Airways Wellington Control Tower
Design Statement

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Report Prepared for
Airways New Zealand

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Image sources:

Fig 5 - Aerial photo source: LINZ data service

Fig 11 - Wellington International Airport 2030 Masterplan:
www.wellingtonairport.co.nz/corporate/2030-masterplan

Fig 31 - Wellington Urban Forest:
www.panoramio.com/photo/38981176
Zephyrometer: bloggingmiddleearth.blogspot.co.nz/2010/04/nit-planes-pains-automobiles.html
Karori Rock Lighthouse: wildbaynz.blogspot.co.nz/2012/07/red-rocks-and-karori-light-house.html

Fig 32 - Nuremberg Air Traffic Control Tower. Airport Nuernberg:
www.airport-nuernberg.de
Lisbon Harbour Control Tower:
www.kme.com/project/kmefolder/prj/34/1.html

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1. Introduction

The subject of this Design Statement is the proposed new air traffic control tower for Airways New Zealand, at the Wellington International Airport in Rongotai.

The current air traffic control tower for Wellington International Airport is located at 34 Tirangi Road, in amongst predominantly detached residential housing on the small rise to the west of the airport runway. There are a number of issues associated with the existing control tower, which has led to the proposal for a new control tower on a new site. Such issues include: (i) the existing tower is over 50 years old, and as such does not comply with current New Zealand Building Code standards; (ii) the existing tower requires significant on-going maintenance and seismic strengthening in order to remain operational; (iii) the existing tower penetrates the airport runway's Obstacle Limitation Surface (OLS).

The proposed new tower on the northern corner of Tirangi Road and George Bolt Street allows Airways to construct a purpose-built facility with an appropriate level of resilience towards natural disasters, that complies with current airport operational safety standards and that considers both current and future air traffic control requirements for Wellington International Airport. It also provides the opportunity to create a structure that is significant as a Wellington landmark, both locally and regionally.

Aerial photo of the airport area

Fig 4

1.1 District Plan

As the height of the proposed tower is greater than the height limit for (Restricted) Discretionary Activities in the Airport Precinct (Airport Area), the construction of the tower is considered a Discretionary (Unrestricted) Activity under section 11.4.2 of the Wellington City District Plan. Assessment criterion 11.4.2.5 is the primary assessment criteria associated with the architectural, landscape and urban design of the tower, and asks:

Whether the design of buildings is in keeping with the scale of the development in the immediate area and accords with good urban design principles.

The purpose of this Design Statement is to demonstrate that the design of the proposed tower addresses this assessment criterion.

1.2 Urban Design Principles

In order to address assessment criterion 11.4.2.5, a series of 'good urban design principles' needs to be established to guide the architectural, urban and landscape design. The key principles that define 'good urban design' in the context of this site and project include:

1. The tower should relate to its context. This means that the tower should have a considered and positive relationship with both the near (streetscape and local urban form) and far (townscape and regional) urban contexts, as well as the relevant landscape context.
2. The tower should have design integrity. This means that the tower should adopt an architectural form and language that is meaningful and coherent with respect to its function and its relationship with its receiving environment.
3. The materiality and detail of the tower should support it contextual relationship and design integrity. This means that appropriate and robust materials and detailing are employed to implement design principles (a) and (b) noted above.

These principles have been generated concurrently with the preparation of an Independent Urban Design Assessment by Morten Gjerde (FNZIA). The Independent Assessment may use different descriptions or wording of the principles to those noted above.

1.3 Design Statement Structure

This Design Statement is structured to progressively describe how the above 'good urban design principles' are achieved by the design of the tower. It does this by describing the design context, and then demonstrating how the 'good urban design principles' are implemented through the design response.

Sections 2, 3 & 4 describe the design context in terms of the physical site context, the project brief and the process that has led to the current design. Section 5 describes the design concept of the tower, while Sections 6-9 provide analysis of the design concept, with respect to the way in which the 'good urban design principles' are achieved through the proposed design of the tower.

This Design Statement is to be read in conjunction with Studio Pacific Architecture's architectural drawings.

2. Site

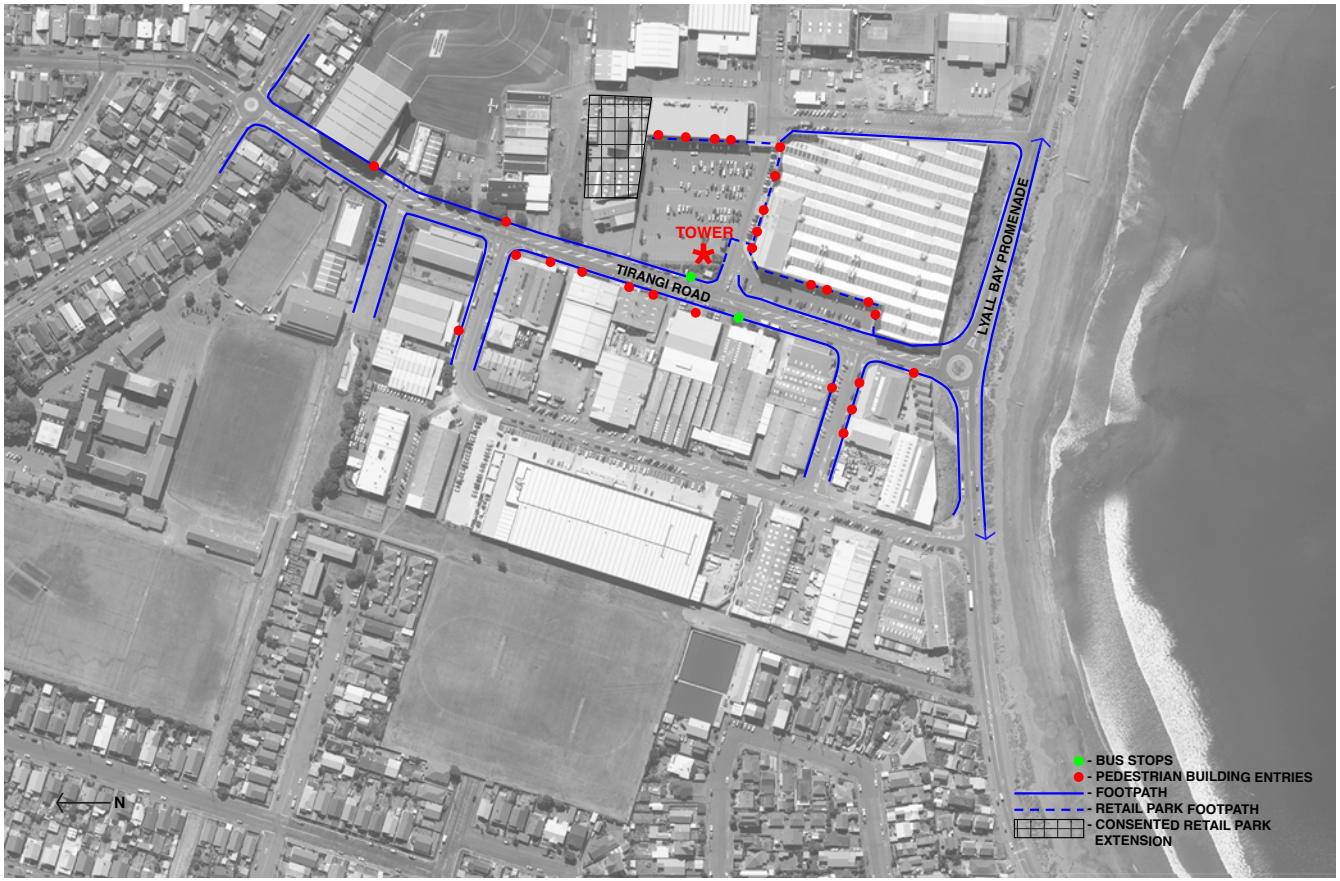
2.1 Existing Site

The site for the proposed tower is located on the northern side of the corner of Tirangi Road and George Bolt Street in Rongotai. The site is owned by Wellington International Airport Limited (WIAL), and will be leased by Airways New Zealand for the purposes of constructing and operating the tower. The legal description of the parcel of land on which the site is located is Lot 39 DP21360.

The site is currently used as car parking for the WIAL owned bulk retail park on George Bolt Street. The site itself is predominantly covered by asphalt, kerbs, channels and lighting poles associated with its function as a car park. There are no existing buildings or significant structures on the site, however there are two small utility structures to the south of the site, one a sewer pumping station and the other an electrical sub station. A large signage structure associated with the retail park is located between the site and Tirangi Road.

There is an established soft landscaping margin between the site and Tirangi Road, which contains a variety of native planting species including tussocks, flax, cabbage tree and pohutukawa.

Under the Wellington City District Plan, the site is part of the 'West Side' development area of the Airport Precinct. Properties opposite the site on Tirangi Road are zoned Business 1.



Local pedestrian amenity in the vicinity of the tower

Fig 5

Figure ground drawing of the urban grain in the area

Fig 6

2.2 The Airport Precinct

The 'West Side' airport precinct to the north and east of the site is a significant component of the surrounding urban context. The existing development within this precinct includes a low-rise office building, workshops, a large hanger and car parking sites. The western apron of the airport extends from the runway to the eastern side of these sites. The street frontages to Tirangi Road include a landscaped frontage associated with the office building at 95 Tirangi Road, as well as vehicle crossings and hard paving associated with the workshops at 93 Tirangi Road. The most significant development in terms of bulk and location is the private passenger hanger (known as the 'Execujet Hangar'), at 91 Tirangi Road. This building presents an almost blank frontage directly to Tirangi Road.

To the east of the retail park, along Cochrane Street, similar airport related activities and buildings existing, including hangers, workshops and the airport fire service.

The terminal concourse on the east side of the runway features prominently in views from Lyall Bay, and is also visible via a view shaft down George Bolt Street, immediately to the south of the site. The airport runway itself forms a significant part of the mid-ground views of the airport precinct from Lyall Bay.

2.3 Immediate Urban Context

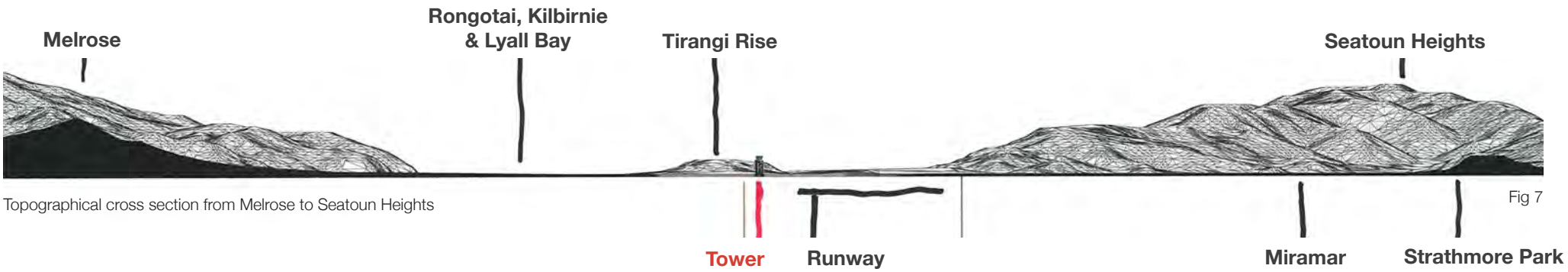
The tower site is located centrally along the Tirangi Road street frontage of the Airport Retail Park. The immediate context and street environment is consistent with that of a light industrial and large format retail urban environment.

The retail park is composed of large-format retail tenancies, set back from Tirangi Road by a large area of car parking. While the buildings in the retail park are generally single storey, their heights are similar to a two or three storey building. Signage and colour associated with the branding of retail tenancies define a large part of the external appearance of the buildings within the retail park. Within the retail park, building entrances are defined by a series of canopies that face out onto the car parking area and also provide pedestrians with protection from the weather. The area of car parking between the retail park and Tirangi Road contains pole mounted lighting, trolley parks and regularly spaced areas of soft landscaping.

Development over the road from the tower site is light-industrial in nature. Similarly to the retail park, while much of this is single storey, the height of buildings is more like that of two-storey buildings. The long, shallow gabled roof forms of the buildings along the west side of Tirangi Road is consistent with the architecture of light industrial and warehouse buildings.

Tirangi Road is a wide road with a central painted median, with parallel parking and footpaths on both sides. The nature and scale of development along Tirangi Road adjacent to the site means that there is very little precedent for public activation of the street edge. Except for the retail park's larger set-back, buildings are generally set back a number of metres from the street with either a landscape or car parking margin between the building and the footpath.

Key views from the footpath outside the tower site include the view of Lyall Bay south down Tirangi Road, the view to the residential area and existing control tower on the hill to the north of the site, and the view to the airport runway, terminal and Strathmore hills down George Bolt Street to the east. Tirangi Road is defined as a 'Collector Road' under the Wellington City District Plan, and connects to Lyall Parade to the south, which is a 'Principal Road'. The number 14 bus route (Wilton-Rongotai via. Kilbirnie) services Tirangi Road with a 30 minute frequency. The bus stop for this service is located directly outside the tower site.



Topographical cross section from Melrose to Seatoun Heights

Fig 7

2.4 Wider Rongotai

The urban context of wider Rongotai to the south, north and west of the site contains a variety of urban activities. To the south, along Lyall Parade, recreational use of the foreshore is a defining characteristic of the area. This includes use of the beach area for surfing, kite boarding walking and exercise activities. Restaurants and cafes have appeared along Lyall Parade to compliment this activity. The most recent of these, the 'Spruce Goose' café, involved the relocation and renovation of the historic Aero Club building to a site on the corner of Cochrane Street and Moa Point Road, to the south east of the tower site.

Development to the north of Coutts Street (where the existing control tower is currently situated) generally consists of residential housing, mostly one to two storey detached dwellings. A rise in the topography of this area means that housing overlooks both the airport precinct to the east and Rongotai/Kilbirnie to the west.

The city blocks to the west of Tirangi Road are largely made up of business activities, which are generally light-industrial in nature. Buildings in these blocks are generally single storey factory/warehouse type structures, but also includes a large format retail hardware store (Bunnings Warehouse) and associated car parking. Rongotai College is located to the west of this, which in addition to its school buildings also contains large areas of green space used as sports fields.

2.5 Far Context & Urban Grain

The site can be viewed from a number of far and elevated vantage points, including Mount Victoria, Strathmore Heights and Melrose. From these vantage points, the urban grain of the site and its surrounding context can be observed.

The tower site itself is centrally located amongst the grain of urban fabric made up by the light industrial, large format retail and airport precinct buildings to the west side of the airport runway. This grain is generally large footprint and low permeability, interspersed with areas of open-space car parking. This is bounded to the west by the open-space created by the airport runway.

To the north and east, the urban grain and block structure quickly changes to that of one and two storey detached and semi-detached residential dwellings, of the medium density that is typical of flat residential areas in Wellington.

Mediating between these two grains is the green open-space created by Rongotai College.

Photos of tower site in its current form

Fig 8

2.6 Environmental and Landscape Context

The tower site is located on the southern edge of the Rongotai isthmus, approximately 200m from the Lyall Bay waterfront, and is almost centrally located between the ridges of the Strathmore Hills and Miramar Peninsula to the east and Melrose hills to the west.

The surrounding landscape context is defined by the south coast and the associated coastal edge. Significant features of the near environment include the rocky coastal edge at Moa Point to the south east of the site, the overlooking wind-swept escarpment at Moa Point, and the sandy duneland of Lyall Bay to the south of the site. Below the current car park and imported fill, the site itself is composed of sandy soil and marine materials, which is one of the reasons why significant engineering is required to the sub-structure of the tower.

The Greater Wellington Regional Council defines this general area as 'Duneland' in the Wellington Regional Native Planting Guide 2010. The guide notes that coastal grasses and shrubland within sandy, free draining soils would have dominated the soft landscape of the area in the past. Section 5 of this design statement outlines how this has influenced the soft landscaping around the tower.

With little existing natural or artificial shelter, the site is highly exposed to the weather. The prevailing winds are both the northerly and the southerly. While the northerly is the most frequent wind, the southerly is also significant as it is often cold and accompanied by rain. The winds are laden with salts and residual sand, which creates a harsh environment for built structures. The effects of the wind on the site are described in the Wind Report, which accompanies the Assessment of Environmental Effects.

The surrounding environment also includes a number of artificial landscape structures. The most prominent of these is the airport runway itself. As an elongated plateau elevated a number of metres above sea level, the runway is oriented in the north-south direction and is visible particularly at its north and south extents as a structured or bunded landscape form. Another significant artificial structure is the breakwater to the east end of Lyall Bay, which extends around the southern end of the runway and RESA tunnel. This is constructed primarily of concrete, both in-situ as well as numerous pre-cast blocks and biscuits forming a rock-like buffer around the southern edge of the runway.

Breakwater prior to the RESA Fig 9a

Runway adjacent Lyall Bay Fig 9b

Natural and artificial landscape features in the area

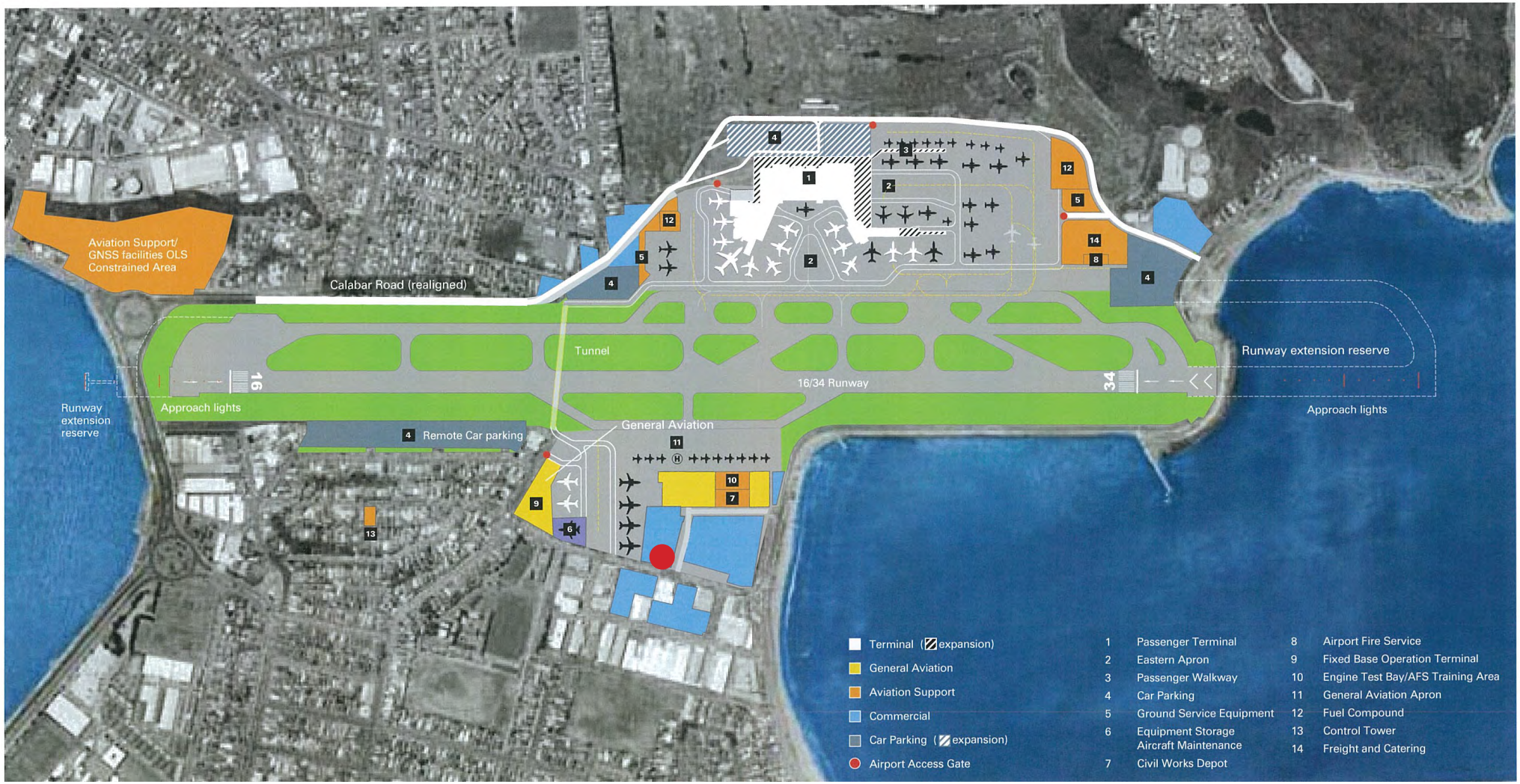
- NATURAL LANDSCAPE
- ARTIFICIAL LANDSCAPE

Fig 10

N

2030 Airport Layout

Figure 10-5



2.7 Future Development

The surrounding retail park site, owned by WIAL, has a resource consent to expand to the currently vacant sites to the north. The proposed scheme includes additional retail tenancies to the north, additional car parking between the new tenancies and Tirangi Road, a new vehicle access point to the north of the tower site, new soft landscaping of a similar scale to the current car park landscaping, and additional retail signage.

It is understood construction will commence shortly on the extended Airport Retail Park. This addition modifies the existing site, particularly its entranceways to Tirangi Road.

The Wellington International Airport 2030 Masterplan, published in January 2010, describes the development intention of WIAL up to 2030. In addition to the on-going use of the immediate site area for commercial activity, the masterplan shows the intention of the airport to expand the western apron up to Tirangi Road, to the north of the tower site. The Master Plan anticipates aviation activities associated with the expanded western apron, including freight operations, aircraft maintenance, additional parking for aircraft and a private jet terminal.

Wellington Airport Runway

Fig 12

View from existing tower to the new tower site

Fig 13

3. Brief

3.1 Project drivers

There are a number of project drivers that contribute to the proposal for a new Air Traffic Control Tower on the proposed site. These drivers outline the purpose of the project, as well as guide design decision-making throughout the design and construction process. These drivers can be described as follows:

Existing Tower Drivers
The proposal for a new tower on a new site is partly driven by the design and condition of the existing control tower. The existing tower at 34 Tirangi Road is over 50 years old and is nearing the end of its useful life. This means that there are a number of inherent building and compliance issues associated with the existing tower. These include:

- Due to its age, the existing tower does not comply with current New Zealand Building Code standards. This includes seismic and fire engineering design standards;
- The existing tower requires significant on-going maintenance and seismic strengthening in order to remain operational;
- The existing tower penetrates the airport runway's Obstacle Limitation Surface (OLS)

Operational Drivers
The primary purpose of the new control tower is to create an optimal operational environment for Airways to undertake its air traffic control operations. While the tower primarily monitors traffic approaching and departing Wellington International Airport, it should also be noted that the tower forms a node of a wider network of integrated air traffic control facilities, and therefore also has regional and national significance. Key operational drivers include:

- Providing maximum visibility for controllers through orientation of the tower with the runway and raising the cab as high as possible without penetrating the runway OLS;
- Provision of sufficient space within the tower to allow for communications equipment and cable work required to operate the tower;
- Provision of space within the tower to allow for future integration of new air traffic control systems and technologies;
- Provision of safe and secure entry for night-time air traffic controller shift changes.

Compliance Drivers
Compliance with the New Zealand Building Code, as well as other relevant safety standards, is a significant driver of the project. This includes:

- Compliance with current seismic engineering standards for Importance Level 4 buildings;
- Compliance with current fire engineering design and compliance standards, including fire egress, fire detection and fire suppression systems;
- Improved accessibility measures, including accessible car parking provision, a lift within the tower, and provision of accessible sanitary facilities within the tower;
- Ensuring that the tower does not penetrate the airport runway Obstacle Limitation Surface.

Resilience Drivers
The design of the control tower needs to have a level of resilience to ensure the on-going operation of the tower, particularly in post-disaster situations. This is reflected in its status as an Importance Level 4 (IL4) building. Key aspects of this include:

- Base isolation, ground improvements and seismic engineering design commensurate with an IL4 building;
- A 500mm raised building platform for flood resilience;
- On site generator and UPS facilities for security of power supply following a disaster;
- An external observation deck to enable manual monitoring of the skies following a disaster.

View from existing tower

Fig 14

Architectural Drivers
Due to the significance of the project both in form and function, a high quality, site-specific design response is required to envelope the project drivers noted above. Such a response includes:

- Creating a tower with a high degree of architectural and visual interest, that relates both to the local site context and the tower's role in the aviation industry;
- Creating a tower that is robust and resilient to the local environmental conditions, including the intense wind, weather, salt and sand conditions found at the site.
- Provision of views for occupiers of the tower, particularly of the north/south runway approaches as well as views across the runway and aprons to the east.

3.2 Site and Overall Tower Brief

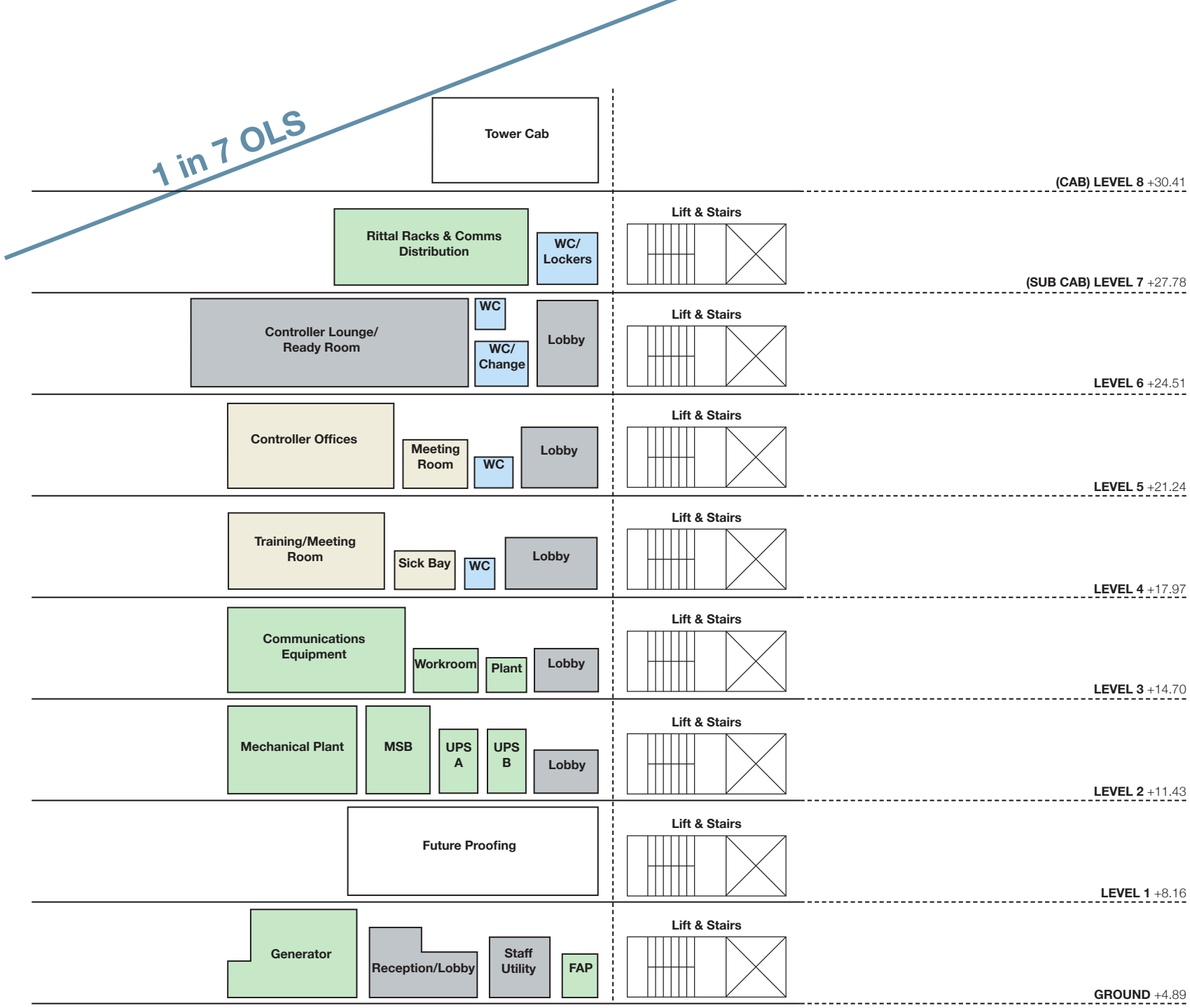
The key functional brief requirements for the project site and the overall building are as follows:

Site
The overall area of the site is approximately 875m^2. The primary function of the site is to allow access to the tower for Airways operational and maintenance staff (the tower is not accessible to the public). Key site brief elements include:

- Car parking for 10 staff vehicles, including one accessible car park;
- Accessible ramp and stair entry to the primary building entrance;
- A 'spill containment area' to allow drop off and re-fueling of the generator fuel tank within the building;
- A security fence including access control and secure car parks to allow for safe night-time controller shift changes.

Whole of Tower Requirements
A number of brief requirements extend across the whole or a majority of the tower. These include:

- Provision of lift access from the ground floor to level 6;
- Provision of an access and egress stair up the full height of the building;
- Provision of building wide fire detection and suppression systems;
- Acoustic design and treatment to mitigate the effects of aircraft noise on the internal environment.



Sectional Diagram illustrating the Functional Brief

Fig 15

3.3 Tower Functional Brief

Due to the small building footprint, the varying functions within the building are generally contained to individual floors. Because of this, the functional brief of the tower is best described on a floor-by-floor basis.

Ground Floor
The ground floor is the main entry to the building, which also houses the generator and fuel tank (which need to be located at this level due to weight and maintenance requirements). Key ground floor brief elements include:

- A wind lobby at the main building entry;
- Space for cycle parking;
- Provision of shower and toilet facilities;
- Space for the building fire alarm panel, sprinkler valve-set and brigade inlet;
- Space for the emergency power generator and 2000L diesel tank.

Level 1 (Future Proofing)
Level 1 fulfills the brief requirement of providing space for potential future Airways requirements. This allows Airways space to adapt the tower to future air traffic control technologies or provide additional staff accommodation.

Level 2 (Services and Plant)
Level 2 provides space for the mechanical plant required to service the building's fresh air intake, heating and cooling requirements. It also houses the building's main switchboard as well as two separate and dedicated Uninterrupted Power Supply (UPS) systems.

Level 3 (Operational Communications Systems)
Level 3 provides space for the communications racks and mainframe required to operate the tower's communications system. The brief requires space for at least 16 communications racks. Provision of a workspace for Airways technical maintenance staff is also required, to enable on-going work to the communications equipment.

Levels 4, 5 & 6 (Tower Controller Floors)
Levels 4, 5 and 6 provide office and support facilities for the team of air traffic controllers. Due to the requirement for ready movement of controller staff between these functions and the cab (particularly in case of emergencies), these functions are required to be as close to the cab level as possible.

Level 4 functions as a support floor for the office space above, with level 5 functioning as office space for the tower control team, and level 6 functioning as a ready room and break-out space for controllers undertaking shift work. Key brief requirements for these levels include:

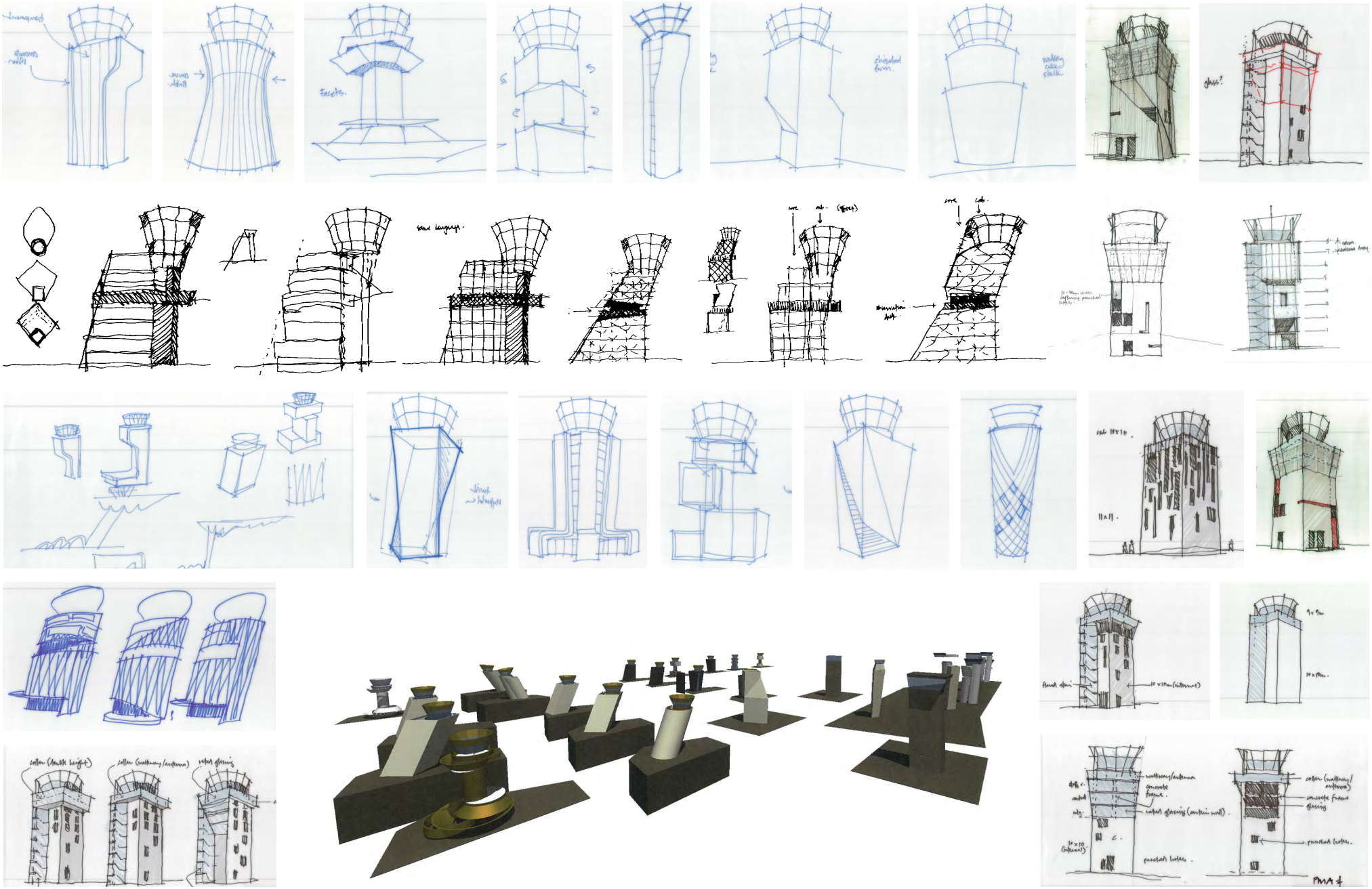
- Provision of a large meeting room, primarily used for training of air traffic controllers;
- Provision of a sick bay, which can also function as a space for 'horizontal rest' of shift workers;
- Space for secure filing of hard copy records;
- Provision of office space for 5 people, including a separate office space for the 'tower team leader';
- Provision of lounge space and kitchen facilities for tower controllers undertaking shift work, with views towards the northern and southern approaches, as well as the airport runway and apron;
- Provision of locker, shower and sanitary facilities for tower controllers undertaking shift work.

Level 7 (Sub Cab)
The sub-cab level provides direct functional support to the main cab level above. The primary purpose of this level is to house the computers, equipment and cable reticulation required to operate the controller desks in the cab level. It also provides access to an external observation deck, which allows controllers to manually observe the sky in case the main cab is unable to be used. Key brief requirements for this level includes:

- Space provision for equipment racks directly below the controller stations in the cab above;
- Sanitary facilities for cab controllers;
- Access to the observation deck;

Level 8 (Cab)
The cab level is the primary functional space within the tower, allowing the controller team on shift to view and monitor the airport take-off and landing approaches, as well as the runway, aprons and terminal gates. Key brief requirements for the cab include:

- Provision of 4 operating controller workstations with one spare space for future growth;
- Provision of maximum views and minimum view shadow to the controller workstations (as close to 360 degrees as possible);
- Provision of chart, map and manual reading stations for controllers;
- Allowance for a mobile external building maintenance unit to allow regular cleaning and re-surfacing of the cab glazing;
- Provision of kitchenette facilities for use by controllers during their shift.



A selection of early investigative sketches

Fig 16

4. Design Process

4.1 Design Options

Like all design processes the design process for the tower itself distils a large number of factors that can be summarised as comprising:

1. The brief and its functional needs
2. The site, its history and context
3. The rules, in the sense of planning rules and other dicta such as structural standards and economics
4. The architect's own creative background and instincts

Design of the tower, because it is an object in space that with its height will inevitably be a landmark, has led to a large and significant number of design iterations.

At a superficial level there are hundreds, perhaps thousands of possibilities for the form of the building. Some of the huge number of form studies are illustrated here.

At a functional level, there are a significant number of givens, some of which, for instance, are:

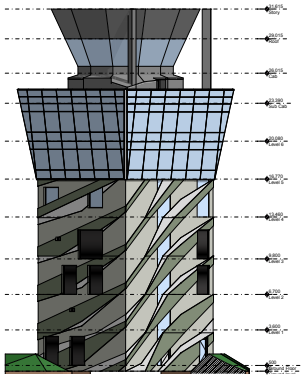
- The tower needs to be at the greatest possible height to facilitate the best possible view for its users, Wellington air traffic controllers
- The cab and its heart – the sub-cab for electronics and the ready room for the controllers – need to be closely associated with each other
- Space requirements for critical electronics and air conditioners. Plant must be provided in the right places.

4.2 Early Investigations

During the design process an in depth study of a number of tower options was undertaken. Three alternative conforming options (in the sense of the brief) are briefly discussed here, of which one has been selected to become the subject of this resource consent application.

A critical issue throughout the design process is the relationship of the building's structural system to its form. This is because of the tower's height, its 'thinness', the need to meet IL-4 standards and the nature of the risks generated by the ground conditions and location. The structure must be intrinsically melded with architecture to create a formal architectonic solution. The design process sought to integrate rather than separate architectural and structural requirements.

An early tower variant with a square footprint placed diagonally to the runway and street, used mass concrete walls and very large raft foundations to provide a structured solution. While there appeared to be a certain economy in this solution, the cost effectiveness, for instance, of constructing very thick concrete walls became questionable. In addition, the building itself was unremarkable and as designers we and others such as the Wellington City Council Urban Designer could see that the form didn't reach the standard a building of this type could or should.



Early tower variant Fig 17

4.3 Game Changers

A further round of investigation into alternative solutions led to new design possibilities. These relied on two game changing design elements being developed.

Firstly, it was found that the system of structurally supporting the tower's cab roof could be changed from a triple external column arrangement to a single central internal column. This suited the controller's visibility demands at Wellington Airport and simplified the structural load pathways in the building.

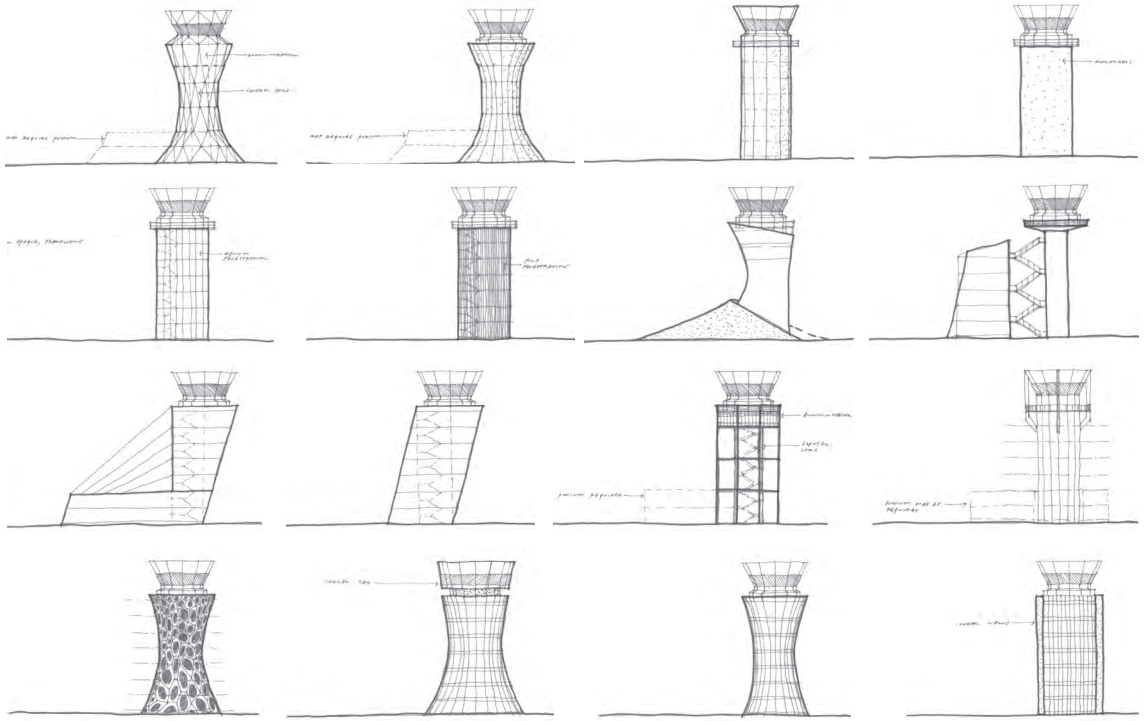
Secondly, it was also found that using base isolation as the main means of seismic protection for the building was cost effective because of the tower's form, requirements and situation. This allowed the tower's shape and form to be developed using any of a multitude of structure and architectural techniques.
Two front runners came about from the renewed design investigations.

4.4 Emergent Concepts

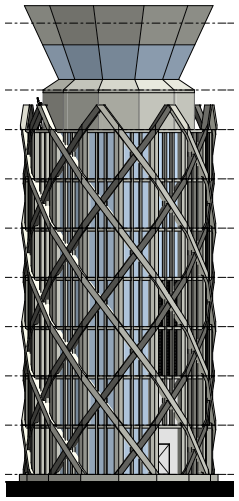
A circular lattice like external structure of pre-cast concrete elements emerged as one proposal. The structural system relies on a regular circular plan form at every level and on the exact repetition of each element. The limitations of the system along with the inefficiencies of a small circular plan form and the unenergised appearance, relegated the lattice form to the sidelines.

A rectangle tower leaning into the prevailing northerly wind also emerged as a possibility. While the building in some senses is defying gravity, it also clearly resonated with the environment in which it sits. An internal centralised steel structural system supports the cab, the cantilevered overhanging floors and a cladding strategy that can vary with orientation.

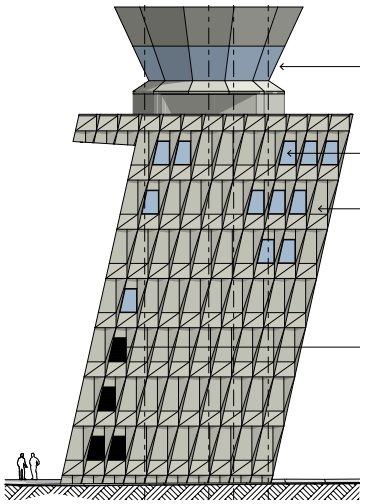
The subject of this Resource Consent application, the leaning tower, was chosen after a lengthy exploration of a variety of building forms, their structural systems and their capability to work as landmarks on the Tirangi Road site.



Later investigations Fig 18



Latice tower concept Fig 19



Leaning tower concept Fig 20

5. Design Concept

The tower concept, now the subject of this Resource Consent application, unfolded in the course of a rigorous design process as has been discussed in the preceding section. The following sections of this Design Statement provide further detail on the concept summarised below.

The tower needs to have a conceptual basis that recognises several architecturally important tenets that are important. These precepts are:

- The height of the building is an inevitable function of its purpose and because of this the building itself is inevitably going to become a landmark in the area,
- While the building has a very practical life and purpose, it still must, more than most other building types, offer a poetic response in its design, and
- As the building users mediate the Wellington climatic environment by controlling the local air space, the building should say something about the Wellington environment in which it stands.

Sketch perspective of the leaning tower concept

Fig 21

The concept of a building that leans into the prevailing winds both follows these precepts and meets the intrinsic needs of the precepts.
The tower embodies a simple statement about Wellington's well known wind prone environment. It does not shirk from addressing the wind, physically and metaphorically, and in doing so it makes a poetic response to the situation in which it sits.

The definition of a landmark as "An object or feature of a landscape or town that is easily seen and recognized from a distance, especially one that enables someone to establish their location" (Oxford Dictionaries on line) is relatively easily met – a building of the tower's height in its location has a certain inevitability in becoming a landmark but it is important that the building is established as a landmark in the positive sense. The tower has a character that embodies the character of its place and at the same time has the positive attribute of being a singular built object that brings an unexpected edge to its context.

With its lean, the tower has the movement and dynamism of the wind itself and it also has directionality. The directionality not only reflects the prevailing wind but is orchestrated to match the direction of the airport runway and reflect the building's primary purpose. Directionality is also reflected in the development of the façades.

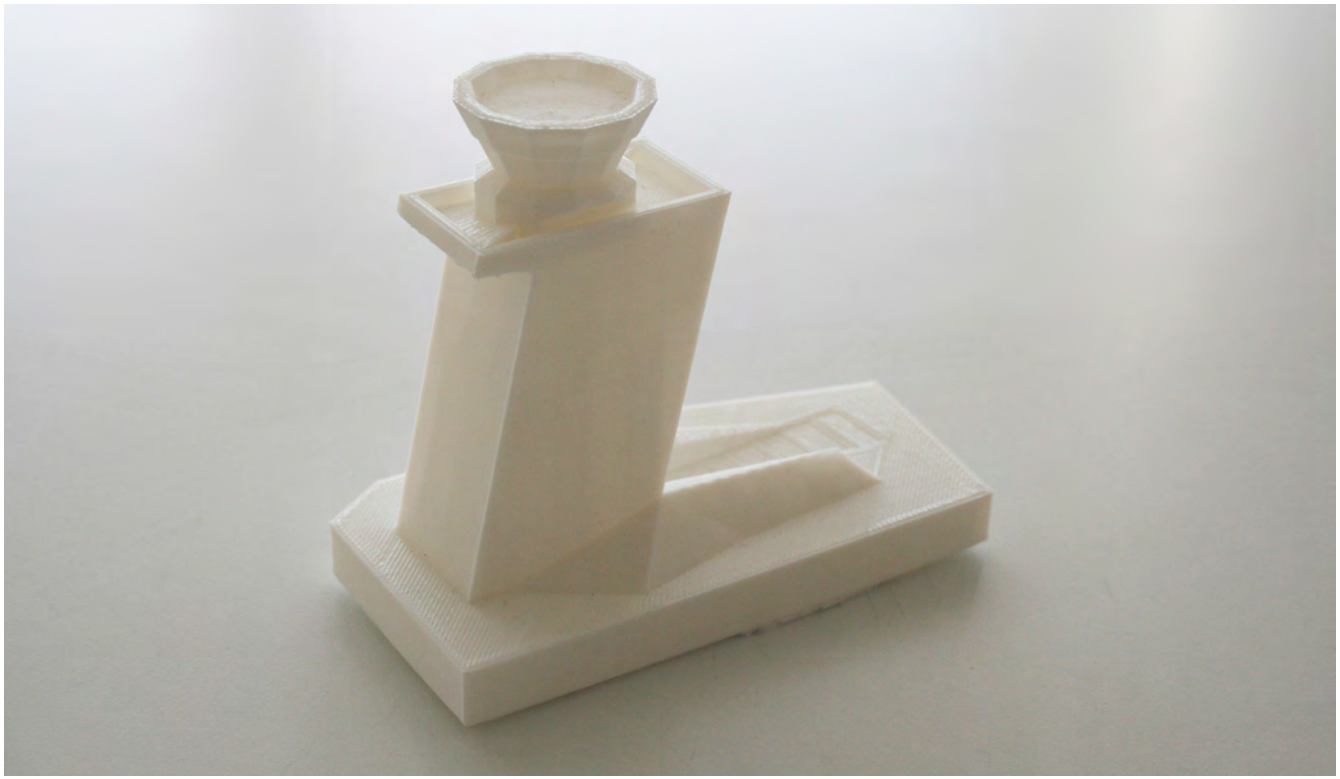


Photo of Control Tower Model

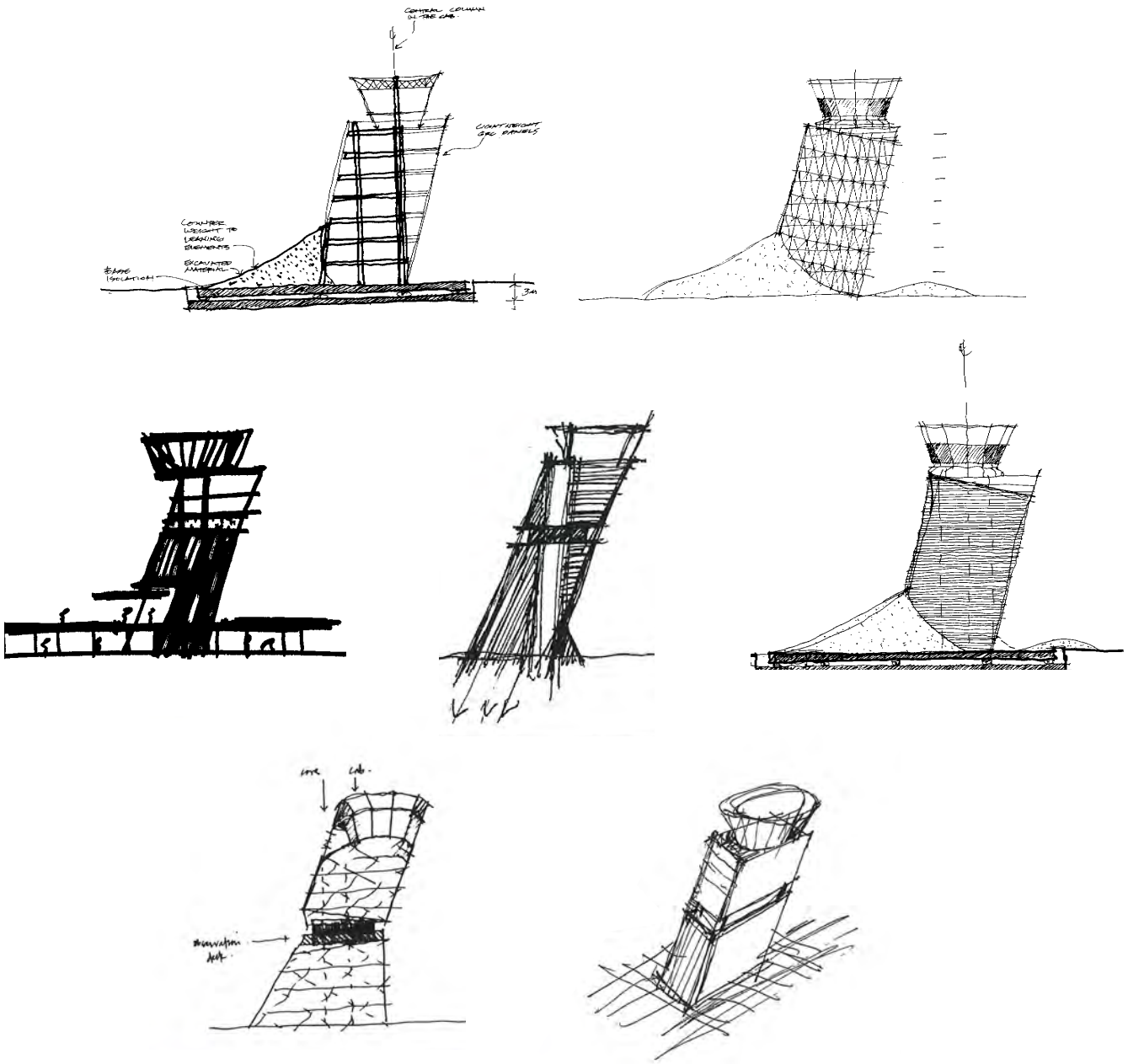
Fig 22

The tower has two rough faces – east and west – that refer to the geology of the coastal edge and two polished faces – north and south – that refer to the polishing action of sea and wind. The materials reflect the climatic challenges of the area and are overtly strong and robust.

Landscaping is used to reinforce the idea of two parallel rough coastal sides to the building and is disposed in a singular pattern running parallel to the east and west faces of the building. Lighting is used at night to reinforce conceptually the purpose and ideas behind the building.

The shape of the building is rectangular as it optimises the efficiency of the space generated within the small footprint of the building. It contrasts markedly with the roundness of the tower cab and enables the references to the materials of the foreshore to be made. The shape of the tower's cab, sitting at the top of the building, is determined by the practical need for air traffic controllers to see the runway, runway thresholds and approaches.

The building, as proposed, meets the needs of the brief described on a floor by floor basis in Section 3 of this Design Statement. The brief, therefore, describes the provisions made in the building to meet the requirements of Airways NZ for a facility of this nature.



Investigative sketches of the leaning tower concept

Fig 23

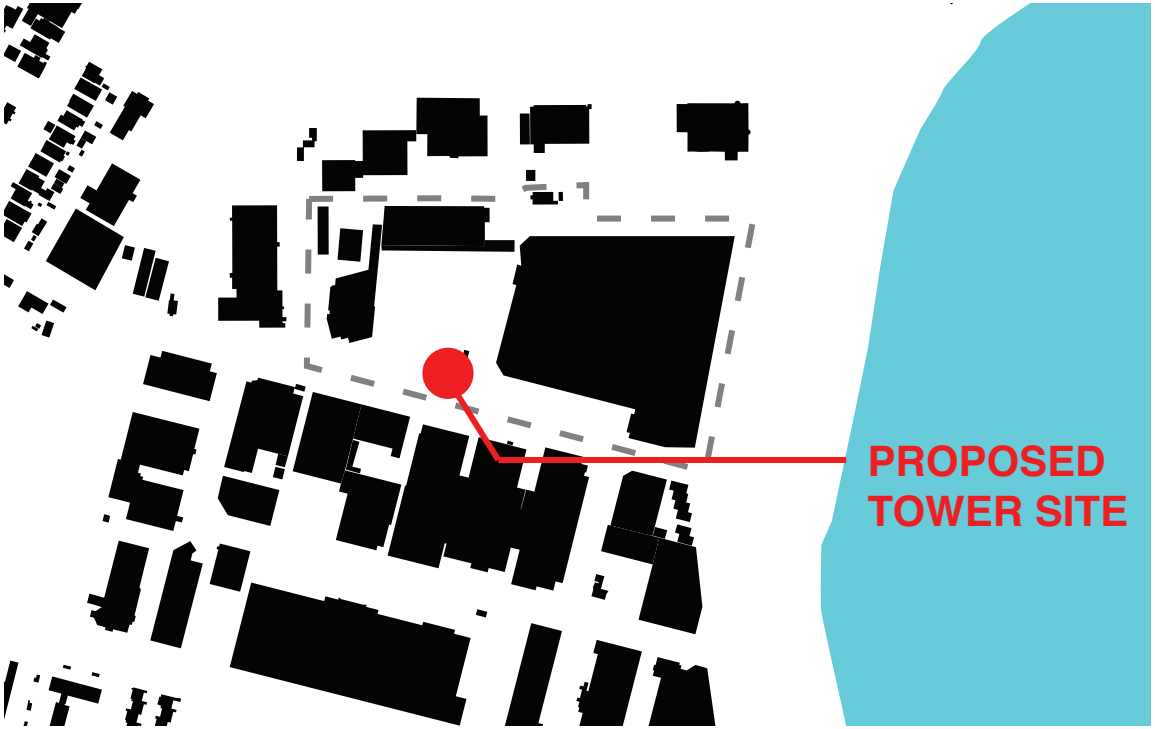


Figure ground drawing of the semi-industrial area around the Control Tower site

Fig 24

6. Analysis: Context

6.1 Relationship to Context

The tower has been designed with its context, particularly its coastal Wellington context, in mind.

The tower's foremost contextual connection to its place is the very obvious lean into the prevailing northerly wind. An opposite connection is to the southerly – while less prevalent than the northerly it is more boisterous and could be said to be chasing the tower's form.

The coastal environment is referenced in the ground treatment, where dune-like concrete forms parallel the tower, and in the cladding, where deeply incised cladding contrasts with smooth sided faces. This is the rough rocks eaten out of the land by the sea and the stones polished by the waves combined into one entity.

The coastal environment also has its share of built structures: the breakwater of Lyall Bay and the interlocking protectors on the runway extension for instance. In a similar vein, the tower has a rugged and robust external appearance that refers to these neighbours.

In a functional sense, this is a necessity as the wind drives particles of sand and salt, rainwater, fuels, dirt and detritus, in the airport and coast area. It is one of the more difficult places to provide durability and longevity, hence the drive for robustness.

6.2 Place

The tower, with its height, is inevitably a landmark in the area. The other buildings in the neighbourhood, as noted earlier and visible from the Figure Ground drawing in Fig 21, generally have large format plan areas and the height of two to three storey buildings.

In a major contrast to the other buildings in the neighbourhood, the tower has a very small plan footprint (of only approx 150m^2) and is the rough equivalent of a nine storey building.

There is a necessary non-conformity with the surroundings but in the context of a semi-industrial big box retail and airport area, there is nothing untoward in locating an airport control tower in Tirangi Road. The tower itself will generate a positive sense of place that would not otherwise be possible. The tower will give an otherwise nondescript part of the city a clearly identifiable central landmark that is quite likely to become the central identifying feature in the area.

Place, in the wider sense of whole segments of the city, is reflected in the ideas behind the building. The tower will be visible from the Strathmore/Miramar ridges through to the Melrose/Hataitai ridge so it occupies a wider city context.

The wider place of coast and airport, city suburbs and forested hills, of a particularly windy isthmus connecting harbour and strait is reflected in the tower – a rock drawn from the sands bracing itself against the wind.

Visual simulation from Tirangi Road (Viewpoint Site 6) Fig 25

Visual simulation from Queens Drive (Viewpoint Site 3) Fig 26

Visual simulation from Lyall Bay (Viewpoint Site 4) Fig 27

Visual simulation from Lyall Bay/Tirangi Road (Viewpoint Site 5) Fig 28

6.3 Visual Simulations

A series of visual simulations have been produced that insert the proposed tower into photographs taken at selected locations that will have views of the proposed building. The simulations have been produced using the NZILA Guidelines. A selection is reproduced here from the full simulation submitted with the application to illustrate the contextual effects of the tower.

At a long distance away, or indeed at a height above the building, such as that shown in the simulations produced at Viewpoint Site 3 in Queen's Drive or Viewpoint Site 9 on the Strathmore hills, the tower, while still clearly visible, tends to merge with the grain of the buildings and hills around it. It appears at one with its airport surroundings.

In middle distance views, such as that from Viewpoint Site 4 on Lyall Bay beach, the tower is quite prominent and stands above the skyline. The dominant visual elements are the tower cab, the flat extended shelf below the cab and the lean of the building supporting these elements. The building is clearly distinguishable and unique. In this realm, it manifests itself as a landmark for the area.

At a close view, such as those of Viewpoint Sites 5 and 6 in Tirangi Road adjacent to the Airport Retail Park, the rectangular lean of the main body of the tower and the materiality of the facade treatments as they vary from east/west to north/south is most apparent. The immediate inspection enabled at this close aspect is repaid with views of the detailed development of facade systems that are as outside the ordinary as the building's overt lean into the northerly.

6.4 Shading Studies

A series of shading studies have been produced for winter and summer solstice and the equinox. An extract from the application drawings is reproduced here - this is the worst case scenario at winter solstice. It illustrates that the building, with its slender form and despite its height, casts a narrow shadow that swings from Tirangi Road in the morning through to the Retail area car park by late afternoon. Due to the nature of the surrounding buildings (large format with minimal windows) the proposed control tower is anticipated to have a negligible impact on adjacent buildings.

Visual simulation from Strathmore (Viewpoint Site 9) Fig 29

Shading study for winter solstice - north to left Fig 30

6.5 Local precedents

The nature of Wellington's climate and its coastal condition has begun to be recognised in a variety of built structures and sculptures in the region. Some are illustrated here.

Of particular note are the works in the Cobham Drive sculpture park where reaction to the wind is the particular point of each work.

An earlier antecedent, some kilometres around the south coast, is the Karori Rock lighthouse with an inadvertently similar lean. The building stands as a bulwark against the elements – like the proposed airport tower, robust enough to continue providing its safety function despite the environmental conditions.

Hon Peter Fraser Statue, Lambton Quay, Wellington

Wellington Urban Forest, Evans Bay, Wellington

Zephyrometer, Evans Bay, Wellington

Karori Rock Lighthouse, South Coast, Wellington

Solace in the Wind Sculpture, Wellington

Fig 31

6.6 Other precedents

The ideas inherent in the proposed control tower have, like all buildings, precedents here and elsewhere.

A building which references the rocks of the south coast lies directly across the runway in Wellington Airport's International Passenger Terminal. Of course, the representation is of a vastly different character, but the new tower will add to a local architectural family in a similar way to the family of wind generated forms mentioned earlier.

While not an exhaustive selection, the illustrations show leaning buildings have been built before, and the earlier examples both colour our perceptions and point the way to a new formal rendition of the proposed control tower. What is unique to the Wellington tower is that the lean is into the wind. This, along with its scale, form and materiality, make the tower one of a kind.

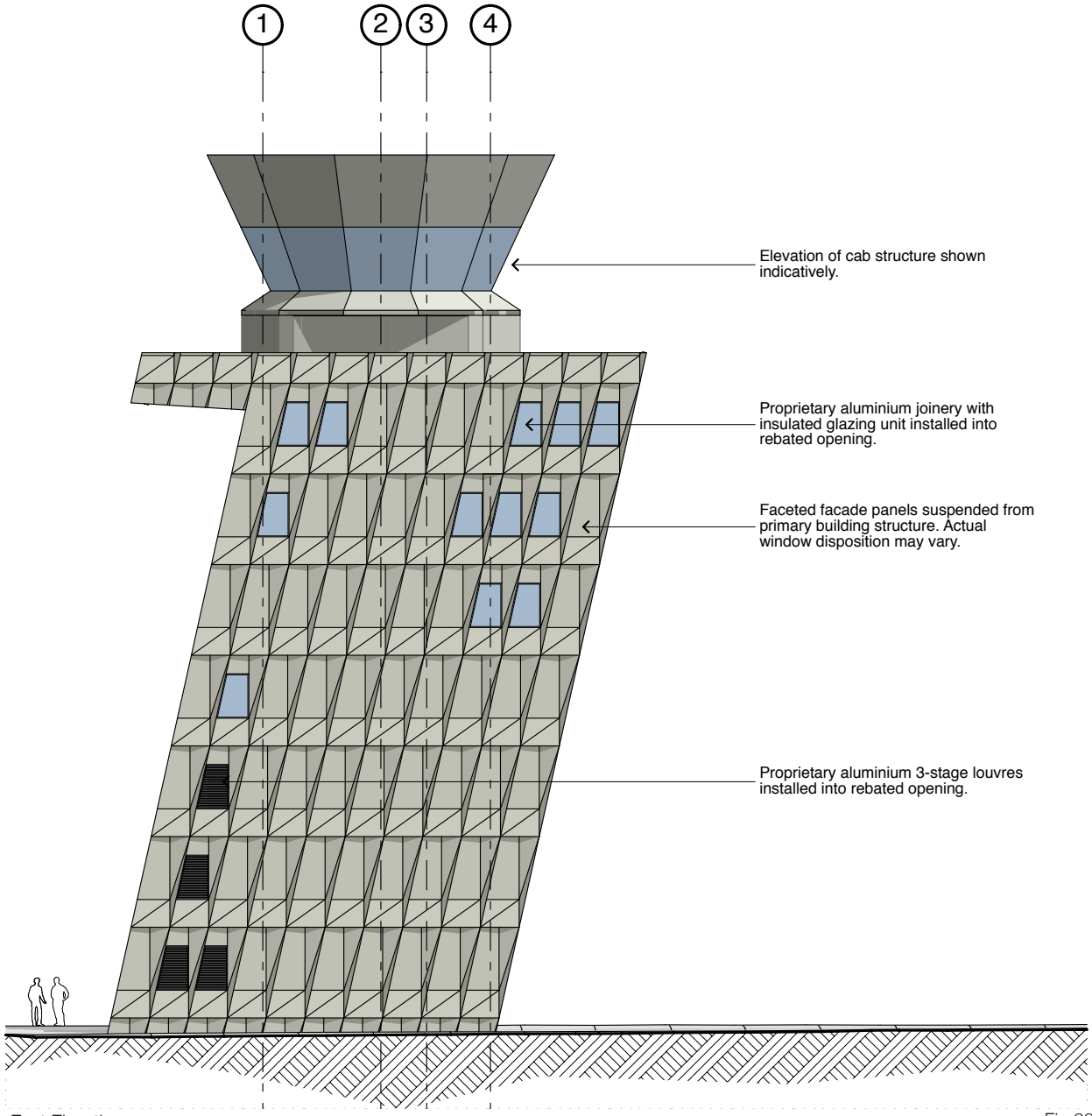
The Rock, Wellington Airport International Terminal

Bella Sky Hotel, Copenhagen

Nuremberg Air Traffic Control Tower, Germany

Lisbon Harbour Control Tower, Portugal

Fig 32



East Elevation

Fig 33

7. Analysis: Siting, height and form

7.1 Siting

The building's site in Tirangi Road was chosen after extensive analysis by Airways New Zealand of a large number of potential sites in the airport's vicinity. Detailed reporting of this analysis is provided separately in the Resource Consent Application.

Rebuilding on the existing tower site was one of the investigated options but is not feasible as the controller's operational visibility requirements cannot be met without penetrating the airport's Obstacle Limitation Surface (OLS) and this is not permitted.

The selected Tirangi Road site meets Airways' visibility requirements. It is central to the thresholds at each end of the runway and has good views to the apron areas in front of the terminal buildings.

The control tower is aligned exactly parallel with the main 16/34 runway at Wellington Airport. It varies slightly from true north and varies marginally from the alignment of Tirangi Road and the street network of the area.

The alignment with the runway indicates the significance of the building to all – its paramount purpose is to ensure the safety of flight operations. Additionally, the street has a low level of impact for the building as there is no immutable relationship such as that between tower and runway.

From a visual point of view, the tower has a close relationship to the runway and other airport activities and acts as a marker for the airport as a whole.

At a more detailed level, the building is placed on its site to ensure serviceability while providing for landscaped integration into its setting.

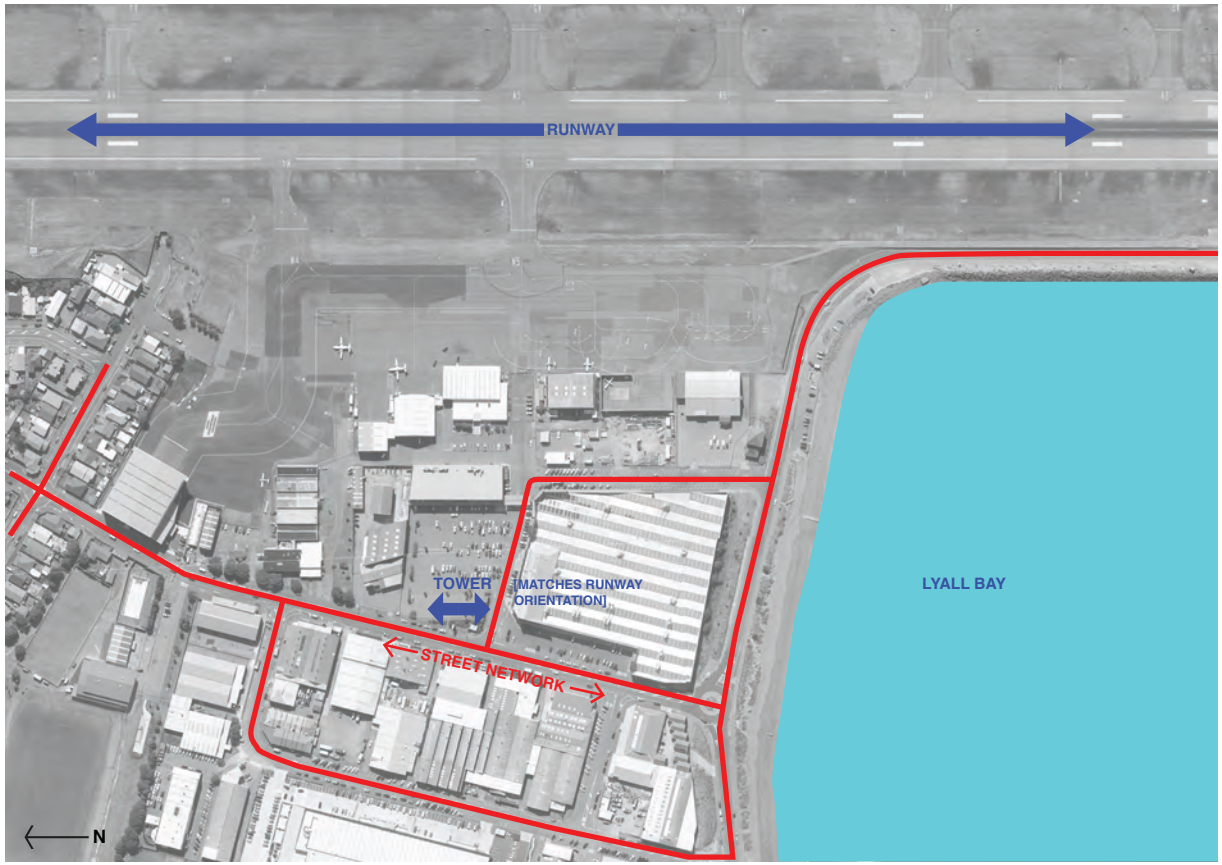


Diagram showing match of tower and runway alignments

Fig 34

7.2 Height, scale and building proportions

The tower's height is controlled by two pragmatic requirements:

- The need to maximize height to provide the best possible visibility for air traffic controllers viewing the runway and the airport environs.
- The requirement, generated by the International Civil Aviation Organisation (ICAO), to build below the 1 in 7 Obstacle Limitation Surface (OLS) discussed in Section 3: The Brief.

To meet the two requirements, the maximum height of the building as it reaches the OLS on the subject site is RL 36.830 or approx 32 metres above ground level.

The plan form size of the building at circa 150m^2 is diminutive in comparison to other nearby buildings or to commercial buildings generally.

The tower cab size is optimised for the number of air traffic controllers within and their need to have visibility. The external deck below the cab must have full accessibility on all sides with some working space for access to cleaning gantries.

Each floor of the building provides essential functionality with the size optimised to provide in addition to lift, stairs, lobby and ducts, generally one full function per floor. The design process has examined these provisions carefully; it is very difficult to usefully decrease floor area – thus making the tower more slender – and somewhat pointless to increase floor area as this increases building cost for little gain in utility.

The tower could therefore be said to have the optimum functional scale and proportion.

The resulting tower has an unusual proportion visually as the height of the building relative to the dimensions of the cab is not particularly large and might hint at a block like appearance rather than that which might be suggested by the term 'tower'.

However, the lean of the building, the use of a rectangular floor plan, with a relatively narrow short side, and the use of contrasting north/south and east/west cladding systems, lend a dynamic to the building that is well outside the norms of say an office block and is clearly evocative of its aviation related purpose.

7.3 Wind effects

A Wind Assessment of the likely impacts of the tower has been prepared by Opus International Consultants and is attached to the Resource Consent application.

The Assessment suggests that the building's slender aspect to the wind will mean wind effects are lower than might otherwise occur with this height of building. However wind effects are most likely at the corners of the building and the Assessment suggests the use of landscape elements to keep pedestrians approx 2m away from the building corners, particularly the southern corners.

In the development of the landscape concept since the time of the Wind Assessment, some of the assumed mitigation measures have been amended or altered to address potential wind effects.

The landscape concept provides the following wind effect mitigation measures:

- Hard landscaping, palisade fencing and dense planting on the NW and SW corners will keep pedestrians away
- Palisade fencing immediately to the north of the building is intended to partly protect the NE corner
- The SE corner is not protected. However, it is not accessible to the general public and Airways' own protocols can ensure protection is available should this prove to be necessary in use.

As the immediate site around the tower is enclosed by hard landscaping and palisade fencing, no general access to the general public is available close to the tower.

8. Analysis: Open space + landscaping

8.1 Open Space Treatment

At ground level, the control tower and its surroundings occupy little more land area than a suburban section with its circa 888m^2 of leased area.

While there is one long street facing boundary, the major impact on the site is the surrounding car parking and access roading for the Airport Retail Park. Just as the tower itself acts as a landmark the landscape around it acts as a kind of island in amongst the asphalt. It is a supporting act and continuation of the street trees that provide the green of the near neighbourhood.

The landscape has parallel bands reflecting the tower's compositional treatment. These bands are also used to provide secure fencing around the building itself. On the east and west sides of the building a series of structured landscape 'dunes' reference the coastal area in which the building sits. These structures will be formed out of robust materials such as concrete or folded steel plate. Planted landscaping also sits on the east and west of the building. To the north and south a palisade type fence, constructed from steel poles, provides site security with a degree of visual permeability.

8.2 Access

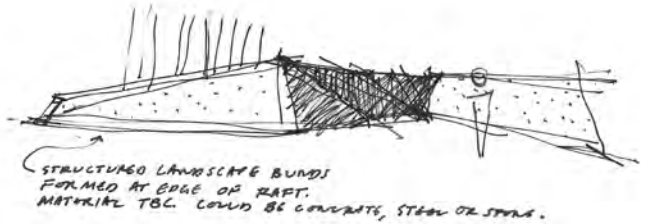
The tower site is screened from the street by its landscape and no formal pedestrian access from the street is provided, as public access to the building is not required and is not provided.

Access to and from the building is provided using the Airport Retail Park car park accessways.

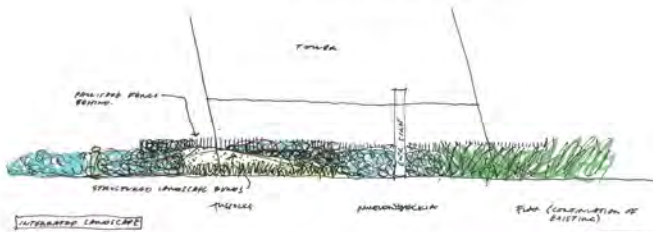
The car park provides access to the east of the tower in a single direction running from north to south. Ten car parks are provided in the Airways lease area for the use of Airways staff and contractors. The existing tower has a similar provision. Bicycle parking for staff is provided inside the ground floor of the building.

Much of the leased area will appear to be part of the wider Airport Retail Park as the area secured and palisaded has been kept to the minimum necessary to meet Airways security needs. This ensures that retailing activity as the major activity in this area is still visible from Tirangi Road. The main entry sits on a plinth raised 500mm above ground level, accessed by ramps and stairs. It is sheltered under the north facing lean of the building. Additionally, a canopy will provide direct protection at the main entry to the building.

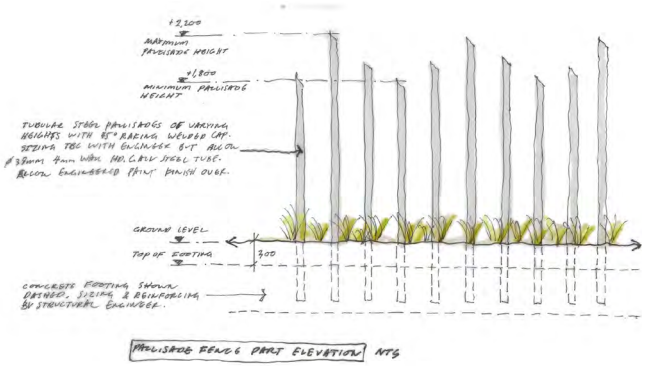
The secure area is broadly of a similar extent to the base isolation raft foundations to the north and south. Landscape elements define the east and west secure boundaries. Within the secure area are found a minority of the dedicated car parks, a containment area for diesel tankers replenishing the generator fuel tanks and the building's main entry.



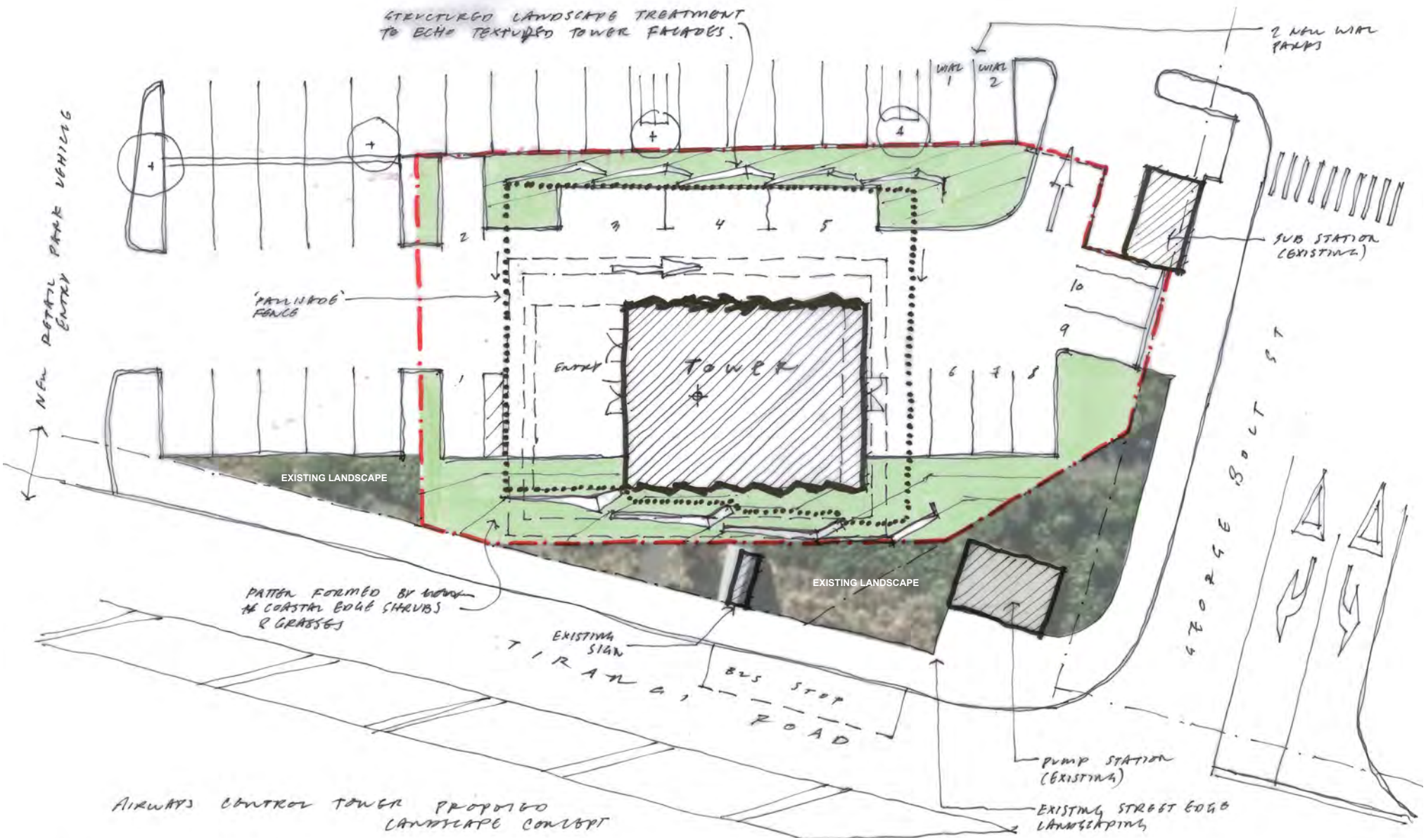
Structured bunds in the landscape Fig 35



Sketch of planting at tower base Fig 36



Sketch of palisade fence Fig 37



Landscape Plan

Fig 38

8.3 Planting

Planting species are chosen from the Greater Wellington Regional Council (GWRC) suggested species list for the immediate coastal area. Additionally, the existing planted areas of flax and cabbage trees around the substation and pump station on road reserve outside of the leased area are of course retained. New planting is in informal bands that reflects the layout of the hard landscaped built elements. It is suggested that muehlenbeckia, tussock and flax is used in the new planted areas.

Pohuehue
Muehlenbeckia complexa

Coprosma
Coprosma rhamnoides

Silvery sand grass
Spinifex sericeus

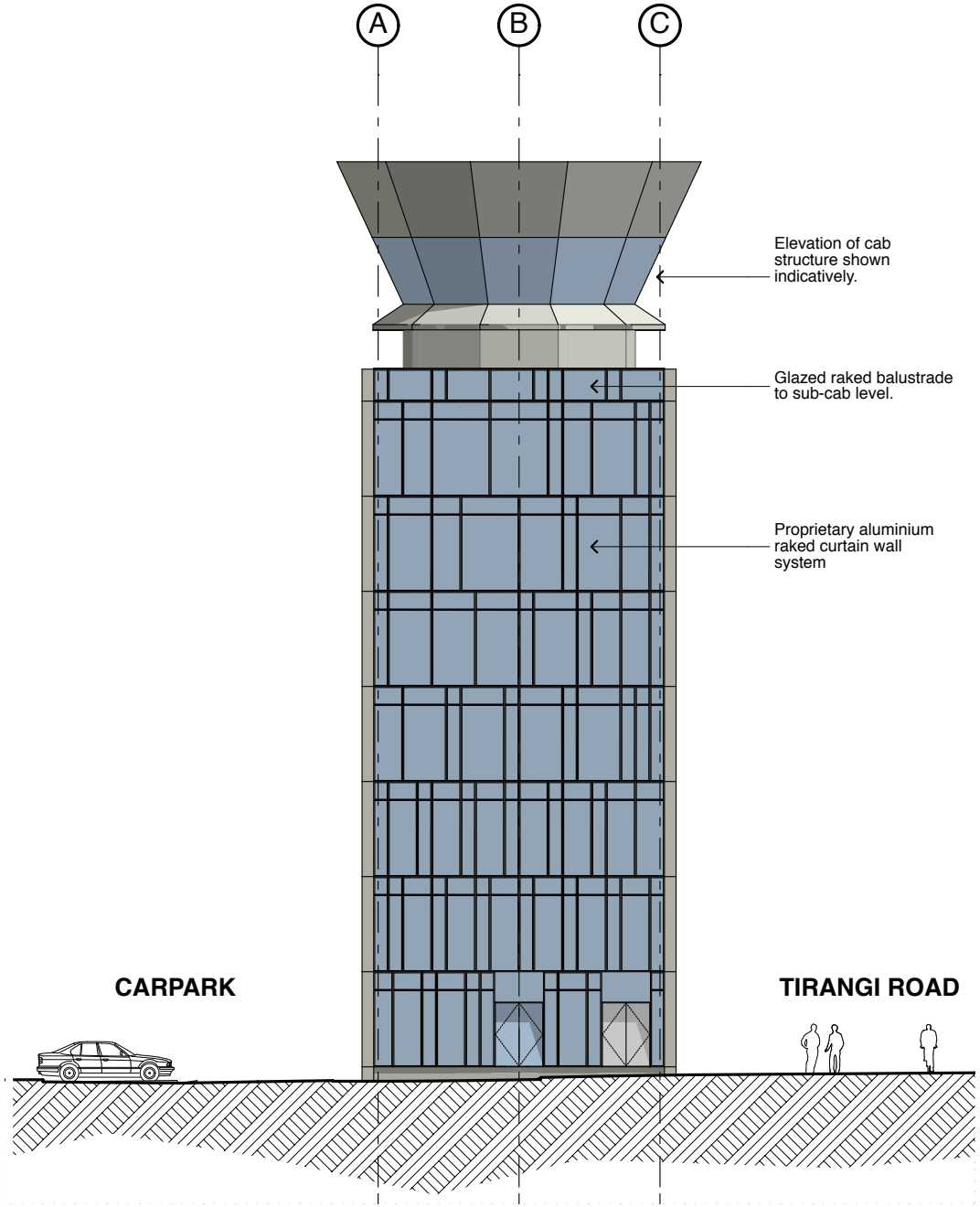
Coastal flax
Phormium cookianum

Pingao
Ficinia spiralis

NZ Iris
Libertia peregrinans

Selection of suggested planting species

Fig 39



North Elevation

Fig 40

9 Analysis: Materials and Detail

9.1 Overall Compositional Coherence

While the building's most significant point of visual interest is undoubtedly its lean to the north, at varying more detailed scales, the design has a consistent and comprehensive approach to its composition.

The tower cab, the workplace of the air traffic controllers, is a twelve sided smooth glazed element with an outward splay. The form of this element is such that it is typically associated with control towers irrespective of the close detail. Its shape and detailing is all intended to maximise the visual area available uninterrupted to the controllers within. Everything, down to the cleaning gantry, is subservient to this over-riding purpose as it is the cab which gives the tower its reason for existing at all.

The tower cab, with its tendency towards circular, contrasts markedly with the rectilinear form of the building below. A flat shelf extends outward from the tower cab and mediates between the round cab and the rectangular tower body. Its purpose is to provide access around the cab for the controllers, for maintenance of the tower cab and for access to antennae that provide some of the data streams required. This high level platform takes on the material characteristics of the tower below.

The tower itself is conceived as if it were a stone or rock drawn from the ground; partly rough as rocks often are on the Wellington south coast and partly smooth as though polished by the waves and wind. In this way the elevational treatment has been given a coherent connection to the coastal context of the building.

9.2 Elevational Treatment

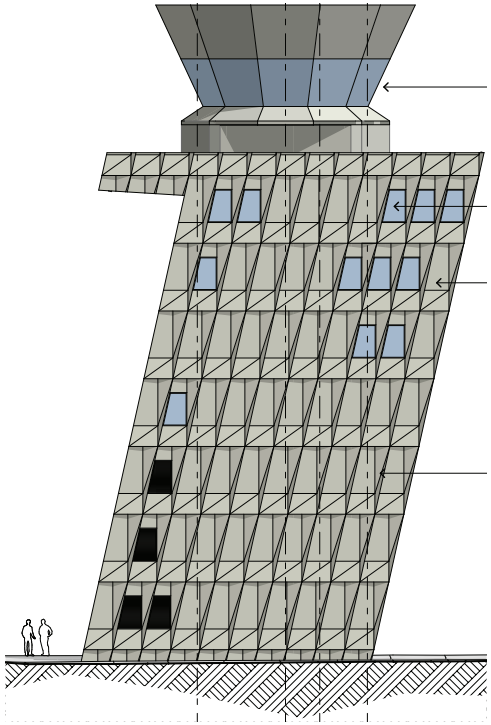
There are two essential elements to the tower building: the tower cab in which the controllers work and the main tower building which provides for support functions and brings the cab up to its maximum height. The two elements are treated in contrasting ways although all materials will respond to the weathering challenges of the area.

The twelve sided cab is a smooth glazed object. The glazing, so essential to the controllers, is carried upwards to form the parapet of the tower cab with fritted glass as the visible cladding surface. Below the cab glazing and reaching down to the external deck, composite aluminium cladding is used to provide continuity in the smoothness of the cab element.

The tower has two sets of contrasting façade treatments. On the east and west facades, an angular and textured cladding treatment is intended to evoke the rocky terrain of the south coast. The cladding is intended to be created from a pre-finished material formed into cassettes or rain screen panels, articulated to create both vertical and inclined alignments up the height of the facade. The exact material will be the subject of detailed design, but could include such materials as glass reinforced concrete or pre-finished metal composite cladding.

On the north and south façades, a smooth polished appearance is sought, reflecting the stones polished by wave and water. The raked cladding here is formed using a proprietary flush glazed aluminium curtain wall system. Visual interest is created with a varying system of glazing subdivision and a varying composition of fully transparent, fritted and opaque glazing. Additionally some glazed sections will be replaced with louvres where plant requirements need to be met.

The exact treatment of each facade will be the subject of detail design studies as at the concept design phase reached so far, the extent and arrangement of some elements essential to building function cannot be exactly delineated. In particular, the exact placement of grilles for mechanical ventilation, the extent of opaque and translucent glazing on the north and south façades, the exact extent of window openings to the east and west, and the placement of doors may need to be varied slightly to accommodate functional requirements.



East Elevation Fig 41

Perspective view of the tower at night, lit as it would be in a moderate southeasterly wind

Fig 42

9.3 Lighting

The main generators for the lighting concept are:

- Lighting reflects the wind idea of the building itself and therefore its Wellington setting
- The lighting is data driven in the same way that Airways own services rely on data taken from radar and other sources
- The lighting has a kinetic aspect; this reflects the nearby kinetic wind sculptures on Cobham drive
- The rough textured sides are lit; these are the east and west sides of the building. The smooth leaning sides on the north and south just glisten like the unlit seas nearby.
- The lighting must have no discernible impact on the controller's cab where it must not interfere with safety and clear visibility to the runway, etc

The building is treated in three parts:

1. The roof does not need a navigational light at this stage but it may be required: this is a regulatory safety issue. On the roof balustrade, there are 4 red lights to point to the 4 cardinal directions: north, east, south and west.
2. The cab itself will register as a black round object at night as its not lit in any way and there is very little light internally
3. The rough textured east and west sides of the tower are lit with LED outdoor lights in an array to be determined at the detailed design stage. The lighting will generally provide a wash of variable colour and this will emphasise the rough texture of the building panels with heavy shadows in the indents of the building.

The LED lighting to the tower illustrates the wind environment in which the tower sits:

1. The lighting is driven by wind speed, gust and direction data either collected at the tower or nearby
2. The lighting colour is determined by matching wind direction to the colour wheel so that southerlies are a cold blue and northerlies are a warm orange: these are at the opposite sides of the colour wheel. Other wind directions would have colours from the colour wheel e.g. the west is green and east is crimson and so on.
3. Lighting intensity is matched to wind speed, so the colouration is more intense and the coverage of the building runs to a fuller extent when wind speeds are higher
4. The lighting also reflects local gusts so slivers of light appear like a graph reaching up the building when wind gusts occur

The airport environment is also recognised:

1. When planes on their takeoff or landing roll pass perpendicular to the tower on the runway and when the appropriate data feeds are available to Airways, the lighting will shimmer as they [theoretically] move from one side of the tower to the other
2. The size and speed of the shimmer varies according to the size and speed of the plane

It is expected that data feeds are used by the computerised lighting controllers to create the wind and plane effects in the lights themselves. As wind direction does not vary all the time, it is expected that the lighting colour will be relatively stable but that windier conditions will be recognisably different to calm days.

9.4 Maintenance and Robustness

The control tower sits in a very exposed area with a harsh weather profile not to be envied. Additionally the effects of sand, salt and fuel residues on the building fabric and any openings cannot be underestimated.

At the level of the tower cab, the cab glazing is especially toughened and cleaned and coated at regular intervals to protect the glass surface from pitting. A specialised gantry is provided just below the tower glass level. Additionally the flat shelf, really an extended deck, at level seven provides maintenance access to the exterior of the tower cab and gantry access to the levels below if required.

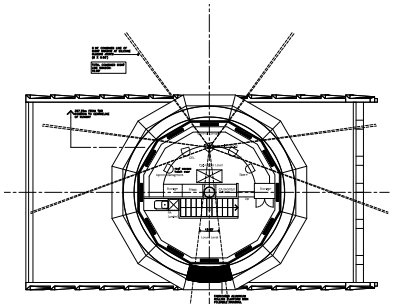
The tower itself is clad in robust materials suited to the harsh environment. On the east and west façades, GRC or similar materials will provide a suitable level of robustness. On the north and south façades, a unitised curtain wall system will likewise ensure weathertightness and durability.

Maintenance access to the tower below the level of the extended deck can be obtained using access equipment suspended below the deck or alternatively using cherry pickers from ground level.

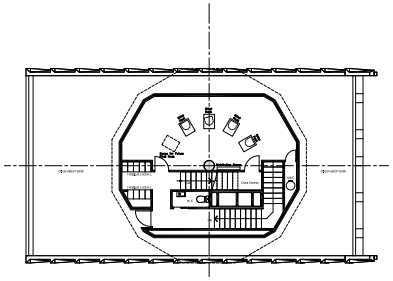
Internal maintenance is facilitated using the lift. As the building has a wide and complex array of control, ventilation and electronic systems, easy access is important to the long term functionality of the building. At ground level, the diesel tanks for the electrical generator are replenished at irregular intervals and a containment pad is proposed at the tanker parking place adjacent to the generator room.

9.5 Plans Elevations and Sections

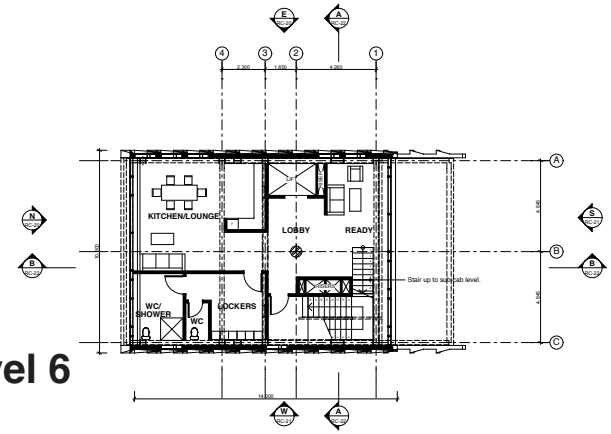
For the sake of the completeness of this Design Statement, the plans submitted with the Resource Consent application documents are reproduced overleaf.



Cab



Level 7



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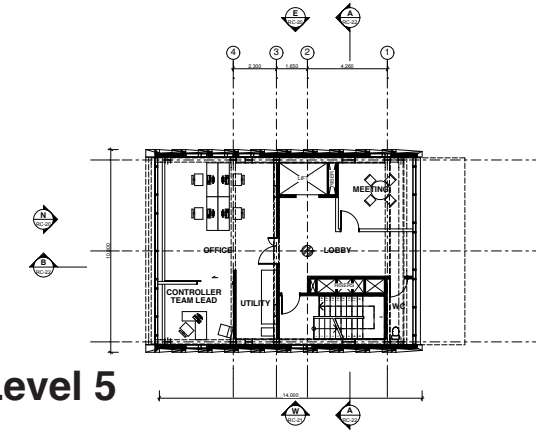

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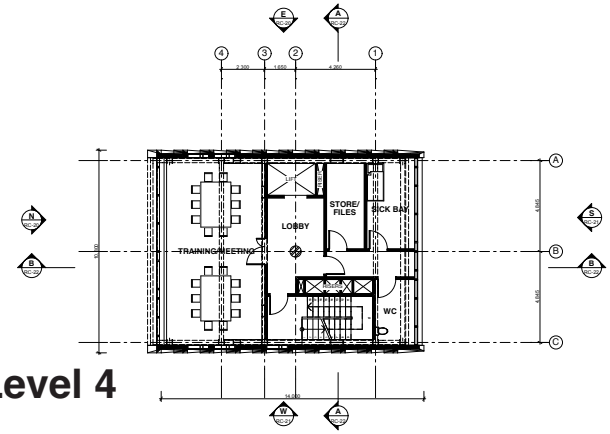

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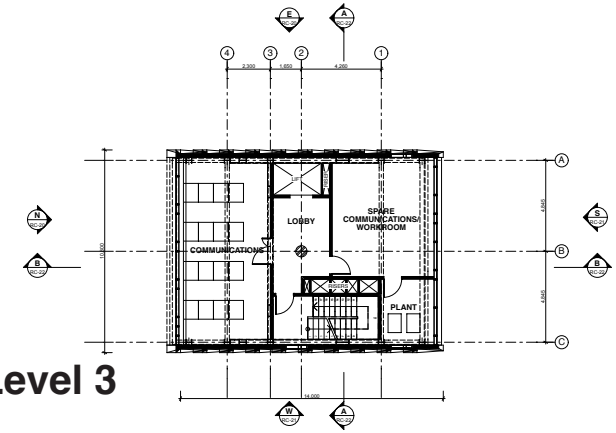

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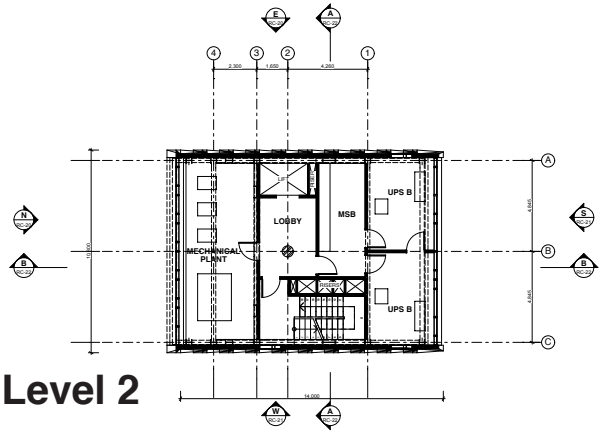
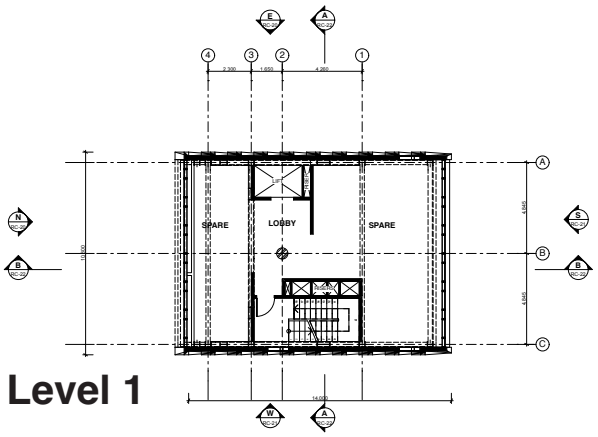
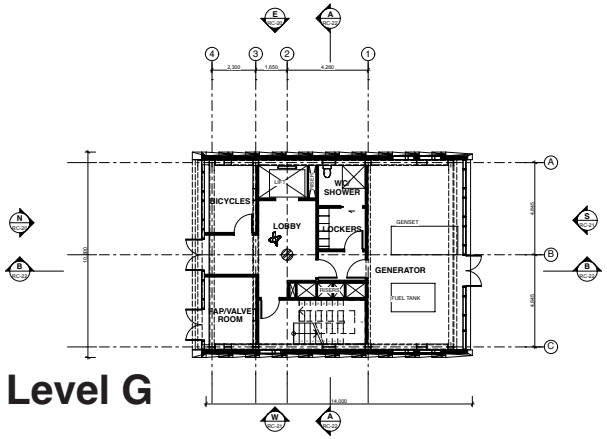


Level 2



Level 1



Level G

Floor plans of each level of the building. Internal layouts are indicative only.

Fig 43

10. Summary

The proposed new Airways Wellington Control Tower meets complex technical needs in providing for the safe operation of Wellington International Airport. Providing effective air traffic control is an aviation safety issue. This is the driver behind the functional requirements of the tower and the sole driver behind the height of the building.

As well as meeting a clear need, the tower building does this in a way that makes a positive contribution to its immediate environs, to the wider locations in which it is visible and to the credibility of the city as a creative, but challenging, place in which to live and work or visit.

The tower building's twelve and a half degree lean provides an immediate cue to the unusual circumstances of its place. The winds are faced head on.

The building's compositional treatment and texture register its place at a finer level of detail, suggesting its coastal and environmental origins.

Its night time lighting reinforces the ideas behind the building form and provides a graphic and graph like display of what is currently happening with the winds that so shape our ideas of the city of Wellington.

Sketch perspective of the tower from the Airport Retail Park

Fig 44

Building Facts and Figures
Height: 32.5m above ground
Nine storeys of accommodation
Lean of 12.5 degrees
Footprint 150m^2 at ground floor; 217m^2 overall
Ground level is at RL 4.39
Maximum height: RL 36.830
Site area: 888m^2