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VORTEX POWER SYSTEMS

ATMOPSHERIC VORTEX RESTRICTED AIR SPACE PROPOSAL

PART 71

Project Title: Vortex Power Systems Demonstration Plant – Christopher Road, Gisborne

Date: 8/9/21

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EXECUTIVE SUMMARY

Vortex Power Systems (VPS) are developing a revolutionary technology to convert waste low grade heat into electricity. The technology uses waste heat from <80^{o}C hot water recovered from thermal processes in industry, to generate and power a controllable freestanding atmospheric vortex which in turn drives a turbine and generates electrical power.

The technology will work as an add-on to industrial and thermal power generation processes, reclaiming energy from low-grade heat that would otherwise traditionally be sent to cooling towers. The technology has been developed from research conducted at the University of Auckland by Prof Richard Flay and Neil Hawkes.

VPS have achieved laboratory scale proof of concept and wish to build and operate a full-scale Vortex Wind Turbine Demonstration Unit. We have selected a remote piece of farmland (Land Zone 1 under land management regulation) at the end of Christopher Road, Gisborne region that we wish to develop our demonstration unit on.

Aeronautical Impact

The plan is for the Demonstration Unit to generate an atmospheric vortex akin to a waterspout that should extend up into the atmosphere. VPS acknowledge that the vortex will be highly turbulent and would pose a significant risk to air users who came within 10m of the core. As a safety precaution, VPS wish to establish an area of restricted airspace for the Demonstration Vortex to operate within.

Given the vortex operating zone outlined, VPS wish to establish a tiered cylindrical restricted airspace that extends 10km into the atmosphere with a 1500m radius from 0ft-8000ft and a 5km radius 8000ft an above, about the Demonstration Unit at 38°35'15.0"S 178°08'57.0"E. VPS intend to operate the Demonstration Unit intermittently (1-2 times per week for 1-4hr periods) for approximately 3 years, thus the restricted airspace would be activated/deactivated intermittently by means of NOTAM.

An assessment of aviation impacts concludes that the proposed restricted airspace will have no impact on current IFR operation, as it will be located more than 3km from the nearest Flight Path, Standard Terminal Arrival Route or Runway Approach. Once Airways NZ implement the new PBN system at Gisborne aerodrome in December 2023, the restricted airspace will overlap the new proposed airspace and this will conflict with the new VASNI missed approach procedure. VPS will schedule the operation/activation of the restricted airspace around scheduled inbound IFR traffic to limit the number of conflicts, to unscheduled/impromptu flights only. An alternate holding pattern will have to be made available for impromptu inbound traffic whilst the restricted airspace is active and VASNI is unavailable. VPS and Airways NZ are developing this procedure and the Air Navigation Service Provider (ANSP) is likely to be able to manage the proposed airspace from a technical point of view.

The restricted airspace will enclose an area that VFR traffic uses occasionally for helicopter recues, agricultural spraying & top dressing, private travel, hobby flying and sightseeing. However, due to the low proportion of operating hours of the vortex and activation of the restricted airspace, consultation of operating schedules will allow VFR pilots to work in and around the airspace easily.

VPS have received verbal and written acknowledgment and support from all aviation stakeholders in the region.

VPS have had this aeronautical assessment SME reviewed by To70 Aviation (Australia), an aviation consultancy that has recent experience with Gisborne Airport operations and the associated airspace. To70 have reviewed the report for technical accuracy and approach and confirmed the document had comprehensively captured the operation of the Demonstration Unit and the potential impacts on local operators.

We believe that with the implementation of a restricted airspace, the support of CAA, Air Traffic Control and local parties and the implementation of a number safety measures, this project can be managed safely without adverse impact on Gisborne's Aeronautical landscape.

VORTEX POWER SYSTEMS TECHNOLOGY

The technology creates the right conditions to reproduce an anchored version of the naturally occurring phenomena of atmospheric vortices/waterspouts, which are effectively natural convection cooling towers capable of generating electricity. By spraying hot water (recovered from industrial processes) into the centre of a Vortex Power Station, VPS are able to heat and saturate the air. The localised hot, saturated air is lighter and more buoyant than the surrounding atmosphere, causing it to rise and induce a low-pressure zone that draws air surrounding the station into the spray zone to be heated and saturated, continuing the cycle. The incoming air is passed through a gallery of "Swirl Vanes" which imparts rotation/vorticity. The swirling, rising air builds into a controlled atmospheric vortex, akin to a waterspout. The vortex's energy is harnessed by a proprietary wind turbine located at the base of the vortex, which generates electricity. The driving force behind the vortex is the temperature differential between the heat source at the base and the cold sink at the top, therefore it is favourable to generate vortices that extend up to the upper atmosphere (tropopause) where the heat sink is coldest, maximising the temperature differential and energy extraction potential. The vortex acts to convert heat energy into kinetic energy air flows which are then converted into electricity by the turbine. Of the water used to heat and drive the vortex, 96% is collected on the Vortex Power Station Pad and returned to the industrial plant at atmospheric temperature, having been cooled by the vortex's free convection.

VORTEX POWER SYSTEMS DEMONSTRATION UNIT

The VPS Demonstration Unit is a research project aimed at providing full scale proof of concept and allowing the development of the technology. The Demonstration Unit is expected to produce a full-scale vortex in the atmosphere at the smallest possible conceivable size, approximately 5MW. This unit will drive a turbine located at the base of the vortex, (approximately 1000mm wide and 250mm) to drive a generator connected to a load bank, to demonstrate the potential power output, the unit will NOT supply electricity to the grid or any other infrastructure.

The demonstration plant will comprise of:

1. Circular bunded Vortex pad
2. Hot water spray system
3. 12 proprietary, adjustable wind vanes positioned evenly around the periphery of the pad
4. Vortex wind turbine (proprietary)
5. Turbine generator
6. Pad substructure abutment for generator and services
7. Hot water generation, supply and return system
8. MCC (motor control centre and office)

This is the entirety of the substantial infrastructure, there are no tall permanent structures containing the Vortex as it needs to be free standing to allow the fundamental physics to work.

Vortex Anatomy & Behavior

The proposed Vortex will extend up into the atmosphere and may generate notable turbulence up to 10km high. At the base of the vortex the core will have a diameter of approx. 1m and as the vortex extends upwards this diameter will increase to its steady state diameter of approx. 5m.

Figure 1 - Waterspout Imagery for Context

The vortex can be considered in three main parts:

1. Base

At the base, where the vortex is formed, the air flows are momentum dominant. Air surrounding the station is sucked in horizontally by the pressure depression in the centre, and as it approaches the centre, tangential velocities are concentrated into the core before erupting vertically like a jet. The maximum tangential/rotational wind speed (Vt(max)) in the core of the vortex will be ~80m/s. Outside of the core the incoming tangential wind speeds reduce proportionally with radius (Vt proportional to 1/radius), i.e the further away from the core the lower the wind speeds. The swirl vanes (which give the incoming wind rotation) are set at a distance 11 times the core radius from the core (approximately 6m out from the turbine), therefore the rotational wind speed at the vanes will be 80m/s x 1/11 ~ 7.5 m/s or 27km/h, which is a stiff breeze. We put a chain link fence outside the vanes, to keep people/livestock out. 10m away the wind speeds are halved again and eventually get lost in the breeze.

2. Convecting Core

As the main vortex core rises into the atmosphere via buoyancy differential, the vortex becomes buoyancy dominant, the vertical wind speeds gradually increase to ~16m/s, the maximum tangential wind speeds decrease to 16m/s and the vortex core reaches equilibrium at a diameter ~5m. Again, the horizontal wind velocity profile is inversely proportional to the distance from the core, at 10m from the core the wind velocity should be <3km/hr. As the vortex climbs moisture in the core condenses and releases latent heat

which acts to maintain the core's temperature and maintain the vortex's buoyancy with respect to the surrounding atmosphere, which allows the vortex to persist up to the tropopause.

3. Dissipating Plume

The Vortex's height is limited by either the initial energy input or ultimately the height of the inversion layer (Tropopause) where the atmospheric lapse rate is inverted. In either of these scenarios, as the vortex rises and runs out of buoyancy the core wind speeds decrease until they become comparable to normal atmospheric conditions and the vortex dissipates into a plume. This delineates the top of the vortex, this is estimated to occur at 5-6km, dependent on atmospheric conditions.

The vortex is susceptible to atmospheric weather conditions and will lean over in the presence of side winds to varying degrees. The bottom however is anchored to the heat supply so cannot move; it will not track sideways at ground level. Tornadoes are able to do this because they are being driven by storms above. We strongly believe that our vortex cannot because it is driven by our heat-source below which is fixed to the plant. Testing from our laboratory provided us with data that suggests the vortex will run until pushed over by 30' from the vertical. Stronger winds than this will break it up - like blowing out a candle flame. If the heat supply is removed or the vortex is blown-out, the core breaks at the base and the existing vortex recedes upwards, following the existing path. The bottom of the vortex will recede all the way up into the original plume and dissipate at which point the entire vortex desists.

The prevailing wind direction at the site is NNW, so the vortex will tend to lean SSE.

VORTEX DEMONSTRATION UNIT OPERATION

Vortex Location

VPS are developing the plant on a 2ha block of land on a dry stock farm located 13km NE of Gisborne, at the end of Christopher Road, Whangara, Gisborne. The Vortex will be generated from appoint source at 38°35'15.0"S 178°08'57.0"E

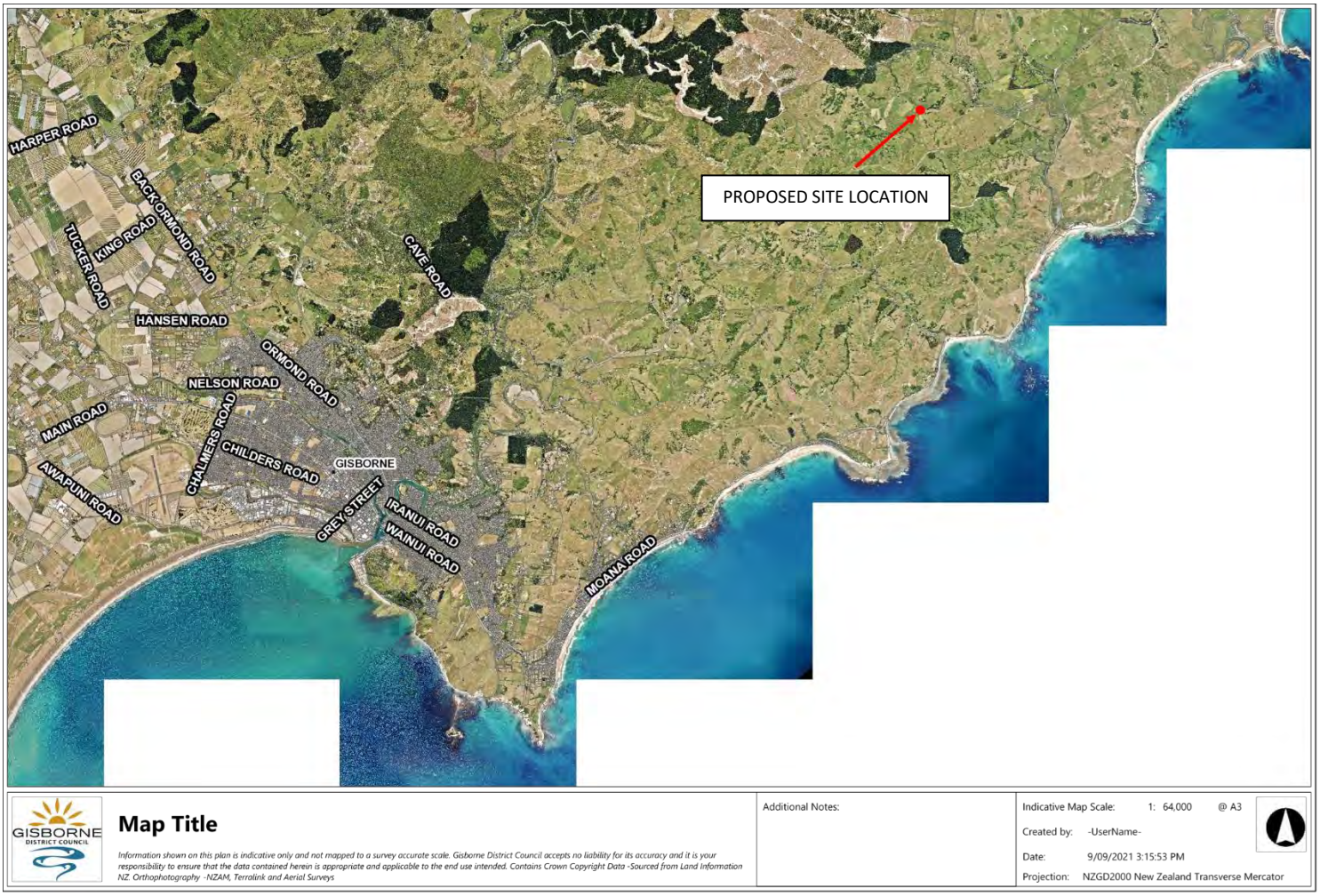


Figure 2 - VPS Demonstration Plant - Proposed Site Location

Operating Zone

Given that the vortex is capable of extending 10km up to the tropopause and is able to be lent over by up to 30°, an inverted conical shaped operating zone can be determined, which extends 10km up from the Vortex plant with a 5km radius at the top.

VPS understand the boundary of this operating zone and proposed restricted air space is 2.4km from the current boundary of Gisborne Tower controlled air space.

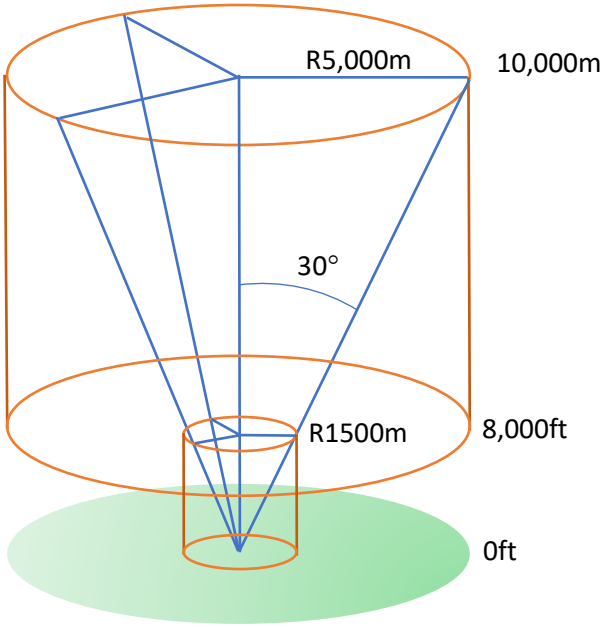


Figure 3 - Vortex Operating Zone and Restricted Airspace

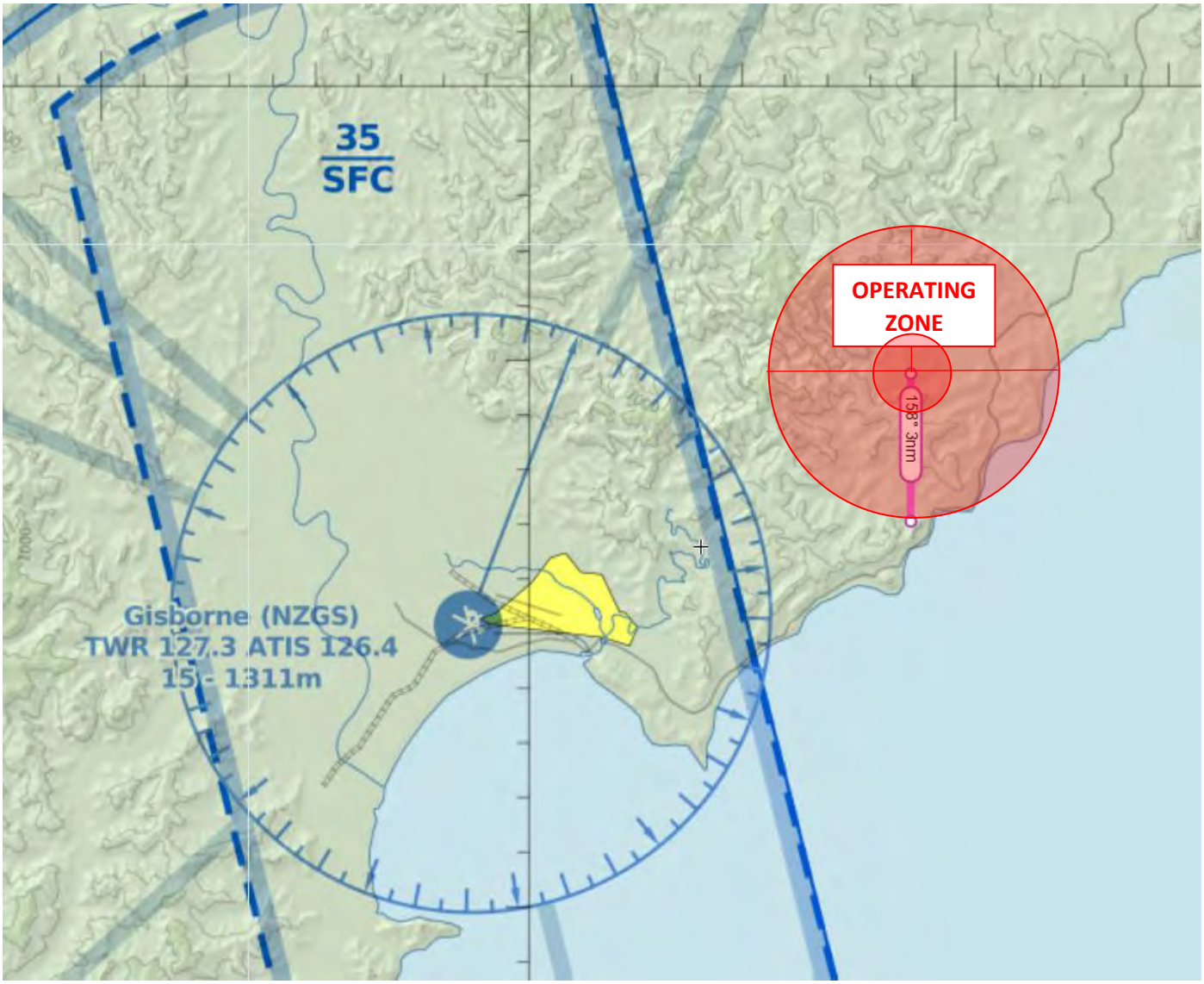


Figure 4 - Vortex Restricted Airspace Layout

Restricted Airspace

VPS acknowledge that the turbulence produced by the vortex will be significant and that it would be unsafe for any form of aircraft to pass through or within 10m of the Vortex core. VPS therefore wish to establish a restricted airspace. Given that the vortex could extend 10km up to the tropopause and is able to be lent over by up to 30°, VPS wish to establish a tiered restricted airspace above and around the point from which the vortex will be generated at 38°35'15.0"S 178°08'57.0"E. The first tier from 0-8000ft with a radius of 1500m and the second tier from 8000ft upwards, with a radius of 5km (tan(30) x 10km = 5km). This will be VPS's primary Airspace Safety measure.

The boundary of this restricted airspace lies 2.4km outside of Gisborne Airport's current controlled airspace.

Airways NZ have concurrently submitted a proposal to update Gisborne Aerodrome to the PBN system, which will be implemented in December 2023. With respect to this PBN proposal, VPS's proposed restricted airspace will still lie outside of the first/lower tier of controlled airspace at 2500ft, however will lie within the second tier from 3500ft upwards, see Appendix A . Discussions with Airways NZ have identified that the proposed VPS restricted airspace will conflict with the proposed VASNI missed approach procedure. The missed approach holding pattern VASNI is a procedure required for inbound traffic only. Scheduling the operation of the restricted airspace around scheduled inbound IFR traffic will minimise the number of conflicts, to unscheduled/impromptu flights only. An alternate holding pattern has been proposed that would be made available for impromptu inbound traffic whilst the restricted airspace is active and VASNI is unavailable.

Operating Schedule

The Demonstration Unit will be a batch operation process, meaning the Vortex will be operated for 1-4hr periods, intermittently. The Vortex will only be operated on consultation with relevant stakeholders and airspace users, to ensure that it doesn't interfere with their activities such as spraying or top dressing.

Vortex Power Systems (VPS) intend to build and operate the demonstration unit from March 2022 to 2025. For the first two months post construction completion and commissioning, VPS intends to operate and generate the Atmospheric Vortex on the station up to three times a week for 2 hour periods. VPS will be limited to 2 hour periods by operational constraints. After these first two months, VPS will reduce the operating frequency down to four times a month until the end of the lease. Again, the maximum run time for each demonstration/trial will be 2 hours only.

Post PBN implementation, scheduling the operation of the restricted airspace around scheduled inbound IFR traffic will minimise the number of airspace conflicts to unscheduled flights only

Operating Hours

The premise of the Demonstration Unit is to research and develop the technology to a level at which we can build the first full scale commercial pilot plant with an industry partner. As such, VPS will initially operate the vortex in favourable conditions, stable atmosphere, low humidity, high atmospheric lapse rate etc. this will likely be over night, dusk and dawn. Once this has been achieved VPS will look to operate this vortex in more challenging conditions (cross winds, atmospheric inversion, high humidity, high temperatures) to test the behaviour and limitations of the vortex. Therefore, over the 2-3 years of operation VPS intend to run the vortex across a variety of operating hours, as atmospheric conditions permit.

Aeronautical Impacts Assessment

This section investigates the Aeronautical Impact of the proposed restricted airspace on Gisborne's Aeronautical Landscape

Aeronautical Landscape

The aeronautical landscape in the Gisborne Region comprises IFR and VFR traffic, with Gisborne Airport located at 38.6619° S, 177.9821° E and Gisborne Hospital Helipad located at 38°38'20.1"S 178°00'13.3"E, encompassed in Gisborne Controlled Airspace. These facilitate domestic travel, private aviation, pilot training, rescue flights, agricultural and commercial aviation. Several domestic and international flight paths also coincident at and over Gisborne Airport Controlled Airspace NZA450.

IFR Traffic

IFR traffic in the Gisborne region and Gisborne Controlled Airspace use prescribed Flight Paths, Standard Arrivals (STAR) and Approaches as detailed in Appendices which bring pilots to land or take off from Runway 14 or 32, depending on the prevailing wind.

The Vortex Demonstration Unit will be located 7.4km outside of Gisborne's controlled air space boundary and therefore the 5km radius restricted airspace boundary will lie 2.4km from the controlled airspace boundary.

As the proposed restricted airspace lies outside Gisborne's controlled airspace it is implied that it won't interfere with any IFR arrival or departure procedures however VPS have further investigated IFR operations to corroborate this.

IFR Air Routes

Flight Paths to, from and over the Gisborne region are shown in Figure 3 below:

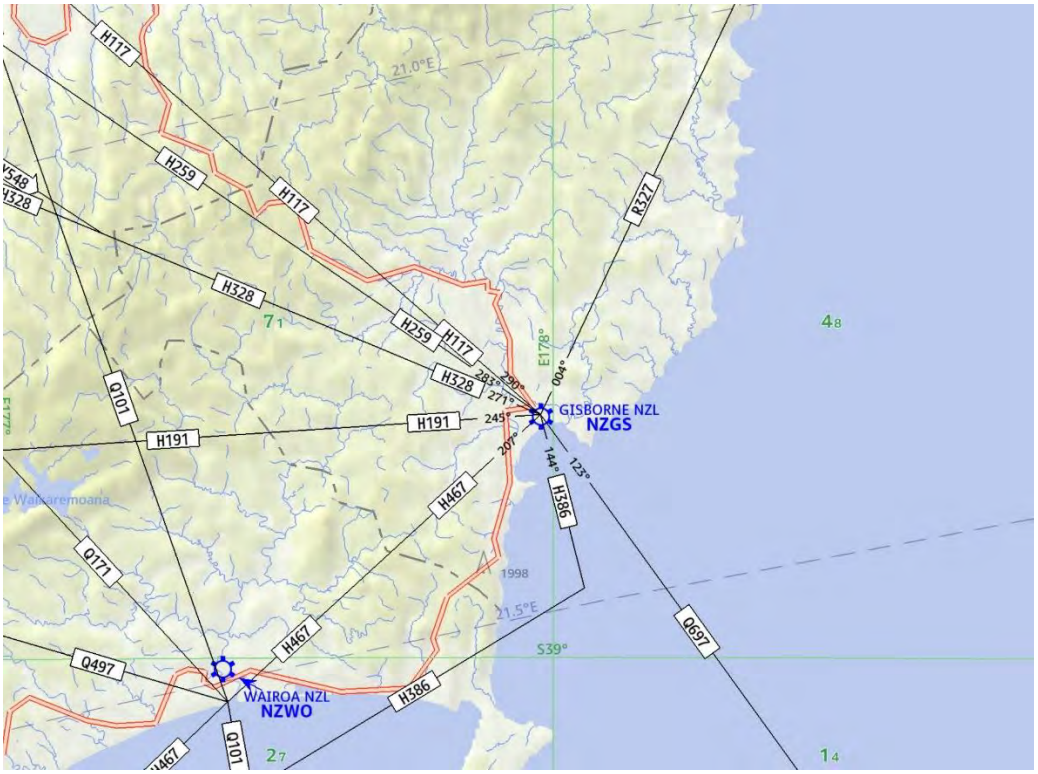


Figure 5-Flight Paths Over the Gisborne Region

With respect to the Proposed VPS Demonstration Unit at 38°35'15.0"S 178°08'57.0"E , the closest flight path is R327. Which is 5.4NM = 10km from the Vortex Demonstration, and therefore 5km from the proposed restricted airspace boundary.

Figure 6 - Vortex Proximity to Flight Path R327

Gisborne Airport Standard Terminal Arrival Routes

Standard Terminal Arrival Routes (STARs) direct pilots from these flight paths to the start of their final landing approach onto runway 14 or 32 of Gisborne Airport. At Gisborne Airport, pilots land and take off on Runway 14 when the the previaling wind is from the 140deg side or on Runway 32 when the prevailing wind is from the 320deg side. The Standard Arrival and Departure Routes are detailed below.

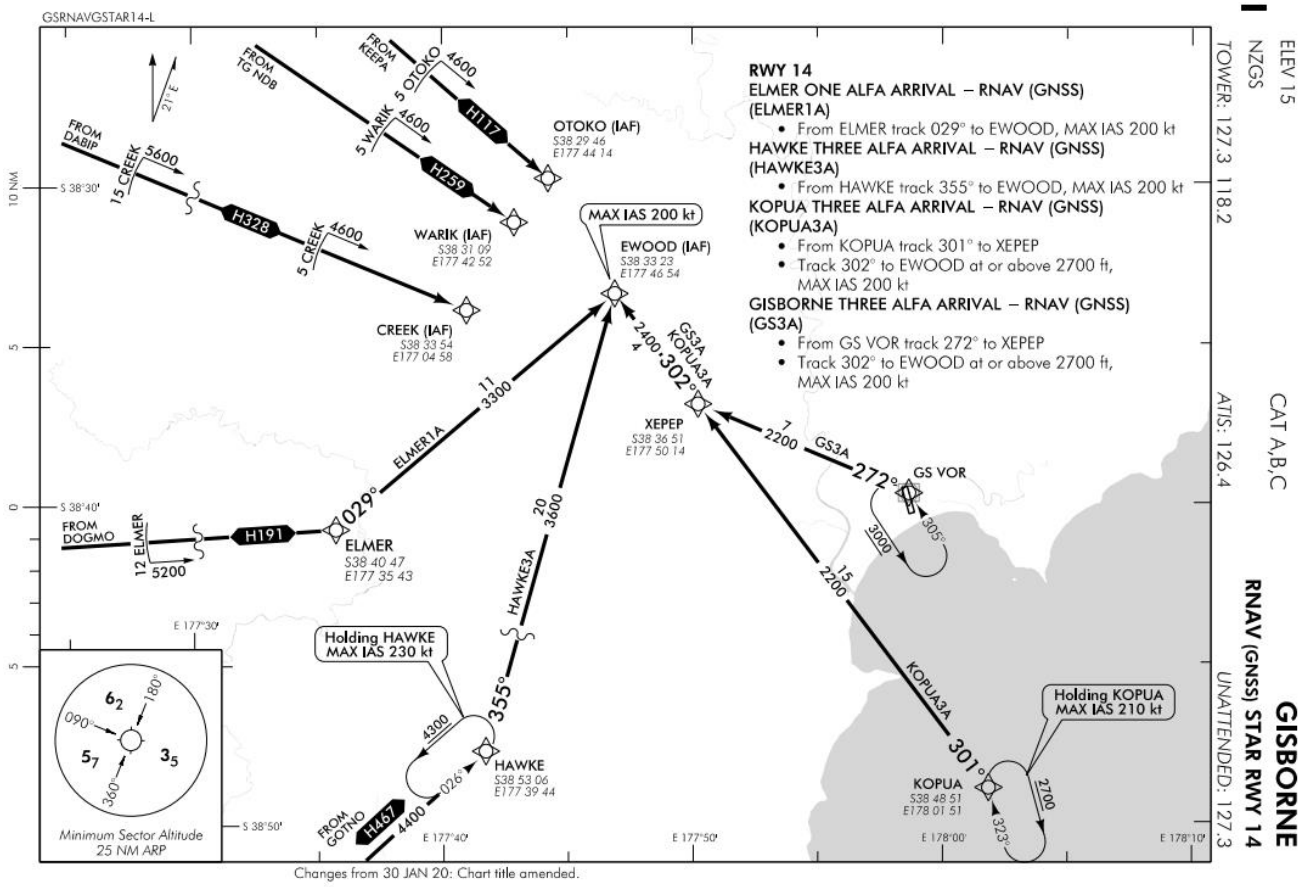


Figure 7 - Gisborne Airport IFR Standard Terminal Arrival Routes for Runway 14

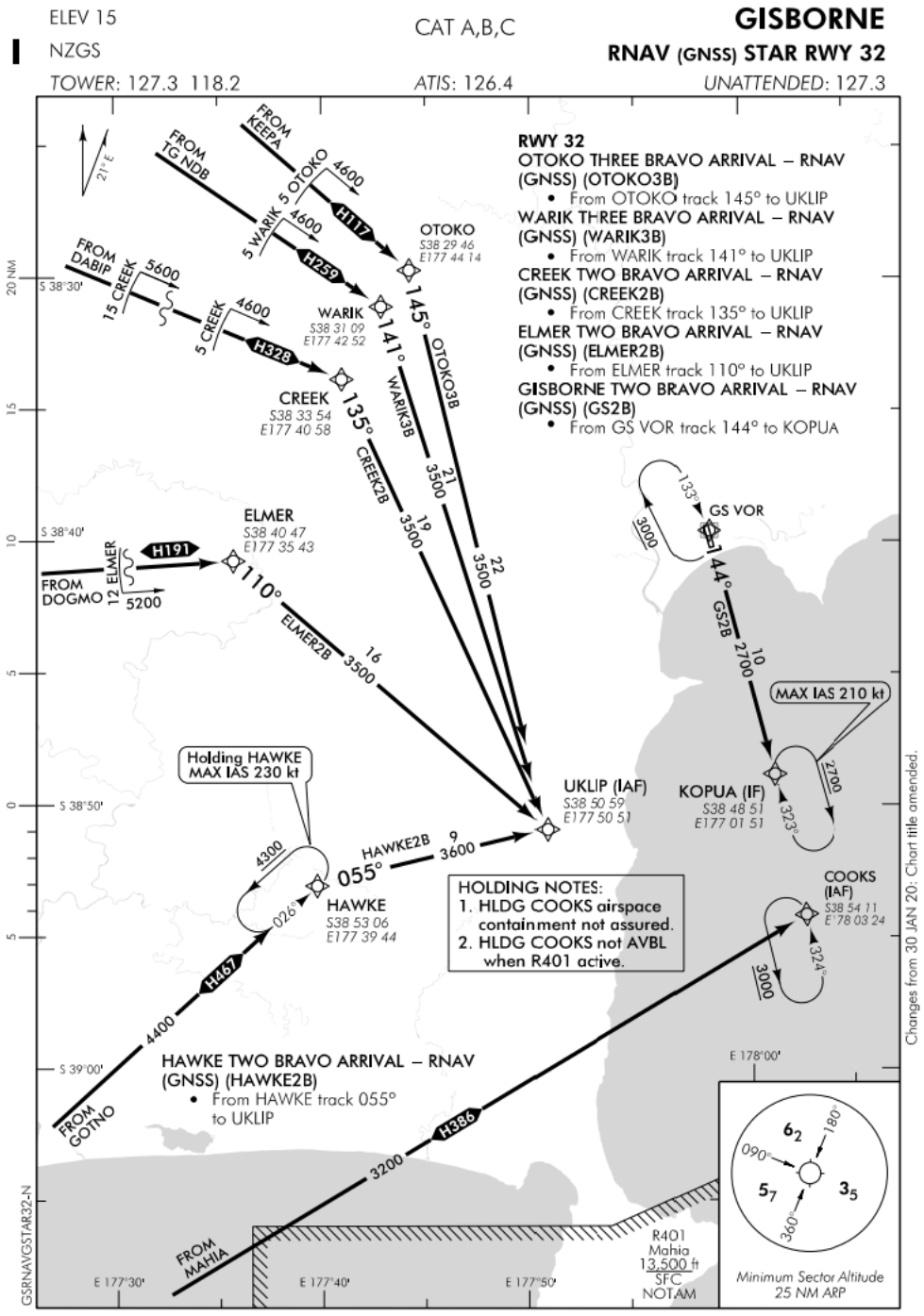
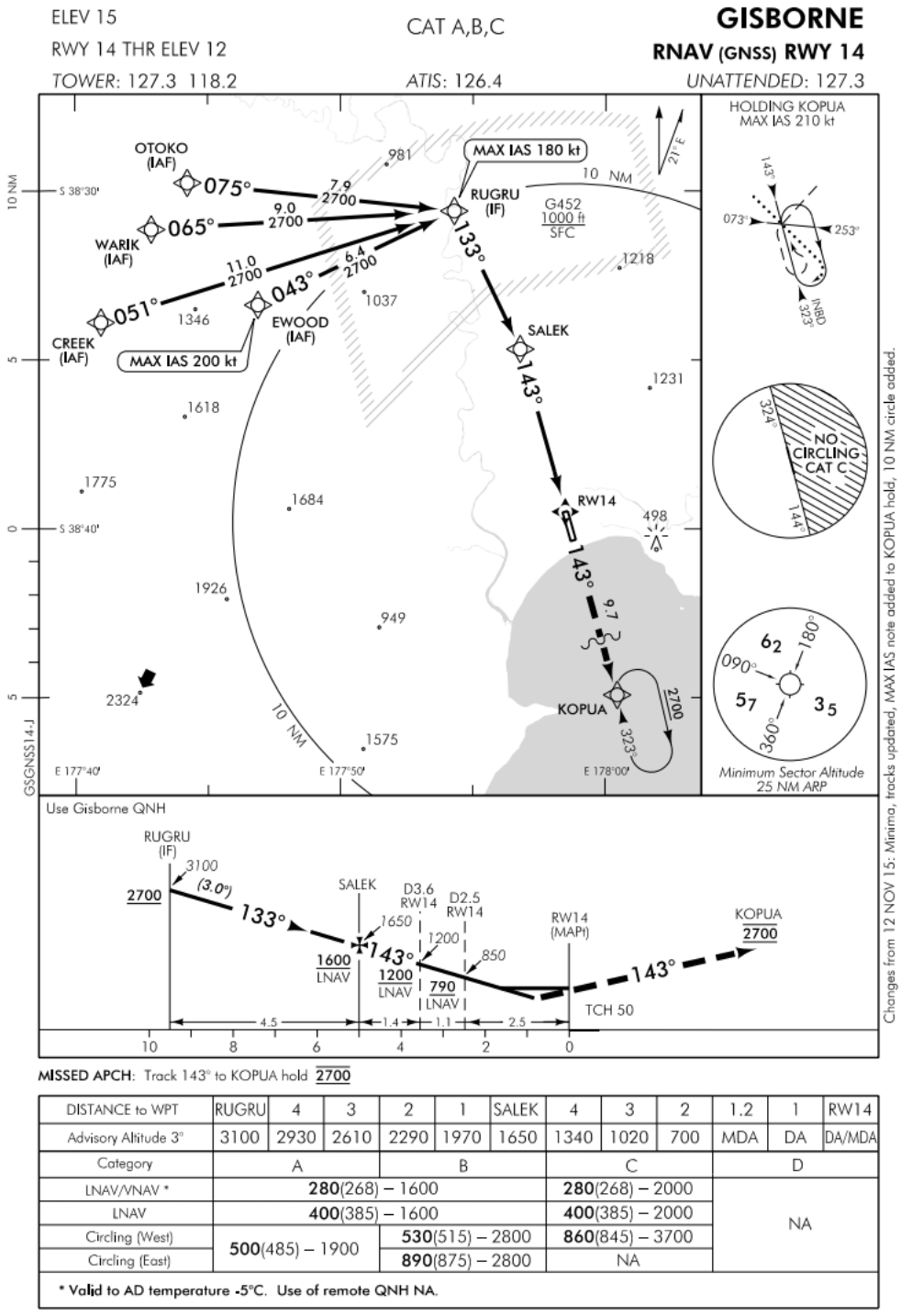


Figure 8 - Gisborne Airport IFR Standard Terminal Arrival Routes for Runway 32

Gisborne Airport RNAV Approaches

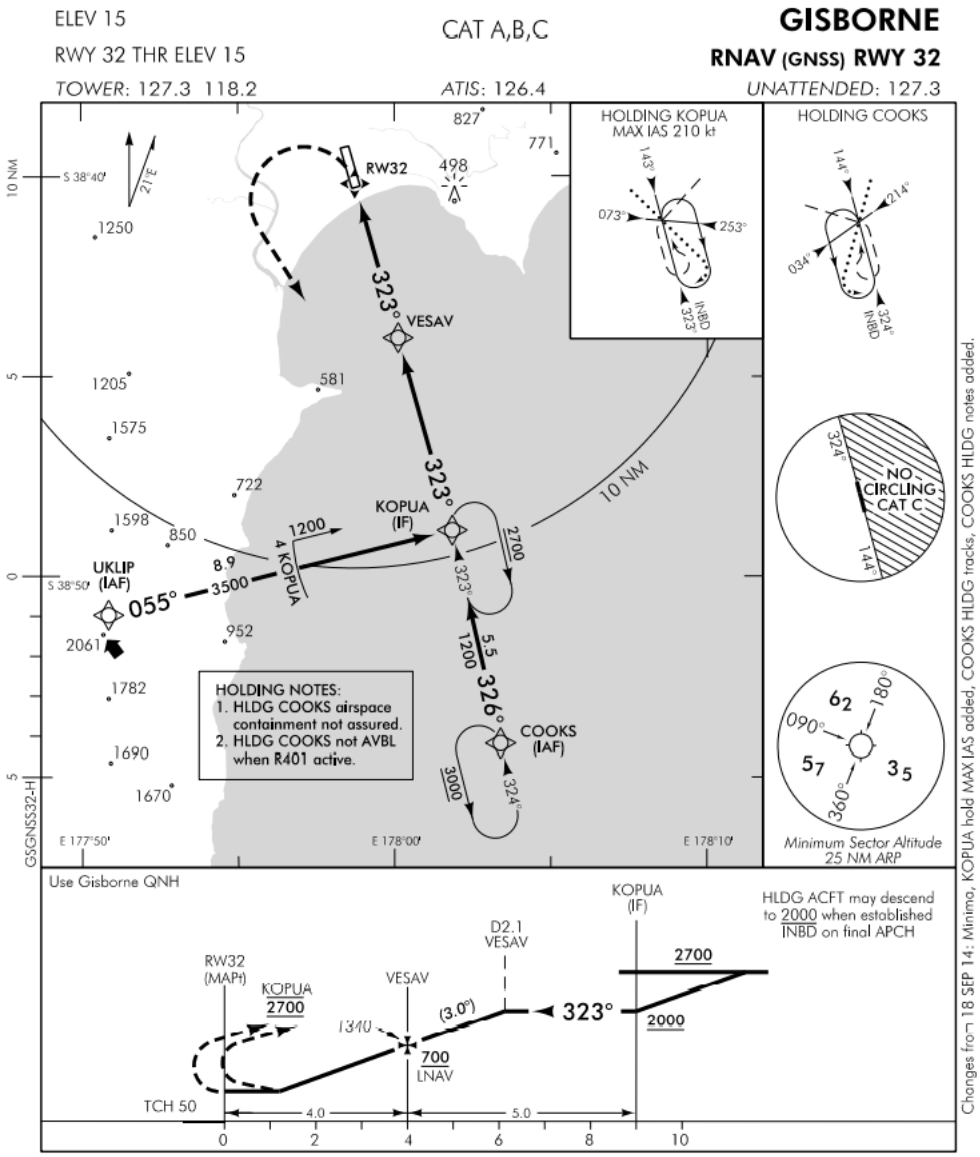


MISSED APCH: Track 143° to KOPUA hold 2700

DISTANCE to WPT	RUGRU	4	3	2	1	SALEK	4	3	2	1.2	1	RW14
Advisory Altitude 3°	3100	2930	2610	2290	1970	1650	1340	1020	700	MDA	DA	DA/MDA
Category	A			B			C			D		
LNAV/VNAV *	**280**(268) – 1600						**280**(268) – 2000			NA		
LNAV	**400**(385) – 1600						**400**(385) – 2000					
Circling (West)	**500**(485) – 1900			**530**(515) – 2800			**860**(845) – 3700					
Circling (East)				**890**(875) – 2800			NA					

* Valid to AD temperature -5°C. Use of remote QNH NA.

Figure 9 - Gisborne Airport Landing Approach for Runway 14



DISTANCE to WPT	RW32	1.2	2	3	VESAV	1	2	3	4	KOPUA
Advisory Altitude 3°	DA/MDA	DA/MDA	700	1020	1340	1650	1970	2290	2610	2930

Category	A	B	C	D
LNAV/VNAV *	**390**(375) – 1600		**# 440**(425) – 2400	NA
LNAV	**400**(385) – 1600		**# 440**(425) – 2400	
Circling (West)	**500**(485) – 1900	**530**(515) – 2800	**860**(845) – 3700	
Circling (East)		**890**(875) – 2800	NA	

* Valid to AD temperature -5°C. Use of remote QNH NA.
\# Requires 3.5% (220 ft/NM) missed approach climb gradient.
For aircraft unable to comply increase minima to 740 (725) – 4000.

Figure 10 - Gisborne Airport Landing Approach for Runway 32

The above procedures do not conflict with the proposed restricted airspace, as they exist wholly within Gisborne controlled airspace. Upon reaching the approach point, pilots begin the final approach which takes them down to land on Runways 14 or 32, as shown. It should be noted that all missed approaches circle back to the final approach point via the western side of the airport.

VFR Traffic

Aviation traffic flying by Visual Flight Rules (VFR) use Gisborne Airspace and aerodrome for a variety of purposes including:

- Air Rescues (Eastlands Rescue Chopper)
- Private travel and Recreational flying (Gisborne Aero Club)
- Pilot training (Eagle Flight School)
- Agricultural spraying/topdressing (Farmers Air, Super Air, Country Helicopters and Ashworth Helicopters)
- Commercial Aircraft Operations for charters, air operations/lifting, scenic flights, firefighting, film & photography etc (Ashworth Helicopters and Country Helicopters)

VPS have consulted each of these stakeholders to gain understanding of their operation and the potential impacts of the restricted airspace.

Aerial Topdressing

A large proportion of Gisborne's land is used for farming, including the land where the demonstration unit will be developed. Many of these farms use aerial topdressing to apply fertilisers, pesticides and other sprays on their land. Having consulted all the local commercial agricultural aircraft operators it is clear that they do operate in the area and will occasionally need to spray land within the proposed 5km radius zone. VPS intend to consult local airspace users and prepare a weekly operating schedule accordingly. The agricultural aircraft operators are comfortable that between the proportionally low active hours of the Airspace restriction and the consultation and scheduling process, we will be able to work in and between one another easily.

Commercial Aircraft Operation

Commercial VFR aircraft (mainly helicopters) provide a range of services in Gisborne including:

- air operations/lifting
- scenic flights
- firefighting
- film & photography

Occasionally these service providers may need access to the region within the restricted airspace boundary. Again, these operators (Ashworth Helicopters & Country Helicopters) are among the stakeholders that VPS intend to consult and schedule with. Again, on consultation these operators have indicated that they are comfortable that between the proportionally low active hours of the restricted airspace and the consultation and scheduling process, we will be able to work in and between each other easily.

Eastlands Rescue Chopper

Eastlands Rescue Chopper provide emergency rescue services to the East Cape and Gisborne Region for those in need of emergency air lift. Throughout the year they conduct multiple missions, several of which are up along the East Cape.

Subject to meteorological conditions, the helicopter either flies relatively direct from Gisborne Airport to the incident over the ranges (in good visibility) or flies along the coastline. The proposed restricted airspace boundary ends along the coastline and therefore won't impede on coastal flying.

The location of the proposed restricted airspace with respect to Gisborne Airport and the shape of the East Cape, means that the majority of the East Cape will still be able to be accessed via direct flight over the ranges, unimpeded, as illustrated in Figure 11. Only a small region of potential rescues requiring flight above 8000ft would require the chopper to skirt around the boundary to reach a patient and an even smaller region below 8000ft. The area directly under the restricted airspace will also be inaccessible by air while the restriction is active.

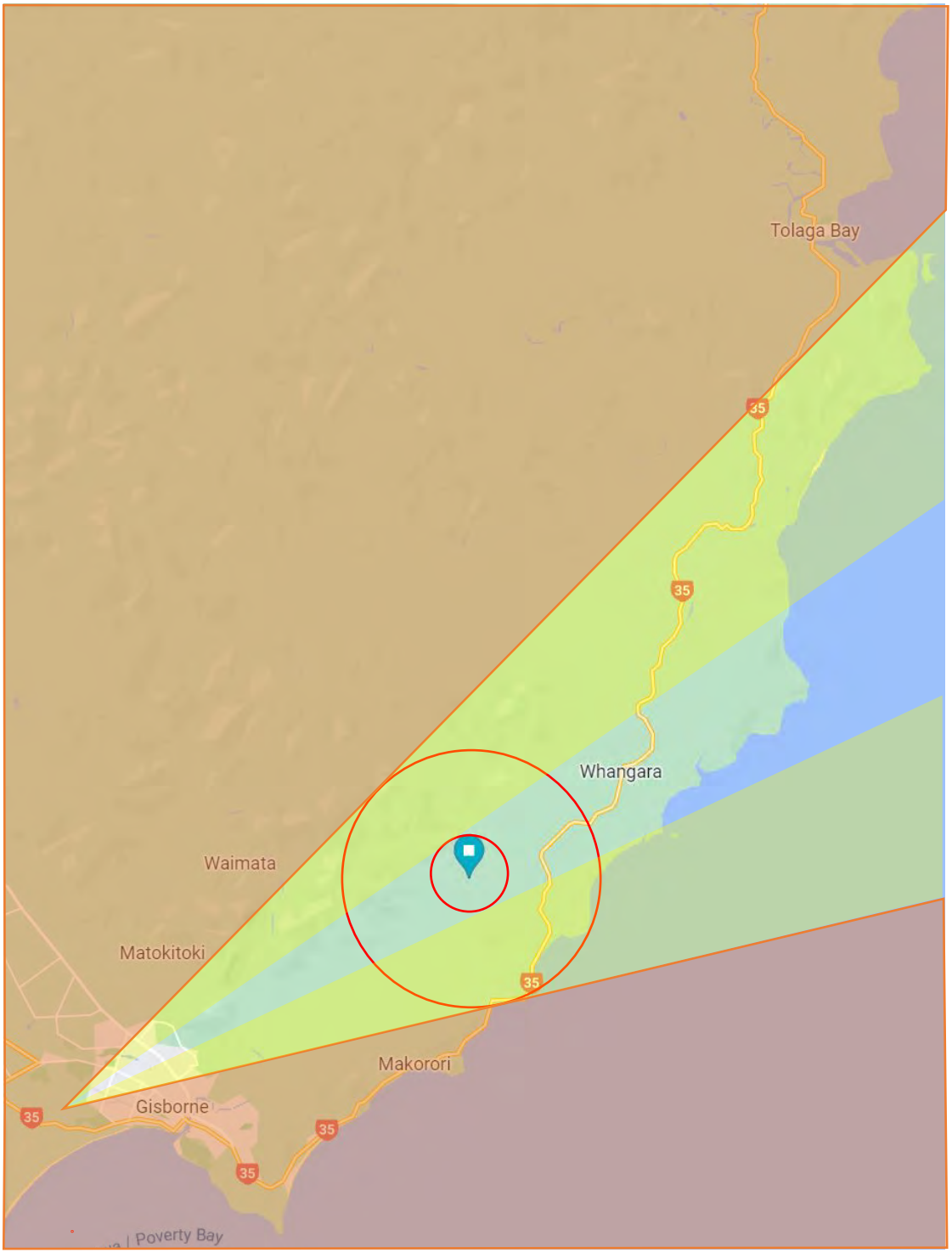


Figure 11 - Eastland Rescue Chopper Access Window

Due to the unpredictable nature of emergencies, it is not possible to schedule operation of the Demonstration Unit around the Eastlands Rescue Chopper operations.

VPS expect that the Demonstration Unit will be able to terminate the Vortex within 30min of notice. Eastlands Rescue Chopper believes that from receipt of a callout, their pilots are able to be over our site within 10min and therefore the option to terminate the vortex and deactivate the restricted airspace for a rescue isn't viable.

Due to the infrequent operation (1-2x a week) and low proportion of operating hours (<8hrs a week) of the Demonstration Unit airspace, along with the minimal disruption to existing routes, Eastland Rescue Chopper are comfortable that the proposed restricted airspace won't have a significant impact on their operation.

VPS believe the Atmospheric Vortex will be easily visible in clear conditions and will be safe at a distance of 10m or greater from the core. Once VPS have evidential proof of this, we look to establish criteria under which Eastland Rescue Chopper are permitted to enter the restricted airspace, should they require.

Airspace Safety Mitigation

VPS acknowledge that the Vortex will be a feature with significant turbulence, with tangential wind speeds of up to 80m/s and vertical wind speeds of 16m/s, therefore flying in the direct vicinity of the core (within 10m) would pose significant risk to any aircraft and crew, as such VPS's primary safety measure is to establish a restricted airspace that can be activated by means of NOTAM, this should restrict all aircraft from coming near to the Vortex. Detailed below are a number of other safety measures that VPS intend to take and methods for communicating and enforcing the restricted airspace.

Administering Authority Airways NZ Gisborne

VPS intend to appoint Airways NZ Gisborne as the Administering Authority of the restricted area. As Gisborne's Air Traffic Controllers, Airways NZ already have visibility of all aircraft in the region and manage the controlled airspace. With this visibility and their capacity/expertise they will be able to manage the restricted airspace and aircraft in its vicinity with direct communication.

Operating Schedule Consultation

On a weekly basis VPS intend to provide all the aeronautical stakeholders with a proposed operating schedule. This will give each stakeholder the opportunity to express whether their operation will be impacted. VPS will alter the schedule accordingly and issue the final notice. This will also allow VPS to give the New Zealand NOTAM Office 24hrs notice prior to activating the restricted airspace by NOTAM.

Notification of Restricted Airspace Activation

Whilst notification of the Vortex's initiation and therefore activation of the restricted airspace will be done via NOTAM, VPS will maintain direct communication with all the aeronautical stakeholders in the region and notify them of the Vortex's operation on the day, 1hr prior and on initiation via SMS and email. Should anything unforeseen happen VPS will again have direct contact with all stakeholders.

Process Safety Features

The Demonstration Unit has a number of fundamental and process safety features that lend themselves to safe operation. The fundamental physics behind the way VPS form the Waterspout means that the Vortex should beunable to persist once the heat source is removed, meaning when the spray system is turned off the Vortex should diminish and recede upwards rather than run on in self-perpetuation. The Vortex should also unable to wander from the heat source, meaning it won't track sideways like a Tornado, as its base is in a fixed-point location. A number of process safety features have been incorporated into the design to ensure that when the vortex needs to be terminated the plant can do so, including fail safe hot water pump shut-off and counter angled swirl vanes, to remove the rotational energy.

Visibility

As illustrated, the vortex will essentially be an artificially generated waterspout. With a diameter of 1-5m and height of up to 10km the vortex will be an easy feature to distinguish against the skyline, on a clear day. On a cloudy day

with poor visibility the vortex may be less easily visible, however on low visibility day the protocol is for aircraft to use the coastal route rather than over the ranges.

Conservatively Large Restricted Airspace

Whilst the full-scale technology is in its infancy, VPS have defined a conservatively large restricted airspace. In reality VPS expects the vortex will be more predictable than the worst-case parameters we have proposed. The vortex operating zone is also more accurately an inverted conical shape rather than a cylindrical volume, however it is standard practice to develop a cylindrical restricted airspace, this means that for all altitudes below the top (10,000m) the restricted airspace is conservatively sized.

Stakeholder Engagement

VPS have engaged with all the aeronautical stakeholders in the Gisborne region to our knowledge and have communicated our proposal and intention to develop the above restricted airspace. All the stakeholders have acknowledged our engagement and are either in support or are indifferent about the proposal. Below is a table of these stakeholders, the dates they were engaged and the ensuing correspondence supplied in Appendix A

Stakeholder	Date of Engagement	Correspondence	Position
Eastlands Gisborne Airport	24/10/21	Letter of Acknowledgment, Email, Verbal	Support
Eastlands Rescue Chopper	24/10/21	Letter of Acknowledgment, Email, Verbal	Support
Airways NZ	23/10/21	Letter of Acknowledgment, Email, Verbal	Support
Gisborne Aero Club	15/11/21	Letter of Acknowledgment, Email, Verbal	Non-committal
Eagle Flight Training	28/10/21	Email, Verbal	Support
Farmers Air	29/10/21	Email of Support, Verbal	Support
Super Air	15/11/21	Email, Verbal	Non-committal
Country Helicopters	28/10/21	Email, Verbal	Non-committal
Ashworth Helicopters	28/10/21	Email, Verbal	Non-committal

Conclusion

We believe that with the implementation of a restricted airspace in unison with the CAA, Air Traffic Control and local parties, this project can be managed safely without adverse impact on Gisborne's Aeronautical landscape. We understand that this is a technology in its infancy and is of an unconventional nature and so intend to implement as many constructive safety measures as feasible. We will continue working with Gisborne Airspace operators to develop and implement the outlined measures.

Appendix A
PBN Area and Proposed Restricted Airspace

GISBORNE AREA CHART
RNAV (GNSS) RWY 14 PROCEDURES
Date: 8 NOV 22 Version 17

From TULMI

To & From RO VOR/DME (Via LUMSO)

To & From WK NDB

KEEPA

5400

INVOT

INVOT Transition

INVOT1A

MIGEN

MIGEN1Q
MIGEN1R

PAVRI

DABIP

7000

V548

H328

LEKON Transition

GS514

H117

LEKON

LEKON1A

H328

GS414

ISMIM

MALSA

MAX IAS 210 kt

MAX IAS 180 kt

AVBIX

GS1A
COOKS1A
VASNI1A

VENAL

At or above 4000 ft

OLGEG

GUDRU

GS479

Proposed Danger Areas

SALEK

UPTER

MAX IAS 210 kt

3800

LIPRI

VASNI1A

VASNI

OMLIK

GS1A

GS VOR

MAX IAS 210 kt

2600

ELMER

OLDEB1Q
MIGEN1R

MIGEN1Q

MIGEN1R

1800

3000

KAGSA

COOKS1A

To & From AP NDB/DME (Via DOGMO)

H191

NEWBY

OLDEB

ERVET

COOKS Transition

H386

COOKS

3000

H467

HAWKE

VADGO

RULSI1A

POPOV

RULSI

H386

3100

GOTNO

ROKIT

MAHIA

3500

DOMON

To & From NR VOR/DME

To & From NR VOR/DME (Via BEVER)

R401
13,500 ft
SFC

D493
FL999
SFC/UL R401

BAY 13,500ft-FL600
BAY 9500ft-FL600
BAY 6500ft-9500ft

GS 4500ft-9500ft
GS 3500ft-9500ft
GS 2500ft-3500ft
GS SFC-2500ft
GS 6500ft-9500ft

OH 9500ft-FL600
OH 13,500ft-FL600

NR 6500ft-9500ft
NR 4500ft-9500ft
NR 3500ft-9500ft
NR 2500ft-9500ft

S 38°30'
S 39°00'
E 177°00'
E 177°30'
E 178°00'
E 178°30'
30 NM
20
10
0

ASSUMPTIONS
H259 TG NDB - GS VOR removed
Remove HAWKE from H467
Remove HAWKE hold
Remove OTOKO from H117
Remove CREEK from H328

AIRSPACE EFFECTIVE DATE
Proposed for NOV 23

LEGEND
- TRANSITIONS ARR
- TRANSITIONS DEP
- STAR
- SID
- APPROACH
- MISSED APPROACH
- ENROUTE (e.g. e852)
- CTA UPPER
- CTA LOWER
- CTR
- CONSTRUCTION PTs (ABCDE)

GISBORNE AREA CHART
RNAV (GNSS) RWY 32 PROCEDURES

Date: 8 NOV 22 Version 16

From TULMI

To & From WK NDB

KEEPA

5400

To & From RO VOR/DME (Via LUMSO)

V548

H328

DABIP

7000

INVOT

INVOT Transition

MIGEN

INVOT1B

H117

LEKON Transition

LEKON

H328

LEKON1B

GS533

MIGEN1P

BEGAG

BAY 13,500ft-FL600
BAY 9500ft-FL600
BAY 9500ft-9500ft

GS 4500ft-9500ft
GS 3500ft-9500ft

GS 3500ft-9500ft
GS 2500ft-3500ft

GS 3500ft-9500ft
GS 2500ft-3500ft

BAY 13,500ft-FL600
BAY 9500ft-FL600
GS 3500ft-9500ft

S 38°30'

30 NM

1500

MIGEN1P

PROPOSED DANGER AREAS

MAX IAS 180 kt

1800

COOKS1P

OMLIK

VASNI

MAX IAS 210 kt

2600

GS582

BAY 6500ft-9500ft
GS 4500ft-9500ft

GS684

GS621

3000

GS VOR

RW32

GS1B

GS 5FC-2500ft

VASNI1B

ELMER

INVOT1B

LEKON1B

To & From AP NDB/DME (Via DOGMO)

H191

VESAV

IDUTO

GS452

At or above 4000 ft

LELOS

SOSGI

EMTOK

ERVET

TUMDU

VASNI1B
GS1B

MAX IAS 220 kt

H467

GS 2500ft-3500ft

ISDIS

LESNU

COOKS1B

H386

COOKS1P

3600

MAX IAS 210 kt

At or above 2000 ft
MAX IAS 210 kt

HAWKE

RULSI1B

BAY 6500ft-9500ft
GS 6500ft-9500ft

BAY 6500ft-9500ft
BAY 9500ft-FL600
OH 9500ft-FL600

COOKS

3000

RULSI Transition

DOXOR

POPOV

RULSI

GS 3500ft-9500ft
GS 6500ft-9500ft

H386

S 39°00'

3100

GOTNO

GS 6500ft-9500ft
BAY 9500ft-FL600
OH 9500ft-FL600

ROKIT

R401
13,500 ft
SFC

NR 6500ft-9500ft

NR 4500ft-9500ft

NR 3500ft-9500ft

NR 2500ft-9500ft

3500

DOMON

MAHIA

To & From NR VOR/DME

To & From NR VOR/DME (Via BEVER)

OH 9500ft-FL600
OH 13,500ft-FL600

BAY 13,500ft-FL600
OH 13,500ft-FL600

D493
FL999
SFC/UL R401

GS 3500ft-9500ft
BAY 9500ft-FL600
BAY 13,500ft-FL600

E 177°00'

E 177°30'

E 178°00'

E 178°30'

10 NM

0

ASSUMPTIONS

H259 TG NDB - GS VOR removed
Remove HAWKE from H467
Remove HAWKE hold
Remove OTOKO from H117
Remove CREEK from H328

AIRSPACE EFFECTIVE DATE

Proposed for NOV 23

LEGEND
TRANSITIONS ARR
TRANSITIONS DEP
STAR
SID
APPROACH
MISSED APPROACH
ENROUTE Q852
CTA UPPER
CTA LOWER
CTR
CONSTRUCTION PTs ABCDE

Proposed danger area - 8000 ft UL

Proposed danger area - >8000 ft UL

Proposed danger zone Gisborne