



PEDESTRIAN WIND ENVIRONMENT STATEMENT

448-550 & 552 PACIFIC HIGHWAY ST LEONARDS

WD183-01F02(REV0)- WS REPORT

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Prepared for:

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DOCUMENT CONTROL

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EXECUTIVE SUMMARY

This report is in relation to the proposed development located at 448-550 & 552 Pacific Highway St Leonards, and presents an opinion on the likely impact of the proposed design on the local wind environment to the critical outdoor areas within and around the subject development. The effect of wind activity is examined for the three predominant wind directions for the Sydney region; namely the north-easterly, southerly and westerly winds. The analysis of the wind effects relating to the proposed development was carried out in the context of the local wind climate, building morphology and land topography.

The conclusions of this report are drawn from our extensive experience in this field and are based on an examination of the architectural drawings prepared by MD+A Architects, received July, 2016. No wind tunnel testing has been undertaken for the subject development, and hence this report addresses only the general wind effects and any localised effects that are identifiable by visual inspection. Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

The results of this study indicate that wind conditions within and around the various outdoor areas of the site will be acceptable for their intended uses with the following recommendations incorporated into the design:

- The solid blade walls along the eastern and western perimeter of the short-stay parking and guest drop-off area are to be louvered or have a porosity of between 25-50%.
- Retention of the proposed brise soleil awnings along the northern building façade.
- The inclusion of densely foliating vegetation capable of growing to a height of 1.5m within the proposed planters along the perimeter edge of the rooftop communal terrace.
- The inclusion of additional set of planter boxes with densely foliating vegetation capable of growing to a height of 1.5m within the proposed planters adjacent to the central lift/stair-core of the rooftop communal terrace.

With the inclusion of the abovementioned recommendations, it is expected that wind conditions for all outdoor trafficable areas within the subject development will be suitable for their intended uses. The densely foliating vegetation is to be of an evergreen species to ensure their effectiveness in wind mitigation throughout the year.

It should be noted that wind tunnel testing is currently being undertaken for this development to determine the impact on the wind conditions within and around the subject development. This will provide a quantitative analysis of the wind conditions and determine the requirement for treatments, including the size and extent of treatments to ensure suitable conditions are provided.

1 DESCRIPTION OF THE DEVELOPMENT AND SURROUNDINGS

The development site is bound by Pacific Highway to the north, low-rise buildings to the east and west, and a narrow laneway to the south (Christie Lane). Low-rise buildings lie further south, followed by residential housing. Note that a 44 storey building is proposed directly south of the site but is not considered as part of this wind assessment. Surrounding the site are predominantly medium to high rise buildings along the northern boundary with low to medium rise buildings along the remaining boundaries. Further away from the site are predominantly low-rise residential housing with commercial/retail developments interspersed throughout. A survey of the local land topography indicates a general rise towards the north and east of the site. An aerial image of the subject site and the local surroundings is shown in Figure 1.

The proposed development is for a hotel building with an overall height of 14 storeys above the local ground. Vehicular access into the development is provided off Christie Lane to the south. The critical trafficable areas associated with the proposed development, which are the focus of this assessment with regards to wind effects, are detailed as follows:

- The ground level pedestrian footpath and main entrance along the Pacific Highway frontage of the site.
- The ground level short-stay parking and guest drop-off area along the Christie Lane frontage of the site.
- The level 1 roof garden (assumed to be trafficable).
- The level 1 exterior gardens (assumed to be trafficable).
- The level 5 communal terrace (assumed to be trafficable).
- The rooftop communal terrace.

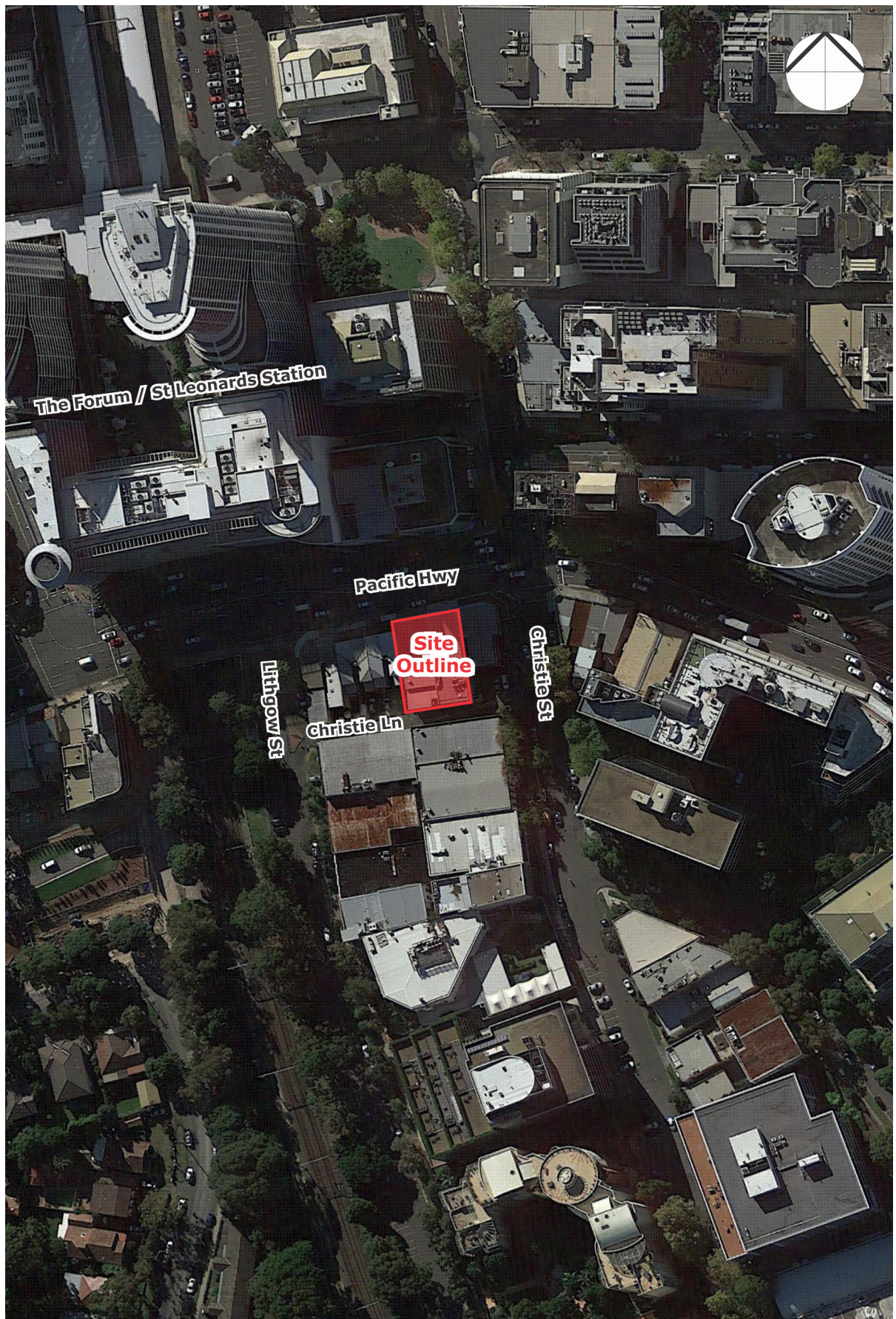


Figure 1: Aerial Image of the Site Location

2 WIND CLIMATE OF THE SYDNEY REGION

The Sydney region is governed by three principle wind directions, and these can potentially affect the subject development. These winds prevail from the north-east, south and west. A summary of the principal time of occurrence of these winds throughout the year is presented in Table 1 below. This summary is based on a detailed analysis undertaken by Windtech Consultants of recorded directional wind speeds obtained at the meteorological station located at Kingsford Smith Airport by the Bureau of Meteorology (recorded from 1939 to 2008). From this analysis, a directional plot of the annual and weekly recurrence winds for the Sydney region is also determined, as shown in Figure 2. The frequency of occurrence of these winds is also shown in Figure 2.

As shown in Figure 2, the southerly winds are by far the most frequent wind 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 since they occur during the winter and hence can be a cause for discomfort for outdoor areas. North-easterly winds occur most frequently during the warmer months of the year for the Sydney region, and hence are usually welcomed within outdoor areas since they are typically not as strong as the southerly or westerly winds.

Table 1: Principle Time of Occurrence of Winds for Sydney

Month	Wind Direction		
	North-Easterly	Southerly	Westerly
January	X	X	
February	X	X	
March	X	X	
April		X	X
May			X
June			X
July			X
August			X
September		X	X
October	X	X	
November	X	X	
December	X	X	

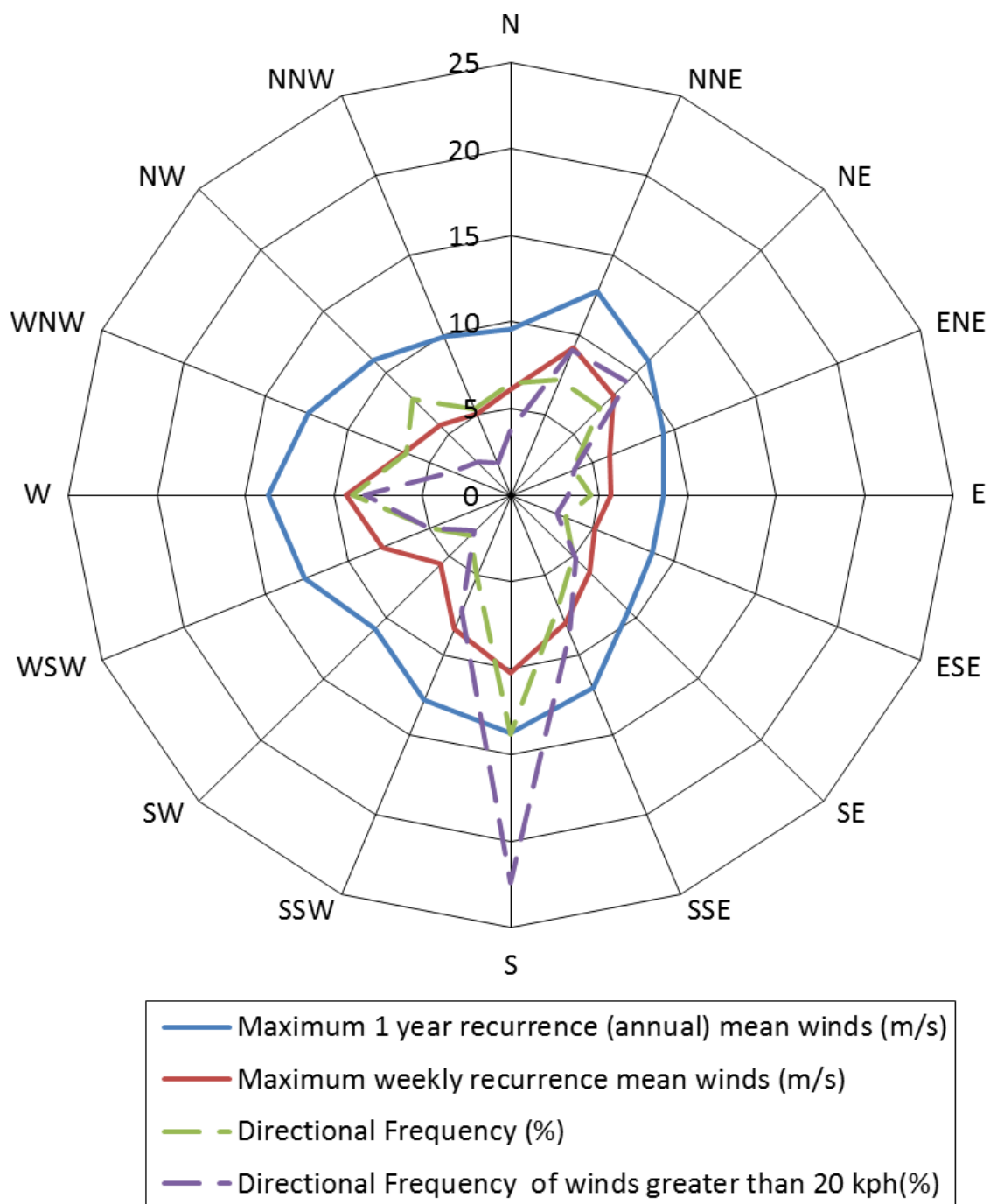


Figure 2: Annual and Weekly Recurrence Mean Wind Speeds, and Frequencies of Occurrence, for the Sydney Region (based on 10-minute mean observations from Kingsford Smith Airport from 1939 to 2008, corrected to open terrain at 10m)

3 WIND EFFECTS ON PEOPLE

The acceptability of wind in any area is dependent upon its use. For example, people walking or window-shopping will tolerate higher wind speeds than those seated at an outdoor restaurant. Various other researchers, such as Davenport, Lawson, Melbourne, Penwarden, etc, have published criteria for pedestrian comfort for pedestrians in outdoor spaces for various types of activities. Some Councils and Local Government Authorities have adopted elements of some of these into their planning control requirements in Australia.

The following table is an example, which was developed by Penwarden in 1975, and describes the effects of various wind intensities on people. Note that the applicability column relates to the indicated wind conditions occurring frequently (exceeded approximately once per week on average). Higher ranges of wind speeds can be tolerated for rarer events.

Table 2: Summary of Wind Effects on People (Penwarden, 1975)

Type of Winds	Mean Wind Speed (m/s)	Effects	Applicability
Calm, light air	0 - 1.5	Calm, no noticeable wind.	Generally acceptable for Stationary, long exposure activities such as in outdoor restaurants, landscaped gardens and open air theatres.
Light breeze	1.6 - 3.3	Wind felt on face.	
Gentle breeze	3.4 - 5.4	Hair is disturbed, Clothing flaps.	
Moderate breeze	5.5 - 7.9	Raises dust, dry soil and loose paper. Hair disarranged.	Generally acceptable for walking & stationary, short exposure activities such as window shopping, standing or sitting in plazas.
Fresh breeze	8.0 - 10.7	Force of wind felt on body.	Acceptable as a main pedestrian thoroughfare
Strong breeze	10.8 - 13.8	Umbrellas used with difficulty, Hair blown straight, Difficult to walk steadily, Wind noise on ears unpleasant.	Acceptable for areas where there is little pedestrian activity or for fast walking.
Near gale	13.9 - 17.1	Inconvenience felt when walking.	
Gale	17.2 - 20.7	Generally impedes progress, Great difficulty with balance.	Unacceptable as a public accessway.
Strong gale	20.8 - 24.4	People blown over by gusts.	Completely unacceptable.

It should be noted that wind speeds can only be accurately quantified with a wind tunnel study. This assessment addresses only the general wind effects and any localised effects that are identifiable by visual inspection and the acceptability of the conditions for outdoor areas are determined based on their intended use (rather than referencing specific wind speeds). Any recommendations in this report are made only in-principle and are based on our extensive experience in the study of wind environment effects.

4 RESULTS AND DISCUSSION

The expected wind conditions are discussed in the following sub-sections of this report for the various outdoor areas within and around the subject development for each of the three predominant wind directions for the Sydney region. The interaction between the wind and the building morphology in the area is considered and important features taken into account including the distances between the surrounding buildings and the proposed building form, their overall heights and bulk, as well as the surrounding landform. Note that only the potentially critical wind effects are discussed in this report.

4.1 Ground Level Outdoor Trafficable Areas

The pedestrian footpath and main entrance area along the Pacific Highway frontage of the site is expected to be acceptable for its intended uses due to the effective shielding from the prevailing winds provided by the subject development and neighbour buildings to the north and the main entrance area recessed into the build-form. The proposed roof garden above is expected to be effective in mitigating potential down-wash effects onto the pedestrian footpath, hence it is recommended to be retained.

The short-stay parking and guest drop off area along the Christie Lane frontage of the site benefits from the shielding provided by neighbouring low-rise buildings along the southern boundary to the direct southerly winds. It is however potentially exposed to accelerating flows around the proposed blade walls – driven by prevailing north-easterly and westerly winds. The area is also potentially exposed to down wash effects. To address these potentially adverse wind conditions, it is recommended that the blade walls surrounding the area be louvered to the extent shown in Figure 3, or with a porosity of between 25-50%. These are expected to throttle the north-easterly and westerly prevailing winds, decelerating the flow around the blade walls and improving wind conditions within the area. Furthermore, given the intended use of the short-stay parking and guest drop of area, down-wash effects off the building façade are not expected to be an issue.

4.2 Level 1 Roof Garden

The roof garden along the northern boundary of the site is potentially exposed to the prevailing westerly and north-easterly winds. However, the latter predominantly occur during the warmer months of the year and hence are usually welcomed within outdoor areas. The side streaming occurring as a result of the prevailing westerly winds are not expected to be a problem as the garden is assumed to be for occasional use. The brise-soleil awnings are expected to be effective in further enhancing the wind conditions on the roof garden, hence they are recommended to be retained in the final design of the development.

4.3 Level 1 Exterior Gardens

The wind conditions within the proposed exterior gardens recessed along the eastern and western aspects of the development site are expected to be acceptable for its intended uses due to the shielding provided by the subject and neighbouring buildings.

4.4 Level 5 Communal Terrace

The communal terrace along the northern boundary of the site is potentially exposed to the prevailing westerly and north-easterly winds. However, the latter predominantly occur during the warmer months of the year and hence are usually welcomed within outdoor areas. The side streaming occurring as a result of the prevailing westerly prevailing winds are not expected to be a problem as the balcony is assumed to be for occasional use. The brise-soleil awnings are expected to be effective in further enhancing the wind conditions on the roof garden, hence they are recommended to be retained in the final design of the development.

4.5 Rooftop Communal terrace

The rooftop communal terrace is potentially exposed to the prevailing southerly and westerly winds. To address these potentially adverse wind conditions, it is recommended that the proposed planters outlined for the Rooftop terrace in the architectural drawings be retained. The contained plants should be of a densely foliating evergreen species, capable of growing to height of at least 1.5m (including planter box), to ensure their effectiveness in wind mitigation throughout the year. An additional set of planters placed in locations shown in Figure 4, are recommended to delay the reattachment of flow washing up and over the southern edge of the Rooftop terrace. Hence with the inclusion of the abovementioned treatments into the final design of the development, the wind conditions within the rooftop communal terrace is expected to be tolerable for its intended uses.

Treatments

- Louvers or material of 25-50% porosity

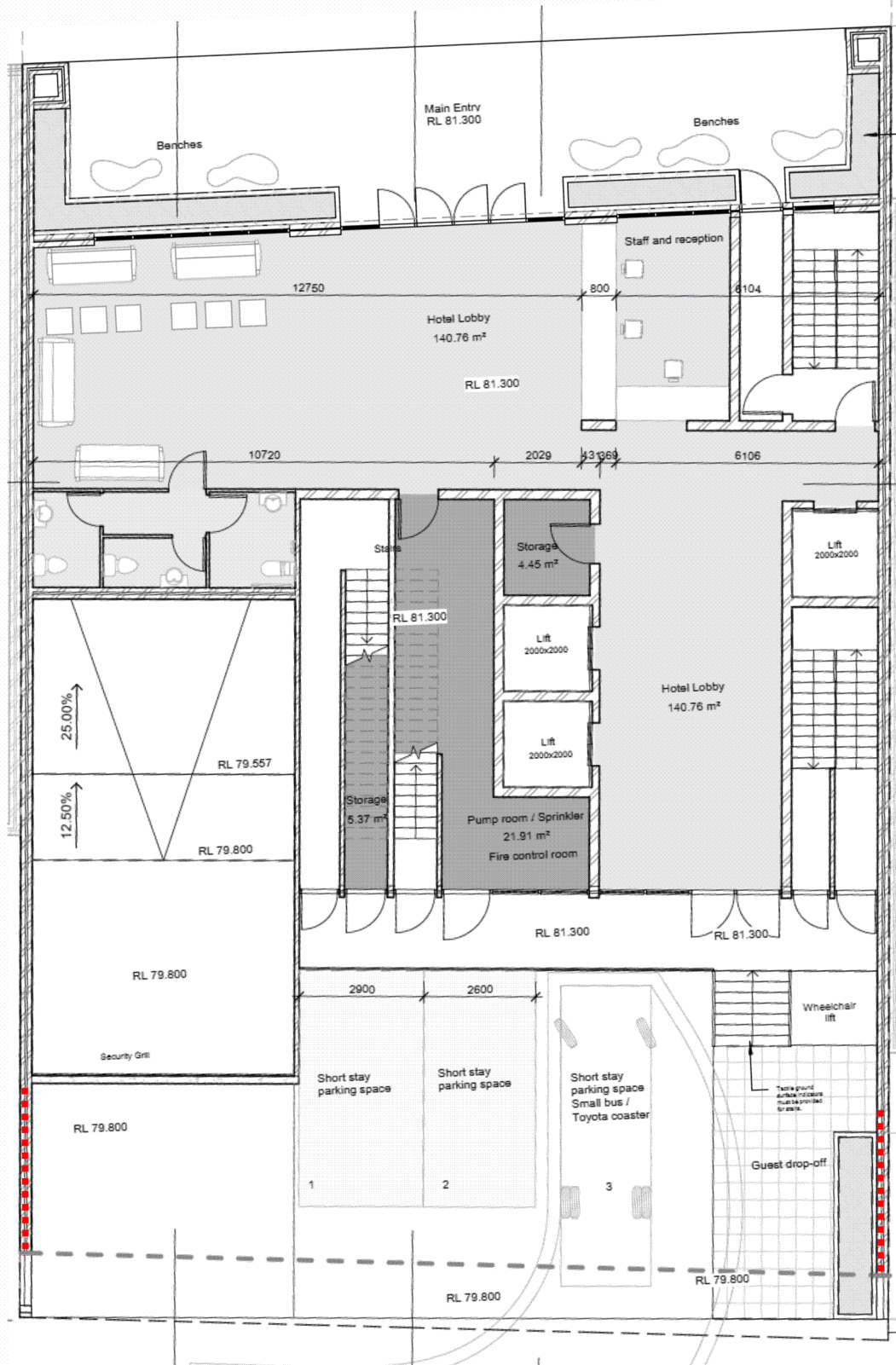


Figure 3: Recommended Treatments – Ground level

Treatments

Densely foliating evergreen plants, capable of growing to a height of at least 1.5m (including planter box)

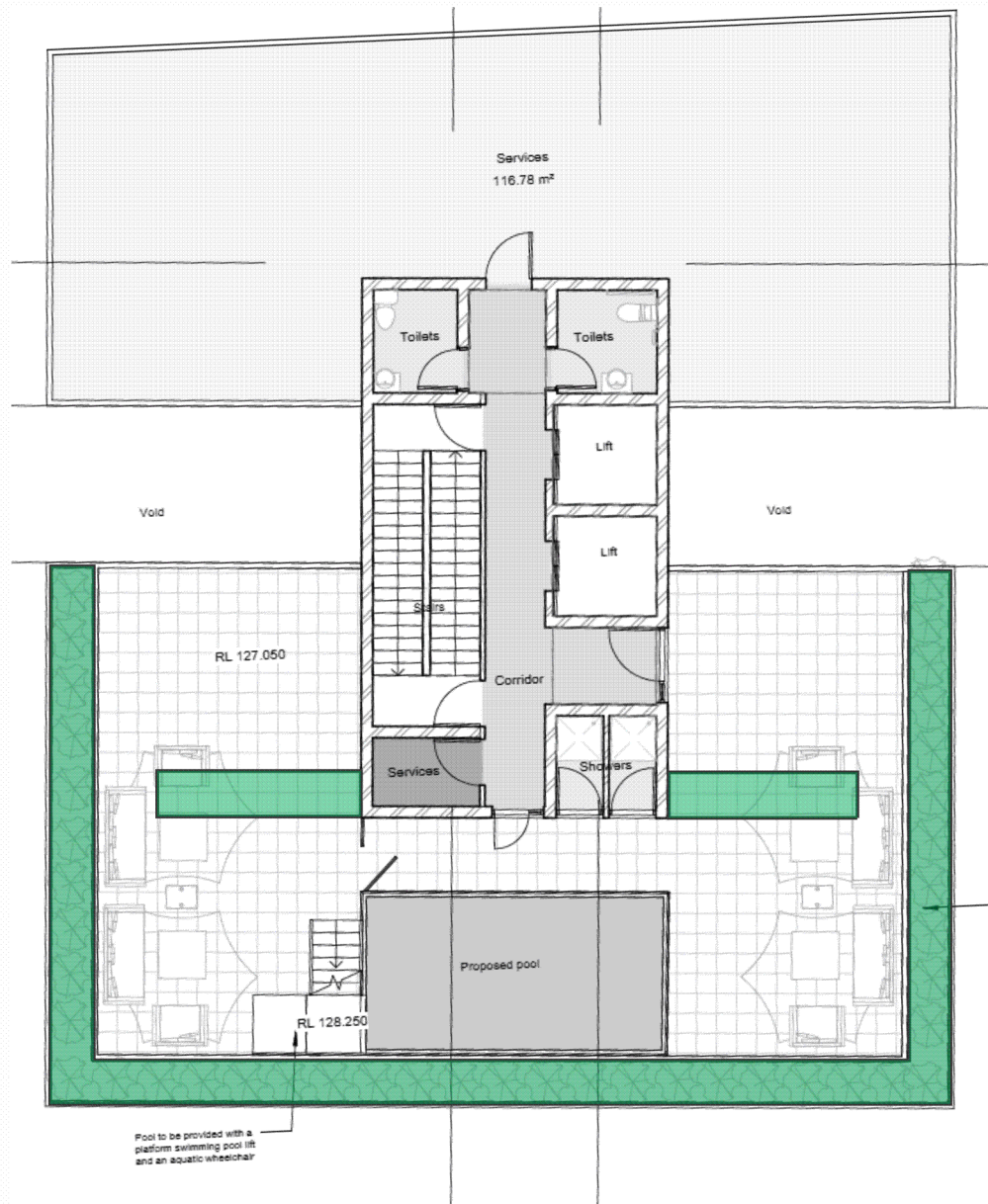
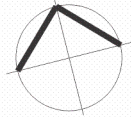


Figure 4: Recommended Treatments – Rooftop Communal Terrace