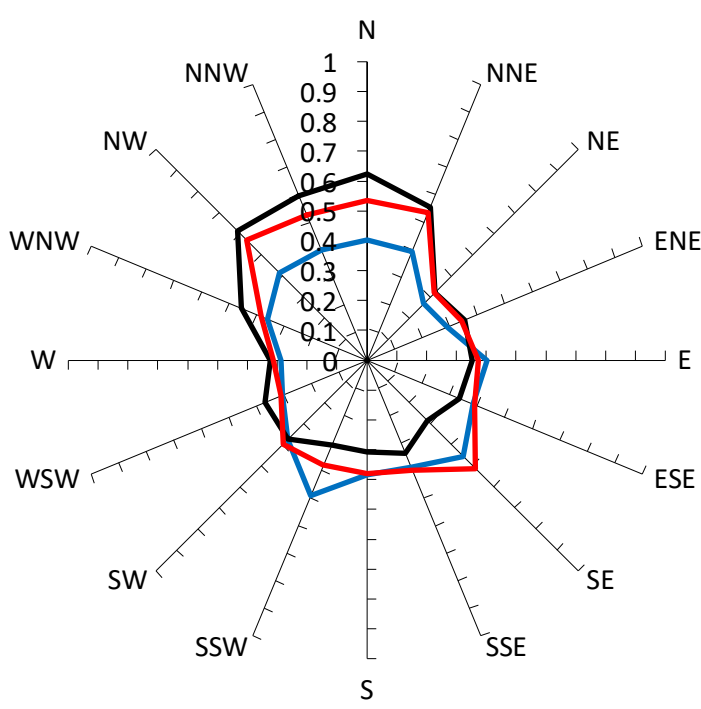
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

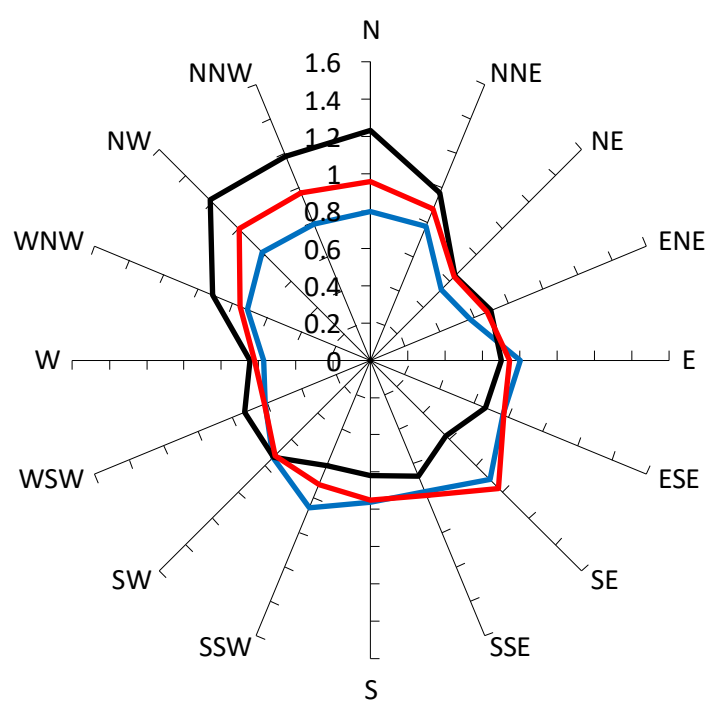
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P67



GEM Velocity Coefficients



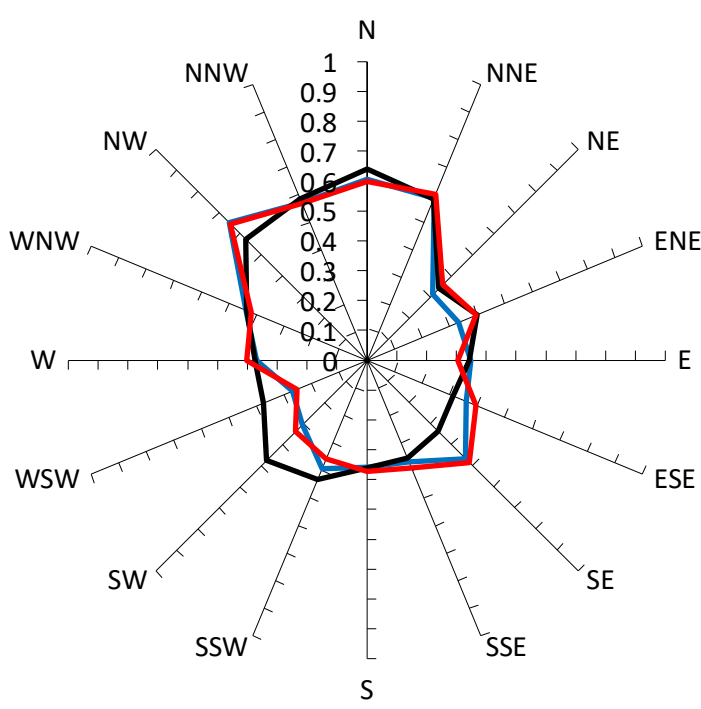
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

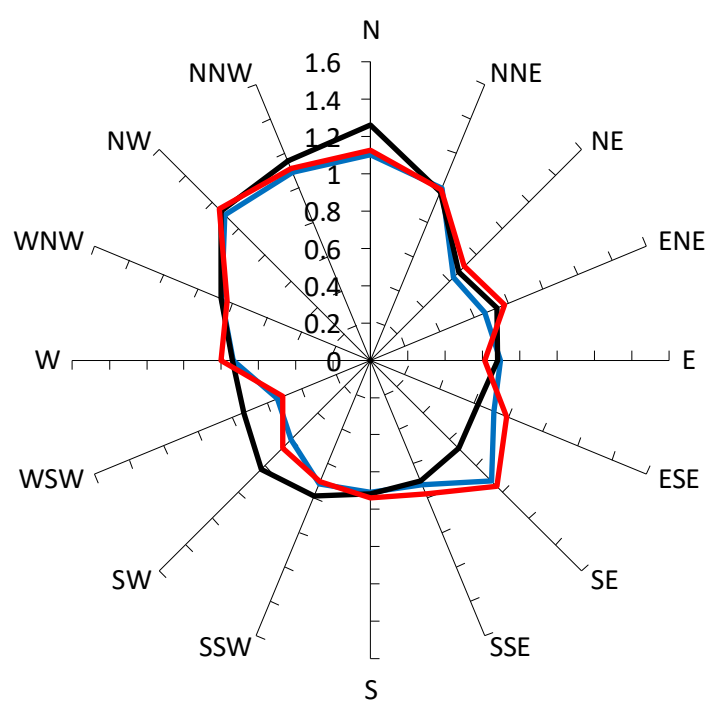
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P68



GEM Velocity Coefficients



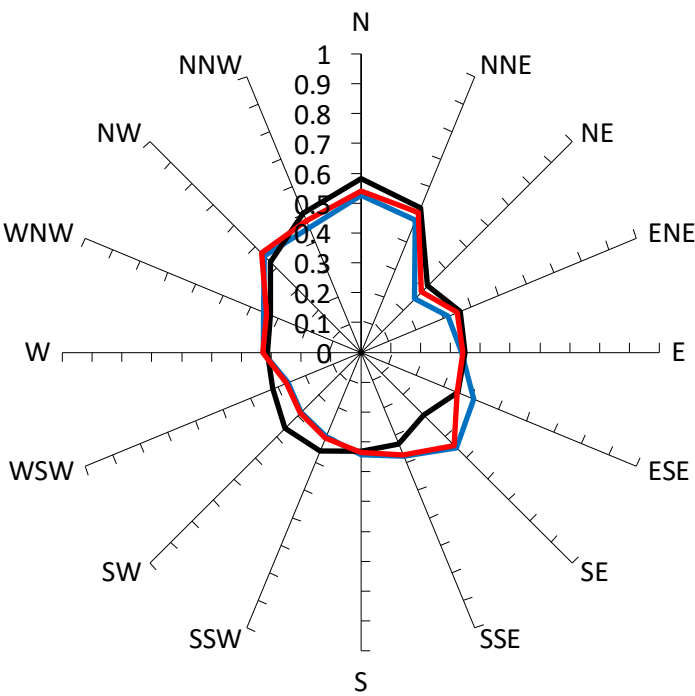
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

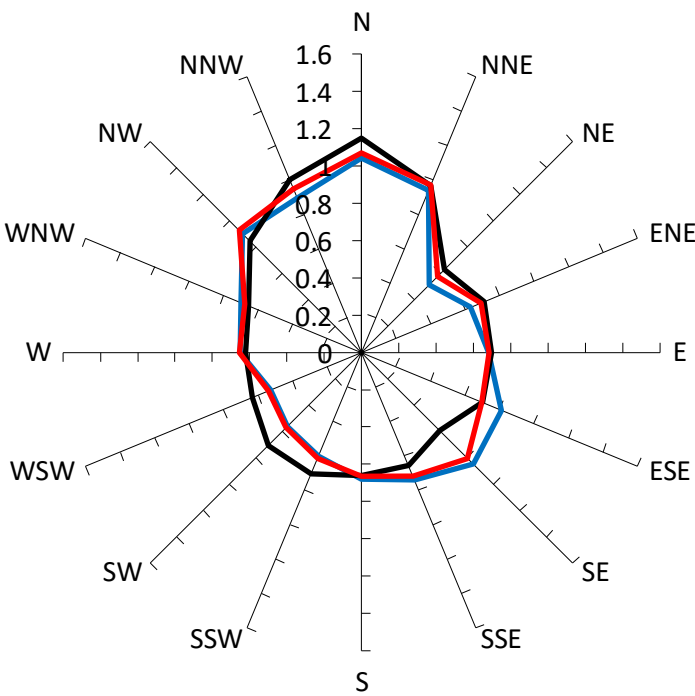
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P69



GEM Velocity Coefficients



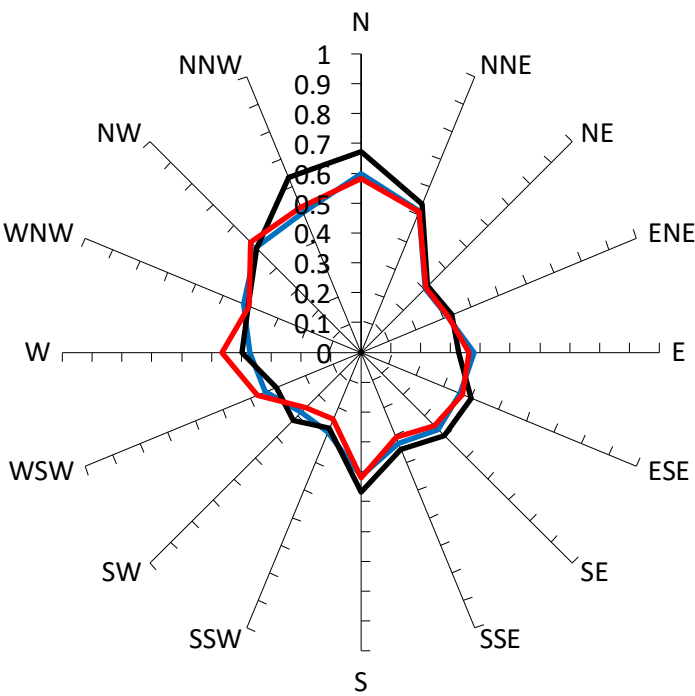
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

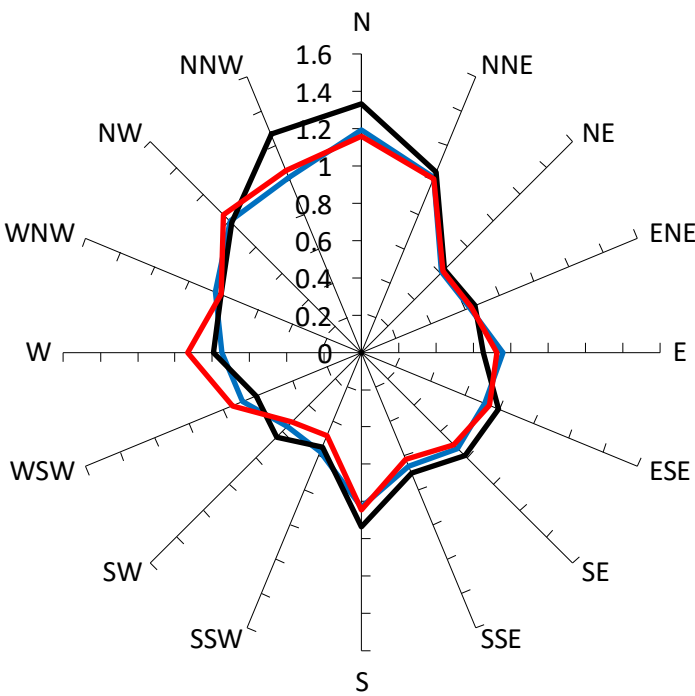
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P70



GEM Velocity Coefficients



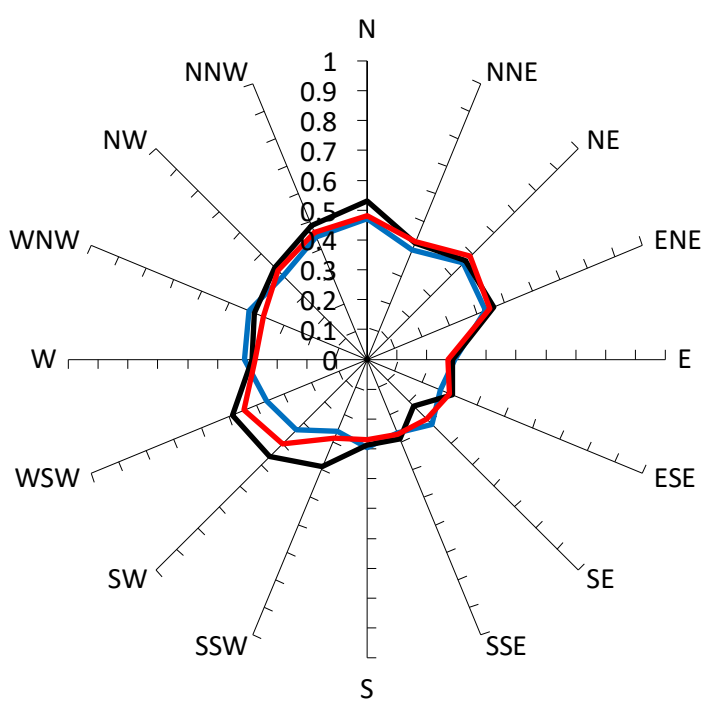
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

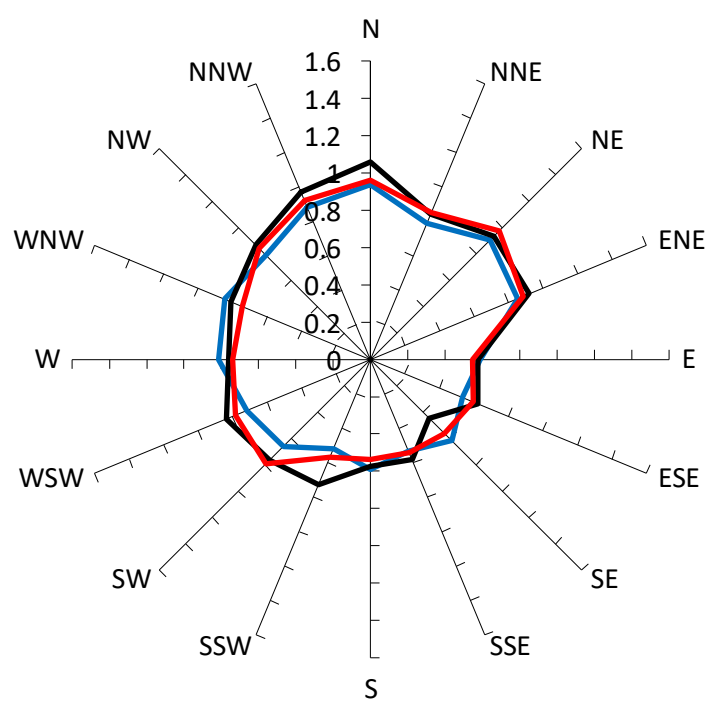
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P71



GEM Velocity Coefficients



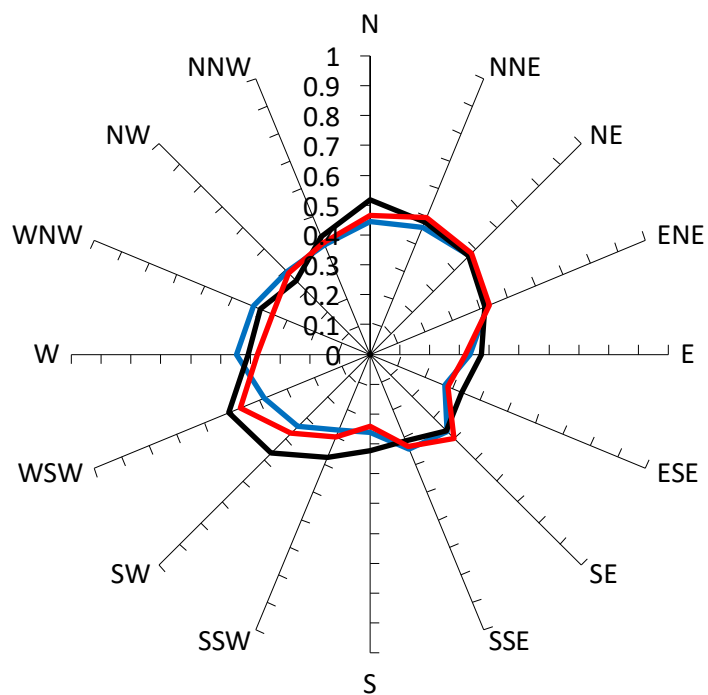
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

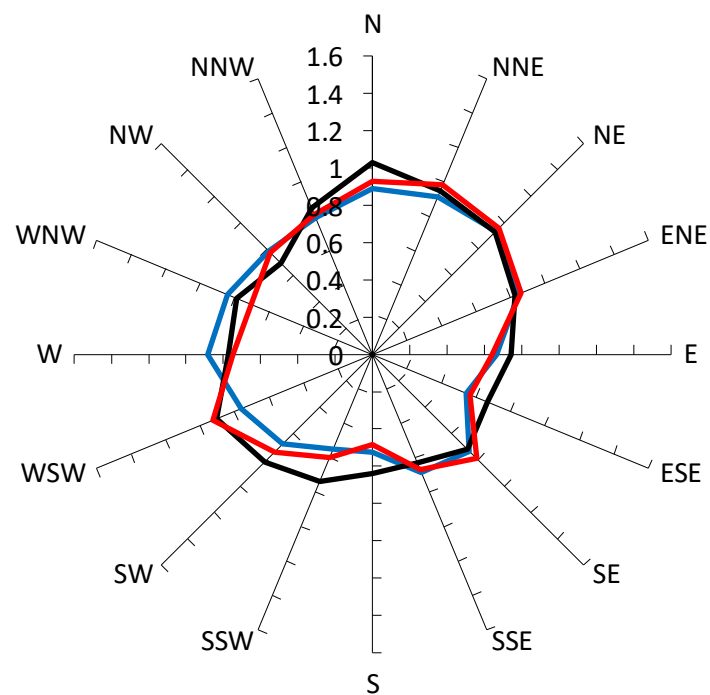
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P72



GEM Velocity Coefficients



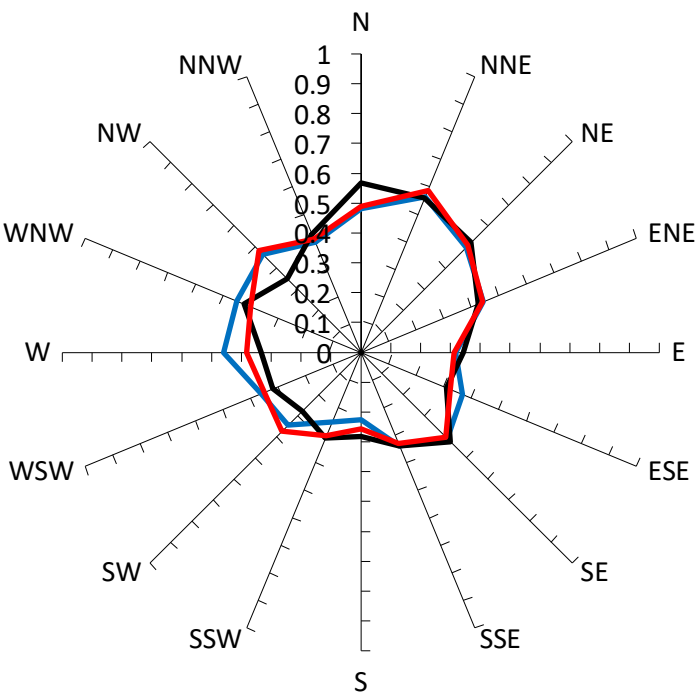
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

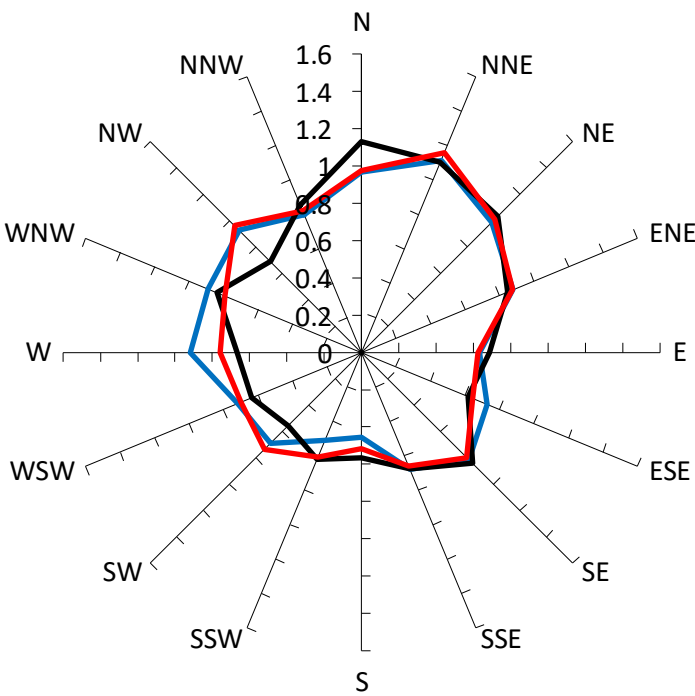
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P73



GEM Velocity Coefficients



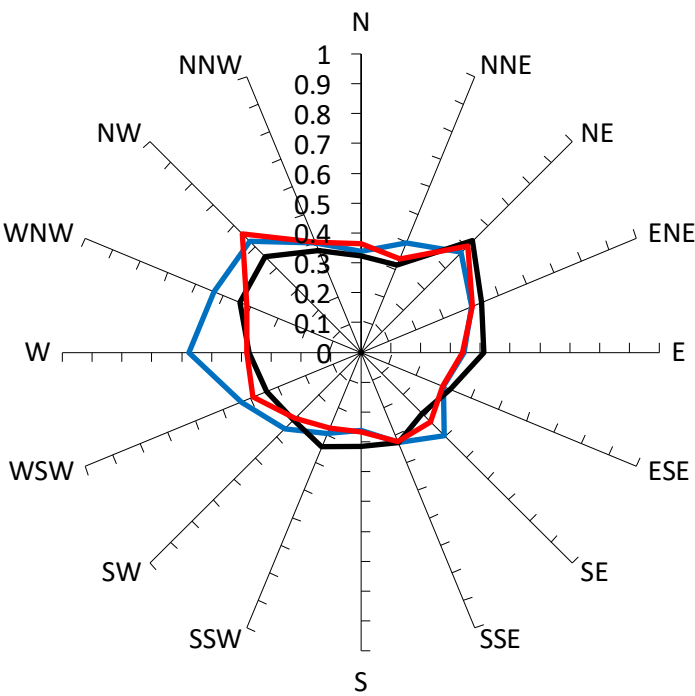
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

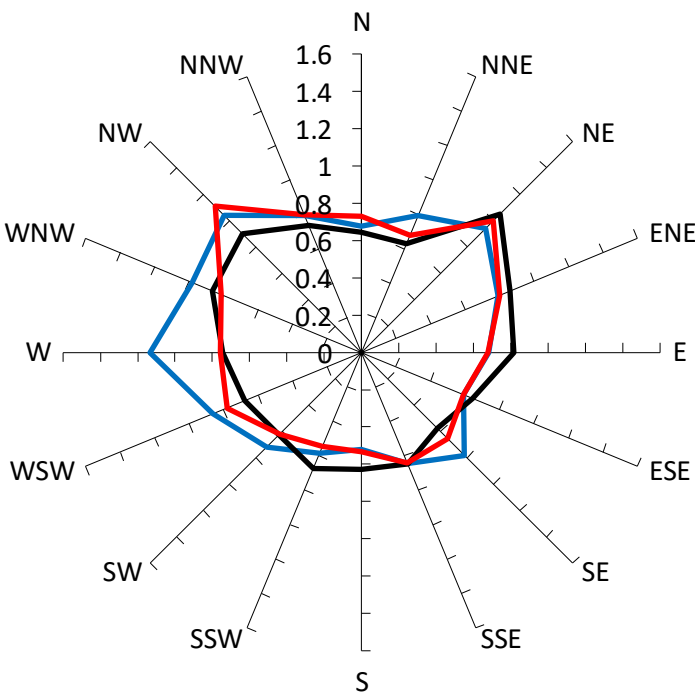
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P74



GEM Velocity Coefficients



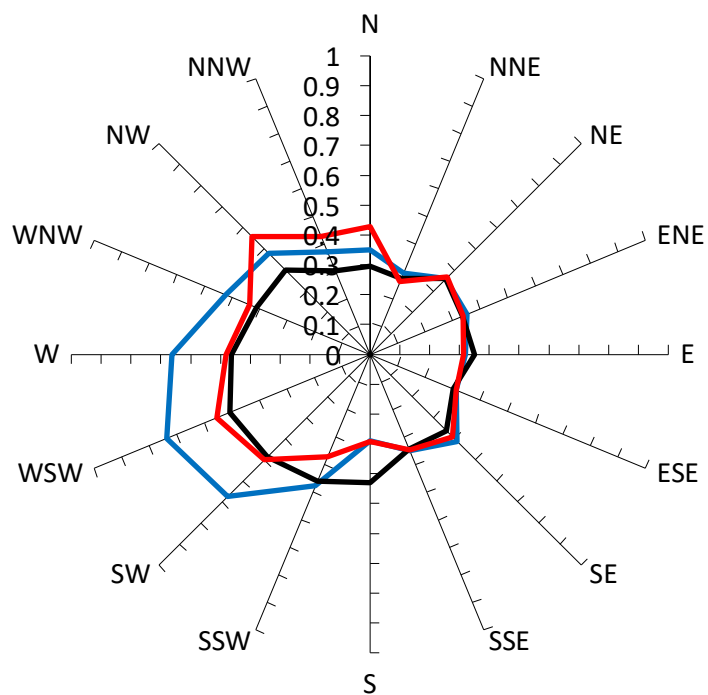
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

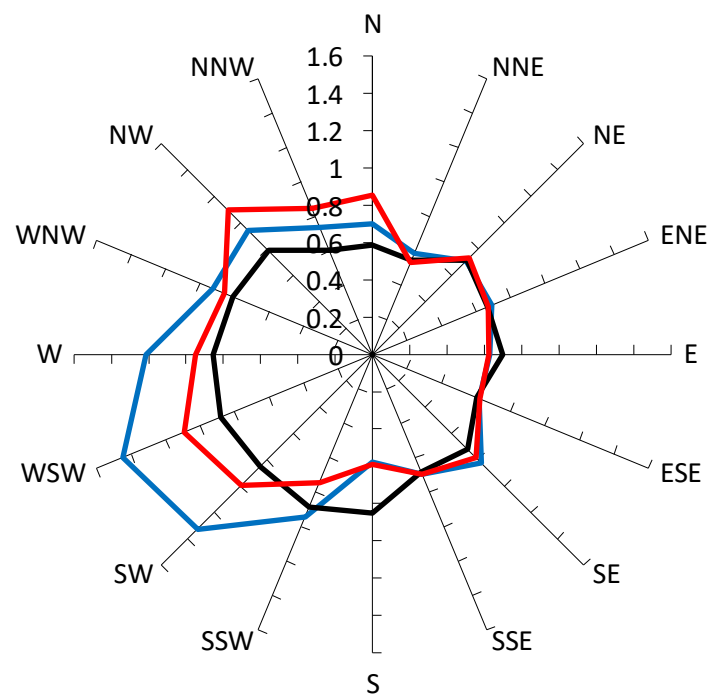
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P75



GEM Velocity Coefficients



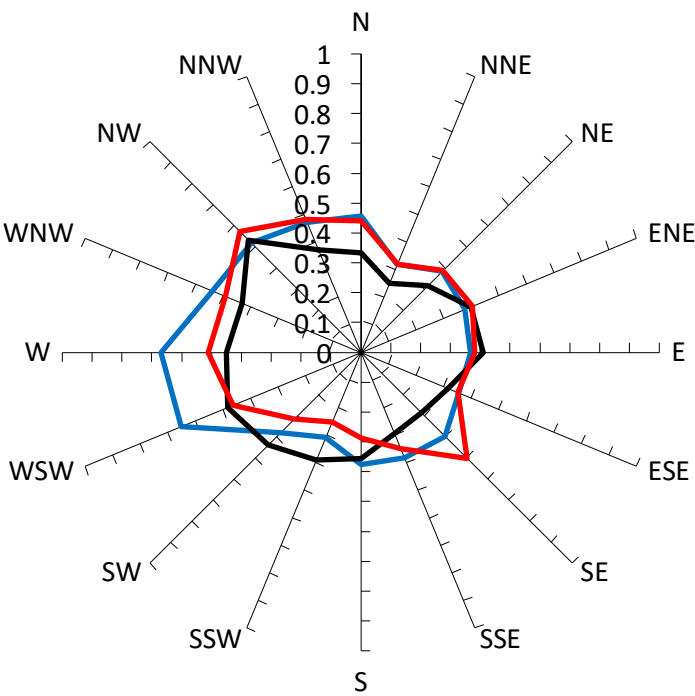
Gust Velocity Coefficients

With development "as proposed", no vegetation or other treatments.

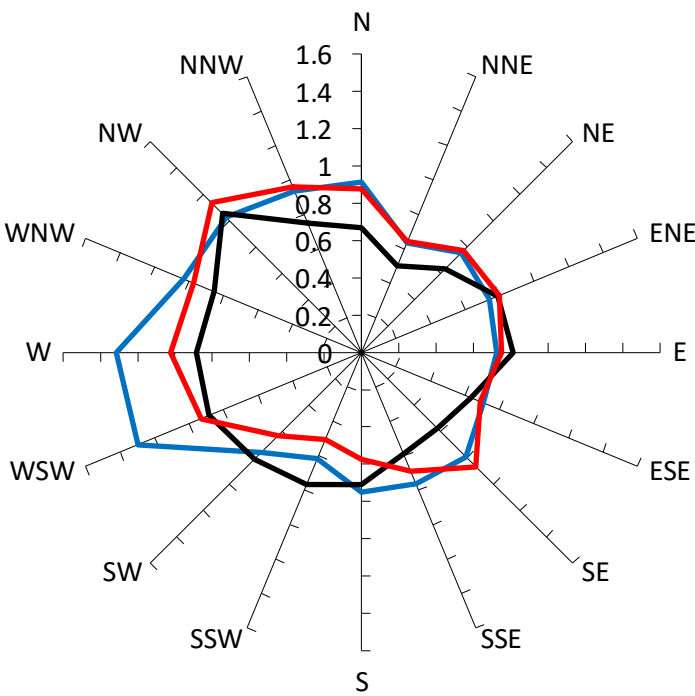
Existing site.

With development "as approved", no vegetation or other treatments.

# Results for P76



GEM Velocity Coefficients



Gust Velocity Coefficients

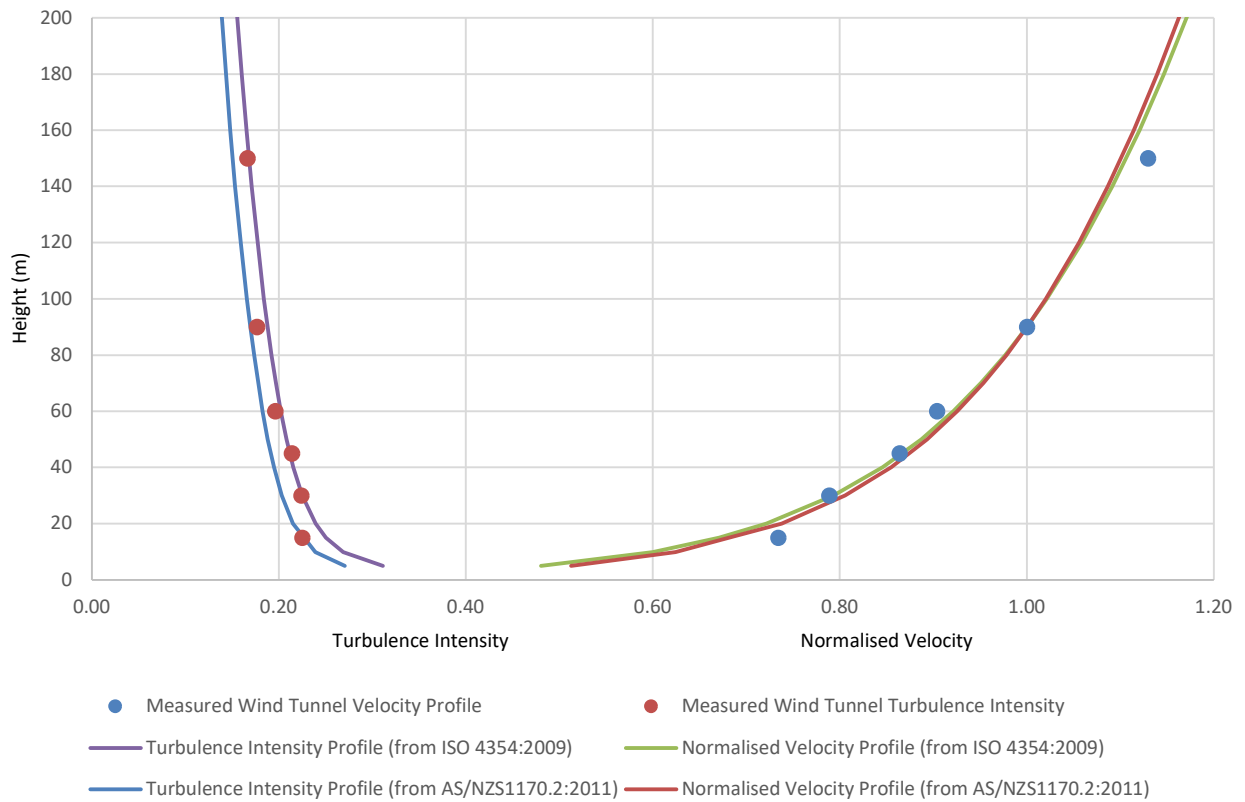
With development "as proposed", no vegetation or other treatments.

Existing site.

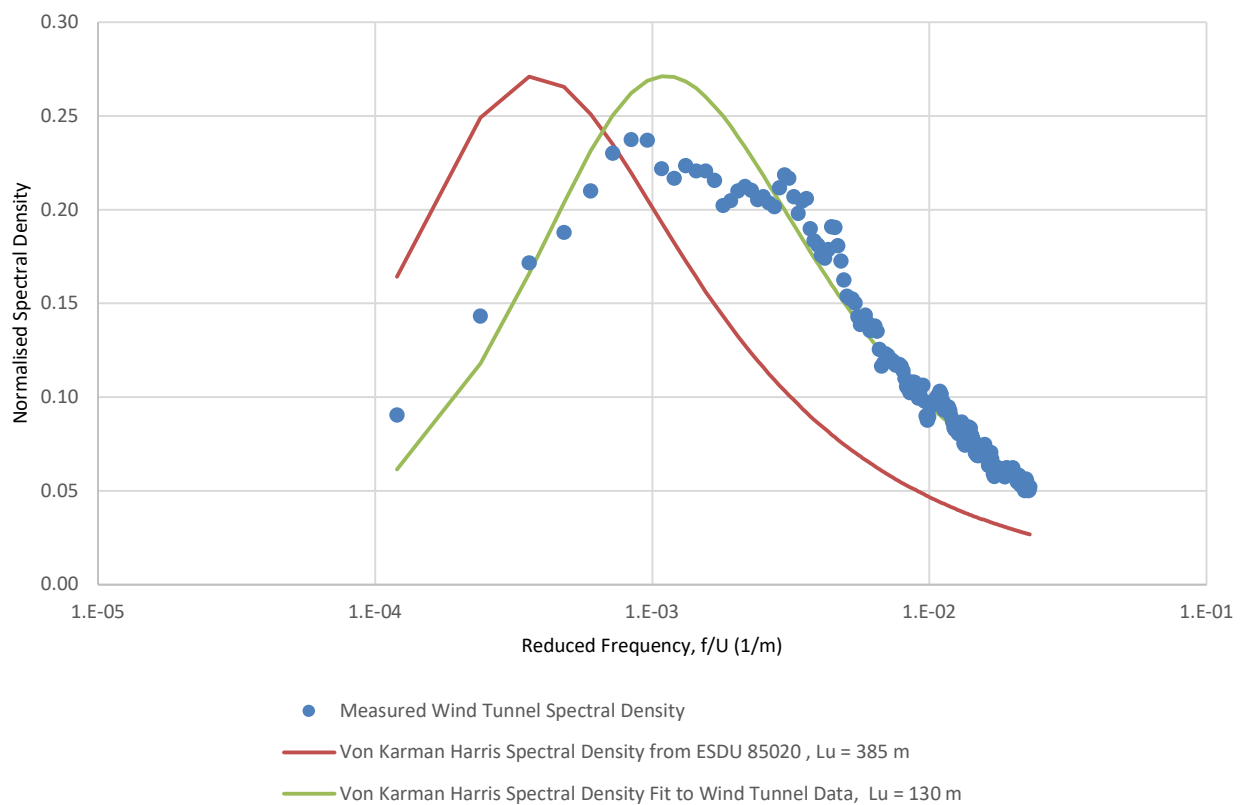
With development "as approved", no vegetation or other treatments.

## APPENDIX E VELOCITY AND TURBULENCE INTENSITY PROFILES

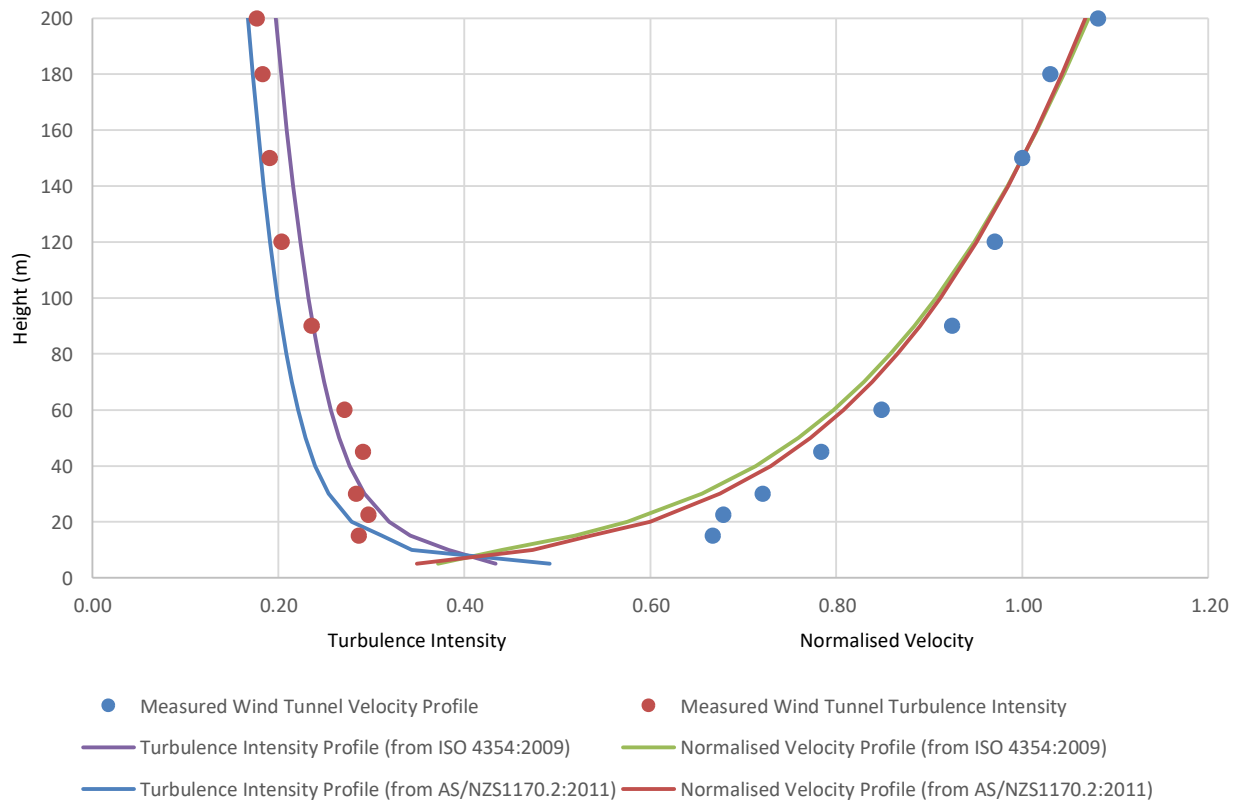
### Mean Velocity and Turbulence Intensity for Suburban/Forest Terrain ( $0.2\text{m} < z_0 < 0.3\text{m}$ ) (TC3) at a 1:300 Scale



### Longitudinal Spectra Density for Suburban/Forest Terrain ( $0.2\text{m} < z_0 < 0.3\text{m}$ ) (TC3) at a 1:300 Scale



### Mean Velocity and Turbulence Intensity for Semi-Urban Terrain ( $0.6\text{m} < z_0 < 1.0\text{m}$ ) (TC3.5) at a 1:300 Scale



### Longitudinal Spectra Density for Semi-Urban Terrain ( $0.6\text{m} < z_0 < 1.0\text{m}$ ) (TC3.5) at a 1:300 Scale

