CONDITION 13 DEPARTMENT OF DEFENCE

(b) Due to the proximity to Casement Aerodrome, the developer should produce a Wildlife Aviation Impact Assessment and implement adequate bird control measures during the construction phase to mitigate the effects of birds on Air Corps flight operations.
(d) Due the proximity to Casement Aerodrome, Military Air Traffic Services requests an Aviation Impact Assessment on all potential emissions. Prior to the commencement of development, the applicant shall submit this assessment for the written agreement of the Planning Authority. The assessment should cover the possible effects of exhaust plumes or any other associated impact on flight operations at Casement Aerodrome.

REASON: In the interests of aviation safety.

Compliance

Please refer to the enclosed Aviation Report to address the above. GIL note the location of the development and its proximity to Casement Aerodrome. Should any details contained within the Aviation report change, such as cranes, and so on, GIL will inform South Dublin County Council of the same and any other relevant state agencies and bodies.

Aviation Report

re
permitted Power Plant
at
Profile Park, Dublin 22
in South County Dublin

for
Greener Ideas Ltd.

and for
Tobin Consulting Engineers

9th September 2022

O'DWYER & JONES DESIGN PARTNERSHIP
AVIATION PLANNING & ARCHITECTURE CONSULTANTS
28 LEESON PARK • DUBLIN 6 • TEL.:353-1-498 1893 [FAX:353-1-496 4410]

www.AviationPlanning.ie e.: admin@AviationPlanning.ie / DesignPartners@iol.ie

CONTENTS

Note: In all maps /diagrams /aerial photos in this report which do not contain a North Point, north lies to the top.

1. Purpose of this Report

1.1 This report addresses the aviation-related items referred to in **Condition 13 of the recent Planning Permission** received in August 2022 by Greener Ideas Limited for a Gas-fired Power Plant at Profile Park, Dublin 22, with SDCC Planning Register Reference No. SD21A/0167.

1.2 **SDCC Condition 13 states —**

Department of Defence.

(a) Given the proximity to Casement Aerodrome, operation of cranes should be coordinated with Air Corps Air Traffic Services, no later than 28 days before use, contactable at airspaceandobstacles@defenceforces.ie or 01-4037681

(b) Due to the proximity to Casement Aerodrome, the developer should produce a Wildlife Aviation Impact Assessment and implement adequate bird control measures during the construction phase to mitigate the effects of birds on Air Corps flight operations.

(c) Due to the proximity to Casement Aerodrome, mitigations may be required in relation to the management of wildlife attracted to attenuation ponds or other water features. Should negative effects of bird activity on Irish Air Corps operations arise, the owner must put measures in place to mitigate these effects to an acceptable level.

(d) Due the proximity to Casement Aerodrome, Military Air Traffic Services requests an Aviation Impact Assessment on all potential emissions. Prior to the commencement of development, the applicant shall submit this assessment for the written agreement of the Planning Authority. The assessment should cover the possible effects of exhaust plumes or any other associated impact on flight operations at Casement Aerodrome. REASON: In the interests of aviation safety.

And an additional aviation Note on page 7 of the Permission states —

NOTE: The applicant shall notify the Irish Aviation Authority and the Department of Defence regarding any cranes likely to penetrate ICAO surfaces.

1.3 **Report Structure & Assessment of the above items**

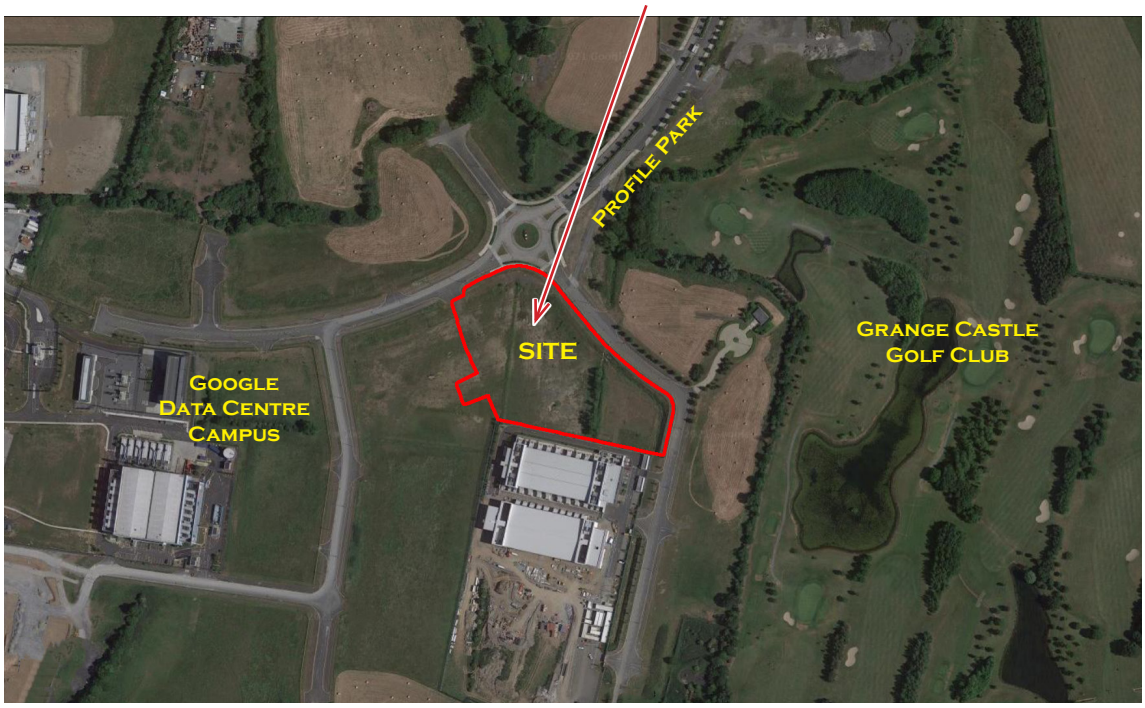
A description of the Site and of the Development, and the Aviation Features and Obstacle Limitations which affect them, are described in Sections 2 to 5 following.

An Assessment of the five items listed above is provided in Sections 6 to 8 of this report: with Crane aspects [item (a) and the Note] in Section 6; Wildlife aspects [items (b) and (c)] in Section 7; and Emissions aspects [item (d)] in Section 8.

2. Location of the Site & its Aviation Aspects

2.1 Site Location:

The permitted Power Plant development is on a site of *circa* 1.85 hectares in South County Dublin, located to the west of Grange Castle Golf Club and to the east of the Google Data Centre Campus, at Profile Park, Dublin 22.



2.2 Items of Aeronautical Significance affecting the site:

(ii) The site lies under the "Inner Horizontal Surface" of Casement Aerodrome [as defined by the International Civil Aviation Organization], which is at an elevation of 131.6m OD (i.e. at 56.8m above ground level on the site).

(iv) The site lies within a circle of 2km radius centred at Casement's aerodrome reference point: this is not an ICAO surface, but a Department of Defence feature.

(iii) The site lies at a lateral distance of 1.4km-1.55km approx. from the centreline of Casement's longer Runway 10/28, and at a lateral distance of 0.8km-1km approx. from the extended centreline of Casement's shorter Runway 04/22;

(iv) No part of the site, however, lies under any of Casement Aerodrome's more significant Obstacle Limitation Surfaces: Approach Surface, Take-Off Climb Surface, or Transitional Surface; and no part of the site lies under any of Weston Airport's or Dublin Airport's Obstacle Limitation Surfaces.

(i) The site, with ground level at 74.8m OD, is low-lying in relation to Casement Aerodrome, i.e. at 11.8m below the aerodrome's datum (of 86.6m OD), and at 22.4m below the aerodrome's published 'aerodrome elevation' (319ft /97.2m OD).

The above items are illustrated Sections 3 & 5 on pages 4 & 6 following >>.

3. Aviation Surfaces in Relation to the Site

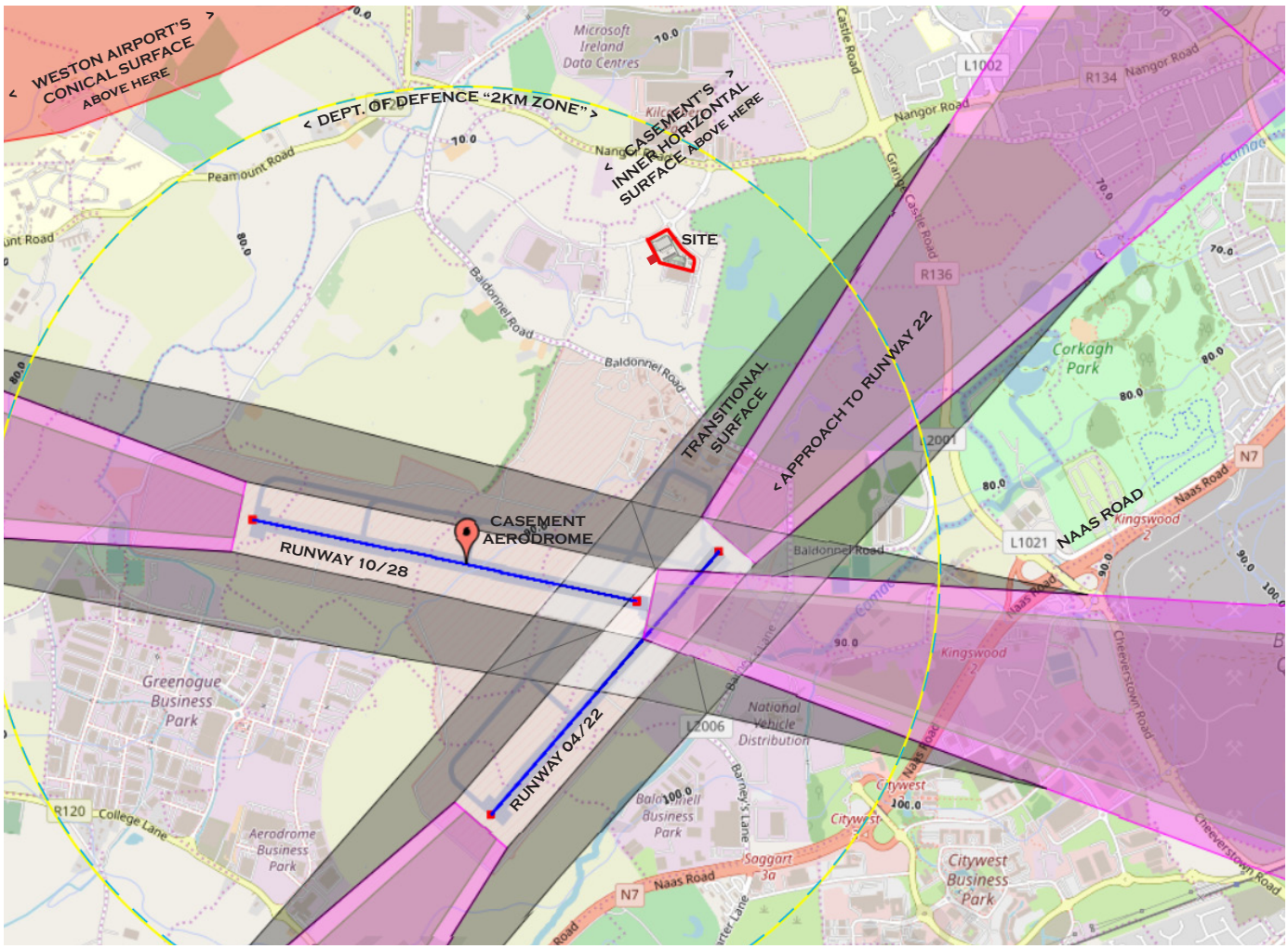
3.1 Although Casement Aerodrome, being a military aerodrome, is not bound by Civil Aviation standards, the Department of Defence has adopted the I.C.A.O. Obstacle Limitation Surfaces in relation to Casement Aerodrome, to protect its aircraft in flight. These Obstacle Limitation Surfaces are similar to the E.A.S.A. Specifications which now apply at Dublin and other Irish airports.

3.2 The Aviation Surfaces of relevance to this Profile Park site are

(i) the ICAO Inner Horizontal Surface for Casement Aerodrome which is a flat surface at 131.6m OD; and

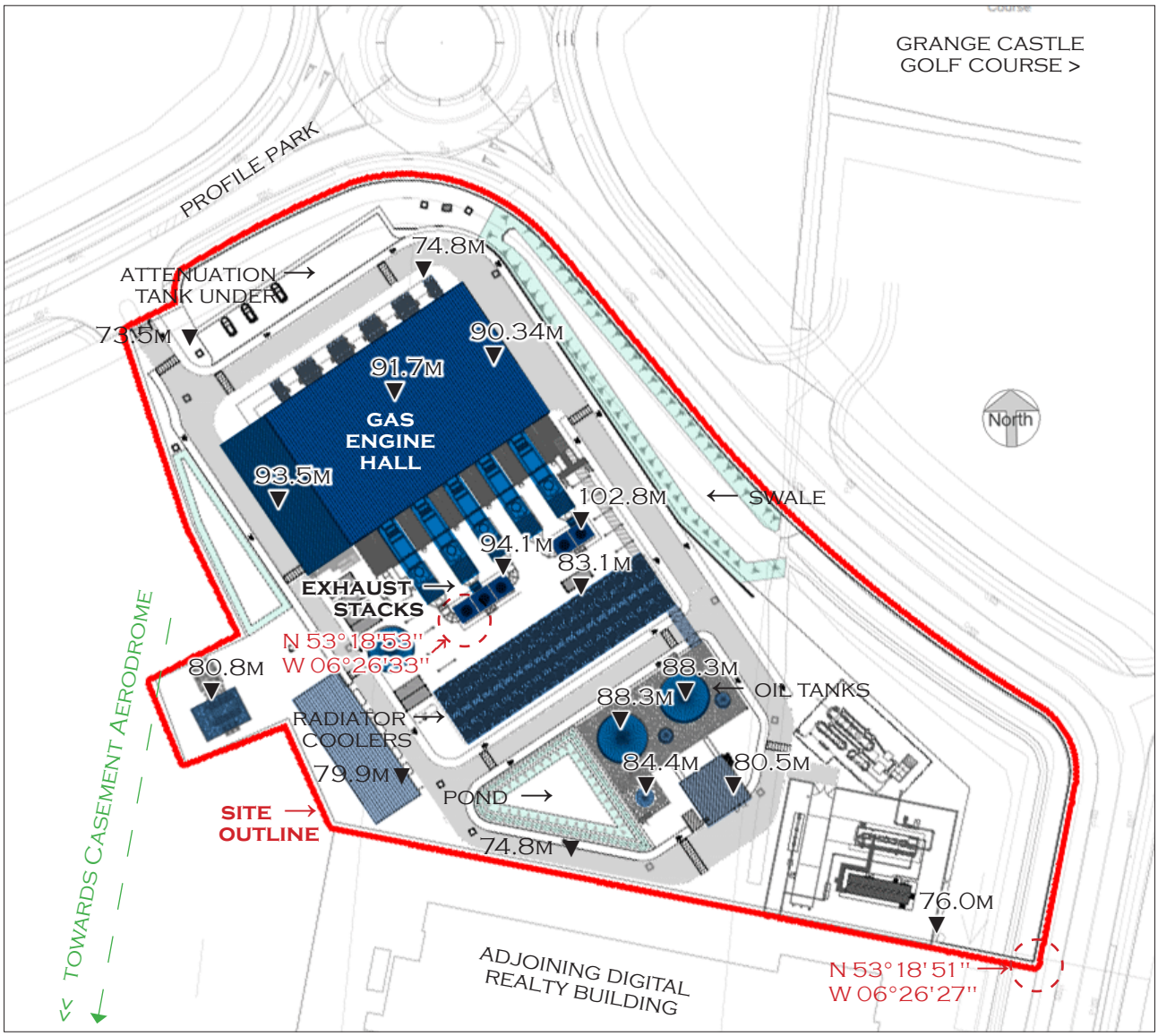
(ii) a Department of Defence "2km Zone" around Casement Aerodrome within which it states new objects should not be more than than 20m above ground, or 20m above the aerodrome's datum (whichever is higher).

3.3 The diagram below (based on Irish Aviation Authority 'Asset' data, onto which the "2km Zone" is added) shows the various aviation surfaces in the vicinity of the power plant site (which is outlined in red). The Inner Horizontal Surface (extending to 4km from both runways) covers all of the area in this diagam.



4. Layout, Elevations, & Coordinates of the Proposed Development

4.1 Below, to approx. scale 1:1,350, is a Site Layout Plan of the proposed Power Plant development at Profile Park, Dublin 22, with elevations OD of its highest elements, and some relevant coordinates.
[The elevations OD of the highest elements (the exhaust stacks) are exact, and the elevations OD given for the lower elements indicate maximum heights of any part of those lower elements.]
In this diagram, darker blue shading indicates higher objects.

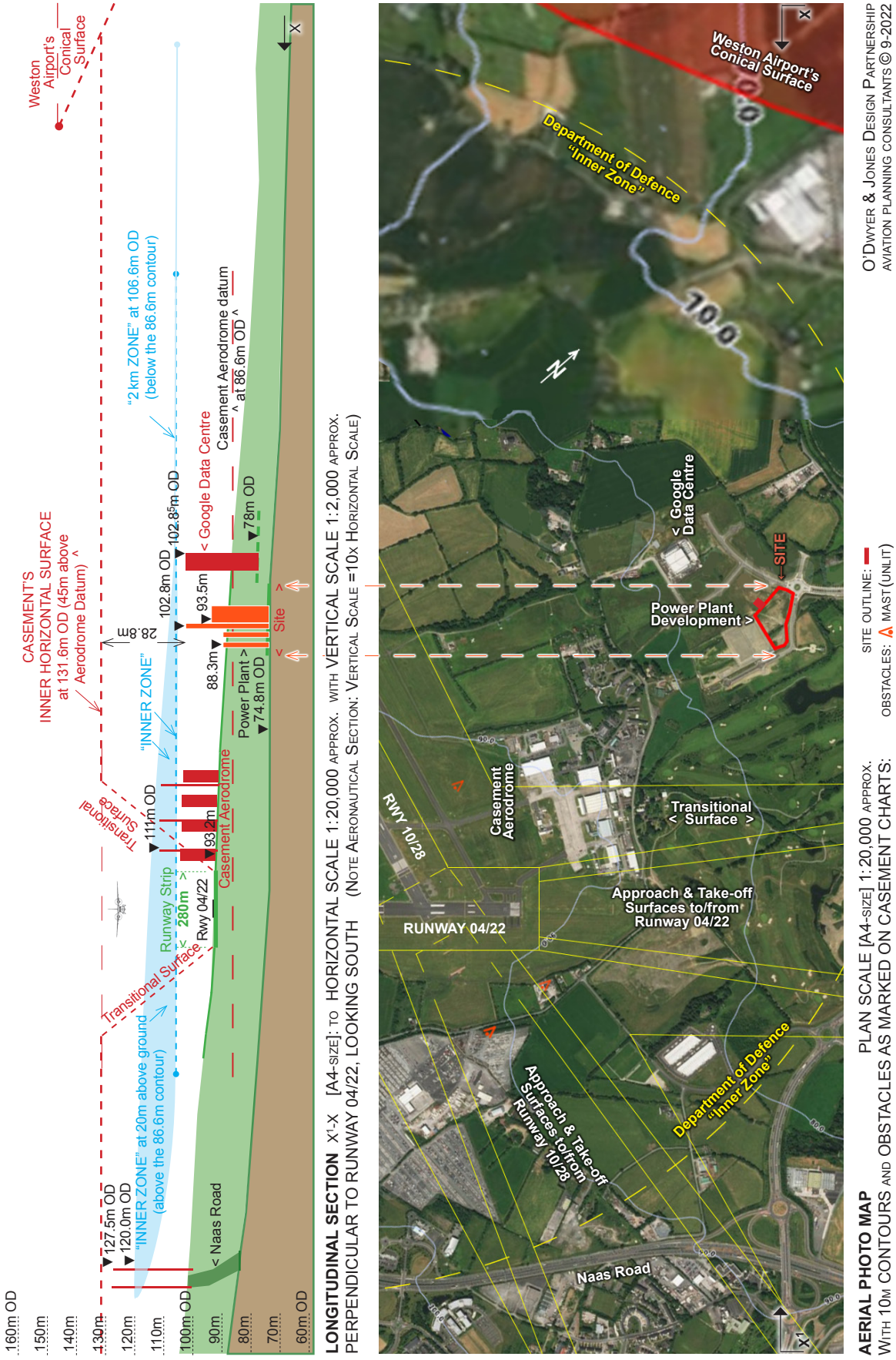


ROOF PLAN OF PROPOSED DEVELOPMENT
WITH ELEVATIONS (O.D.) OF HIGHEST PARTS
SCALE 1:1,350 APPROX.

O'DWYER & JONES DESIGN PARTNERSHIP
AVIATION PLANNING CONSULTANTS © 9-2022

5. Longitudinal Section Diagram & Map

[A4-size:] 1:20,000 horizontal scale
1:2,000 vertical scale (section)



LONGITUDINAL SECTION X'-X [A4-size]: to HORIZONTAL SCALE 1:20,000 approx. with VERTICAL SCALE 1:2,000 approx.
PERPENDICULAR TO RUNWAY 04/22, LOOKING SOUTH (Note Aeronautical Section: Vertical Scale =10x Horizontal Scale)

AERIAL PHOTO MAP
With 10m contours and OBSTACLES AS MARKED ON CASEMENT CHARTS:

PLAN SCALE [A4-size] 1:20,000 approx.

SITE OUTLINE:
OBSTACLES: MAST (UNLIT)

O'Dwyer & Jones Design Partnership
Aviation Planning Consultants © 9-2022

6. Assessment #1
In regard to Cranes during Construction

6.1 This Section deals with the following items:

(a) Given the proximity to Casement Aerodrome, operation of cranes should be coordinated with Air Corps Air Traffic Services, no later than 28 days before use, contactable at airspaceandobstacles@defenceforces.ie or 01-4037681

NOTE: The applicant shall notify the Irish Aviation Authority and the Department of Defence regarding any cranes likely to penetrate ICAO surfaces.

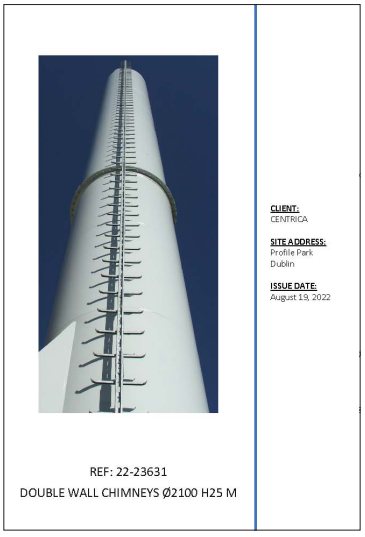
6.2 **Notifications:**

It is noted that S.I. 215 of 2005 – *'Irish Aviation Authority (Obstacles to Aircraft in Flight) Order'* requires prior notification of the use of any crane/s on this site to be submitted, at least 30 days in advance, to the Irish Aviation Authority and to the airport operator.
Specifically on this site, it is confirmed by the client that the operation of cranes on site will be coordinated with Air Corps Air Traffic Services, who will be contacted at least 30 days in advance – by email to airspaceandobstacles@defenceforces.ie and/or by telephone to 01-4037681 at Casement Aerodrome.

6.3 **ICAO Surfaces:**

The locations and dimensions of the ICAO Surfaces in the vicinity of this site are illustrated (in plan) on page 4, and (in plan and section) on page 6 above. It can be seen that the one ICAO Obstacle Limitation Surface which lies above the site is Casement Aerodrome's Inner Horizontal Surface, which is at 131.6m OD, i.e. at 56.8 metres above the FFL level (and ground level) on the site.

It can also be seen from the site plan on page 5 and the section drawing on page 6 that the highest point of the Power Plant will be at 102.8m OD, i.e. at 28.8 metres below the I.H.S., which is more than adequate for crane operations on site. It may be noted that the material and construction of the proposed exhaust stacks is such that they provide their own lightning protection so that additional rods (above 102.8m OD) will not be necessary.



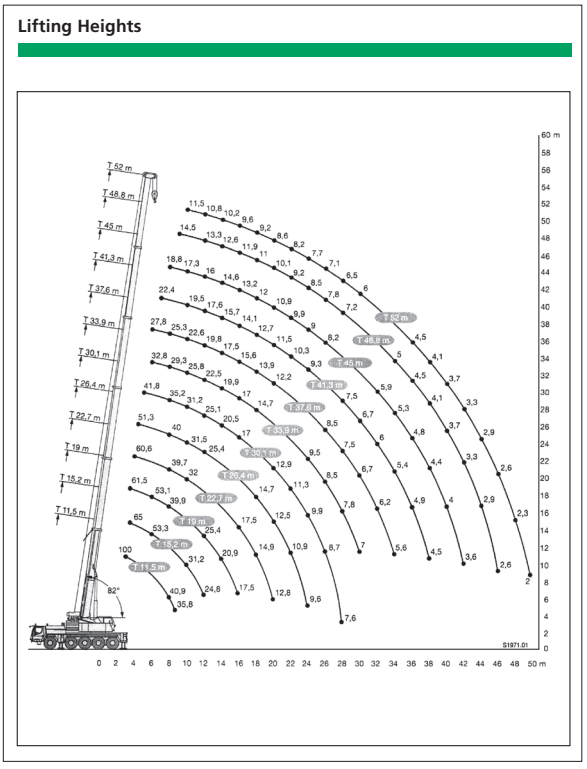
Proposed crane operations for the installation of the highest items on the site – the five exhaust stacks – are described on the following page. The mobile cranes described are the tallest that will be in use on the site.

6.4 **The following are the proposed (quoted) crane operations for the highest items:**

"We have allowed for 1 No 100t crane and 1 No 75t crane for 1 day on site for installing the chimney. Crane selection based on max 10t lifting on a 12-meter radius based on standard crane duty charts.
The cranes will be located within 12 meters of the offload and install area, the crane will be operating with standard lifting equipment and outrigger mats.
We have allowed for a man basket attached to the second crane for access to the top of the chimney."

"We have allowed for 1 No 40t crane for 1 days on site for installing the platform and ladder. Crane selection based on max 1t lifting on a 12-meter radius based on standard crane duty charts.
The crane will be located within 12 meters of the offload and install area, the crane will be operating with standard lifting equipment and outrigger mats.
All cranes will be supplied by a national company."

6.5 **100ton Mobile Crane:**



The illustration opposite [>] is of a typical [Liebherr] 100t mobile crane such as might be used on this site. It can be seen that the maximun vertical reach of this mobile crane is 56 metres above ground level, which figure is less than the distance between Casement's Inner Horizontal Surface and ground level at the site.

The proposed cranes on the site will therefore not penetrate any of Casement's "obstacle limitation surfaces" [as defined by ICAO].

In any event – because the crane could exceed 45 metres above ground level – 30 days' advance notice (in accordance with S.I. 215 of 2005) will be given to the IAA, and to the Department of Defence & Casement Aerodrome, of any crane use on site, and any requirements that the Department of Defence and Air Corps may have in relation to it will be observed.

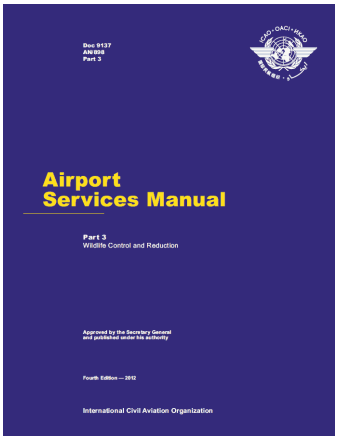
Advance notification of cranes will be in the Construction Management Plan.

7. Assessment #2
In regard to Wildlife Aviation Impact

7.1 This Section deals with the following items:

(b) Due to the proximity to Casement Aerodrome, the developer should produce a Wildlife Aviation Impact Assessment and implement adequate bird control measures during the construction phase to mitigate the effects of birds on Air Corps flight operations.

(c) Due to the proximity to Casement Aerodrome, mitigations may be required in relation to the management of wildlife attracted to attenuation ponds or other water features. Should negative effects of bird activity on Irish Air Corps operations arise, the owner must put measures in place to mitigate these effects to an acceptable level.



It should be noted that this Section deals with **aviation aspects and mitigation measures** in regard to bird strike hazard *[such as referred to in ICAO Airport Services Manuals Part 3 – Wildlife Control & Reduction >]* and that any surveys of wildlife species or migration routes deemed necessary or desirable would fall under the ambit of a separate ecologist. On this site (at c.1.5km from Casement Aerodrome) bird control is the principal wildlife concern (rather than incursions by mammals).

7.2 **The considerations which arise in regard to wildlife aviation impact are:**

(i) Control of any bird & wildlife attractants during construction,
(ii) Avoidance of landscape elements which might provide avian food,
(iii) Avoidance of unnecessary standing water features which might attract birds,
(iv) Management of any necessary standing water elements (such as flood-control swales) in locations where they will be less attractive to birds,
(v) Implementation of ongoing bird control and deterrence measures.

7.3 **Wildlife control during construction.**

In relation to item (b) above, building site management will require the contractor and subcontractors to control all debris on site and in particular any food waste. Management of trenches, topsoil removal, and earthmoving in general, will also be required, to ensure that debris or earth will not remain exposed as attractants to gulls or other birds, and that any flooded or exposed areas will be covered.

The Construction Management Plan is to provide for these items.
And in addition to wildlife control aspects, the CMP will also require that any dust or smoke-producing operations, or use of lasers on site (which might interfere with aviation), be strictly controlled.

7.4 Avian Food Attractants:

The area immediately surrounding the permitted Power Plan will be provided with landscaping – as is shown on submitted drawings nos. 20220517_LD.PRFLEPRK_1.1.pdf & 20220517_LD.PRFLEPRK_1.2.pdf & 20220517_LD.PRFLEPRK_1.3.pdf.
We are advised that the use of seed-bearing plants and trees will be avoided in this landscaping of the power plant site.

7.5 Pond and Water Elements on the Site:

In relation to SDCC's item (c), it can be seen in the Site Plan drawing *(on page 5 above)* that the development will contain a triangular pond and an extended swale. These are necessary for flood control and operational purposes. In addition (to minimise the size of swale needed) there will be an underground attenuation tank beneath the car park to the north of the site.

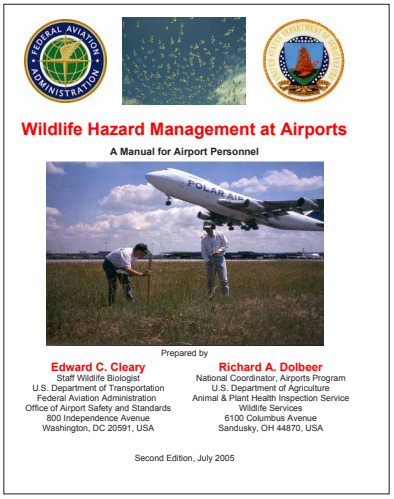
The IAA's recent publication "Bird and Wildlife Stike Management at Aerodromes (2021)" [above] states (on its p.60, under "Dispersal Methods") that

> " Human presence is the simplest method of dispersing wildlife. Also, animals will often react to the presence of the vehicle of the wildlife control unit if they associate it with being harassed."

In this context it should be noted that the pond and swale areas on the site are immediately surrounded by active roadways and buildings, and consequently unlikely to attract the gulls and water fowl which give rise to most bird strike hazard.

There is also an existing golf course in the immediate vicinity of the site (located between the power plant site and Casement's flight paths), which would be of much greater attraction to birds than the constrained Profile Park site.

Guidance in relation to bird-strike hazard and bird-deterrent features is also provided in the FAA's Manual on "Wildlife Hazard Management at Airports" [>] (– ranging from stuffed coyotes to live border collies…)



7.6 Overall Strike Risk:

Overall, no increased bird strike risk is anticipated to arise from the power plant site.

7.7 **Possible Wildlife Mitigation Measures.**

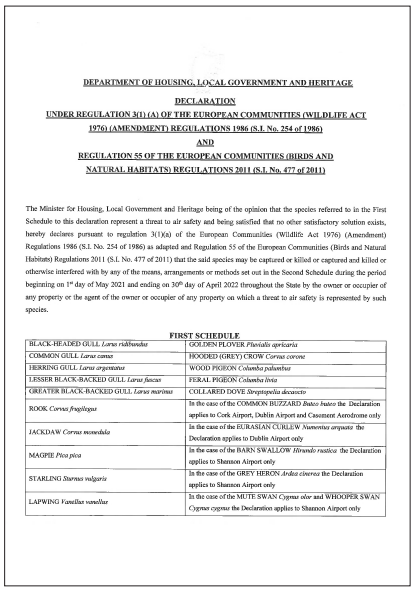
However, in the event of any new bird strike hazard being perceived by the Air Corps, it is agreed that the following mitigation measure can be adopted on the site (as outlined in IAA, ICAO, FAA manuals etc.):

(i) the pond area can be covered in netting (per ICAO etc. advice), should the need arise;

(ii) the IAA states (in the manual illustrated on previous page) that "Green laser beam guns seem to be effective to chase water birds away from the water surfaces at the airport."

(iii) artificial hawk kite deterrents may be employed intermittently (the IAA notes that gulls can get habituated to these).

In relation to SDCC's item (c) it is highly unlikely that any more significant bird control methods should arise on the power plant site (such as trapping or culling), but if so, provision (including in respect of protected species) is made under the Wild Birds Declaration (a Ministerial Order) made for the purpose of air safety. The 2021-22 Order is shown opposite [>], which lists the gulls and other large birds, and the flocking birds (such as starlings), and – specifically in relation to Casement Aerodrome – the Common Buzzard.



DEPARTMENT OF HOUSING, LOCAL GOVERNMENT AND HERITAGE

DECLARATION
UNDER REGULATION 3(1) (A) OF THE EUROPEAN COMMUNITIES (WILDLIFE ACT 1976) (AMENDMENT) REGULATIONS 1986 (S.I. No. 254 of 1986)
AND
REGULATION 55 OF THE EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS 2011 (S.I. No. 477 of 2011)

The Minister for Housing, Local Government and Heritage being of the opinion that the species referred to in the First Schedule to this declaration represent a threat to air safety and being satisfied that no other satisfactory solution exists, hereby declares pursuant to regulation 3(1)(a) of the European Communities (Wildlife Act 1976) (Amendment) Regulations 1986 (S.I. No. 254 of 1986) as adapted and Regulation 55 of the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) that the said species may be captured or killed or captured and killed or otherwise interfered with by any of the means, arrangements or methods set out in the Second Schedule during the period beginning on 1st day of May 2021 and ending on 30th day of April 2022 throughout the State by the owner or occupier of any property or the agent of the owner or occupier of any property on which a threat to air safety is represented by such species.

FIRST SCHEDULE

BLACK-HEADED GULL *Larus ridibundus*	GOLDEN PLOVER *Pluvialis apricaria*
COMMON GULL *Larus canus*	HOODED (GREY) CROW *Corvus corone*
HERRING GULL *Larus argentatus*	WOOD PIGEON *Columba palumbus*
LESSER BLACK-BACKED GULL *Larus fuscus*	FERAL PIGEON *Columba livia*
GREATER BLACK-BACKED GULL *Larus marinus*	COLLARED DOVE *Streptopelia decaocto*
ROOK *Corvus frugilegus*	In the case of the COMMON BUZZARD *Buteo buteo* the Declaration applies to Cork Airport, Dublin Airport and Casement Aerodrome only
JACKDAW *Corvus monedula*	In the case of the EURASIAN CURLEW *Numenius arquata* the Declaration applies to Dublin Airport only
MAGPIE *Pica pica*	In the case of the BARN SWALLOW *Hirundo rustica* the Declaration applies to Shannon Airport only
STARLING *Sturnus vulgaris*	In the case of the GREY HERON *Ardea cinerea* the Declaration applies to Shannon Airport only
LAPWING *Vanellus vanellus*	In the case of the MUTE SWAN *Cygnus olor* and WHOOPER SWAN *Cygnus cygnus* the Declaration applies to Shannon Airport only

7.8 **Wildlife Aviation Impact Summary:**

In summary, it is confirmed —

(a) no increased bird strike risk is anticipated to arise from the power plant site, and

(b) that any bird-hazard mitigation measures, which the Air Corps may consider necessary on the power plant site, will be carried out.

8. Assessment #3
In regard to Aviation Effects of Exhaust Plumes

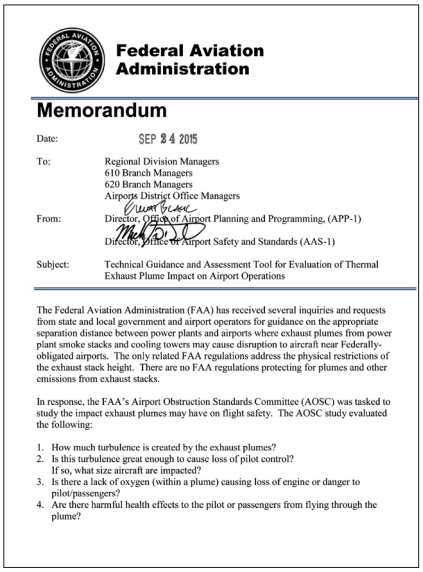
8.1 This Section deals with the following items:

(d) Due the proximity to Casement Aerodrome, Military Air Traffic Services requests an Aviation Impact Assessment on all potential emissions. Prior to the commencement of development, the applicant shall submit this assessment for the written agreement of the Planning Authority. The assessment should cover the possible effects of exhaust plumes or any other associated impact on flight operations at Casement Aerodrome.

8.1 International Aviation Policy

Aviation Policy in relation to Power Plant emissions is currently being developed. A Federal Aviation Administration document of 2015 initiated a study of the effect that power plant thermal plumes might have on aviation safety, under the following headings:

1. How much turbulence is created by the exhaust plumes?
2. Is this turbulence great enough to cause loss of pilot control? If so, what size aircraft are impacted?
3. Is there a lack of oxygen (within a plume) causing loss of engine or danger to pilot/ passengers?
4. Are there harmful health effects to the pilot or passengers from flying through the plume?



Federal Aviation Administration

Memorandum

Date: SEP 24 2015

To: Regional Division Managers
610 Branch Managers
620 Branch Managers
Airports District Office Managers

From: Director, Office of Airport Planning and Programming, (APP-1)
Director, Office of Airport Safety and Standards (AAS-1)

Subject: Technical Guidance and Assessment Tool for Evaluation of Thermal Exhaust Plume Impact on Airport Operations

The Federal Aviation Administration (FAA) has received several inquiries and requests from state and local government and airport operators for guidance on the appropriate separation distance between power plants and airports where exhaust plumes from power plant smoke stacks and cooling towers may cause disruption to aircraft near Federally-obligated airports. The only related FAA regulations address the physical restrictions of the exhaust stack height. There are no FAA regulations protecting for plumes and other emissions from exhaust stacks.

In response, the FAA's Airport Obstruction Standards Committee (AOSC) was tasked to study the impact exhaust plumes may have on flight safety. The AOSC study evaluated the following:

1. How much turbulence is created by the exhaust plumes?
2. Is this turbulence great enough to cause loss of pilot control? If so, what size aircraft are impacted?
3. Is there a lack of oxygen (within a plume) causing loss of engine or danger to pilot/passengers?
4. Are there harmful health effects to the pilot or passengers from flying through the plume?

Arising from this, the FAA recommends adoption of a model developed by MITRE Corporation to predict plume size and severity of flight impact from thermal exhaust plume(s).

8.2 Emissions Analysis

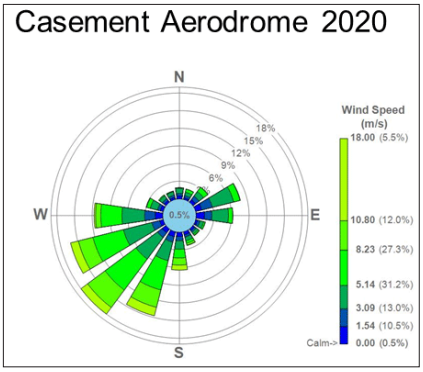
The MITRE "Exhaust-Plume-Analyzer" (recommended by the FAA) has been applied in an analysis of the emissions of the Profile Park Power Plant, by Dr Edward Porter of AWN. [That Analysis was included in the project's EIAR, and pages from it are appended at pp. 16-23 following].

In particular this MITRE Analysis has investigated

(i) oxygen content;
(ii) emissions temperature; and
(iii) vertical velocity of emissions;

and whether or not these items might have an effect on helicopter operations (which are more susceptible to these items than fixed-wing aircraft).

8.3 Wind Direction



This analysis also took into effect all recent Casement Aerodrome wind data [>], and it should be noted that the location of the site and the direction of the prevailing wind mean that emissions will be directed away from Casement Aerodrome (which lies to south-south-west of the power plant site).

8.4 Emissions Analysis Findings

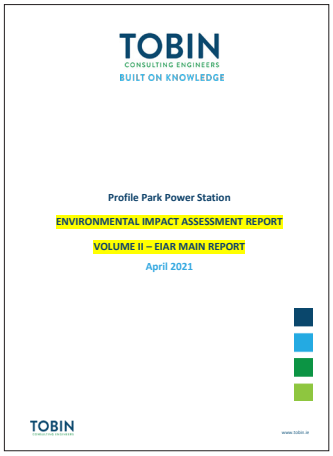
The findings of the AWN Study, using the MITRE Exhaust-Plume Analysis recommended by the FAA, were included in the Environmental Impact Assessment Report [EIAR] for this project. These address possible helicopter risk elements.

These findings are summarised as follows:

" (i) Oxygen Content – within 9 metres of the stack top the oxygen concentration will increase above the 12% risk level for oxygen.

(ii) Temperature – the temperature of the plume will drop to less than 50°C within 11 metres of the stack.

(iii) Vertical Velocity – the critical vertical velocity of 4.3 m/s will not be exceeded within 15 metre from the stack top.



Thus, the maximum extent of the risk zone of the plume for each parameter is shown below based on three full years of meteorological data covering all meteorological conditions including pressure /temperature inversions:

Risk Zone for Oxygen – 9 metres
Risk Zone for Temperature – 11 metres
Risk Zone for Vertical Velocity – 15 metres "

8.5 Recent Stack Height Reduction (by 3.8m)

It may be noted that the heights of the Profile Park power plant stacks were originally envisaged to be 31.8m in height above ground level, and that (as subsequently submitted and permitted by SDCC) they have since been reduced by 3.8m to 28m above ground level. In relation to this reduction in height (with consequent improved results) AWN has stated as follows:

> "We kept the original thermal plume study, with the original stacks heights (approx. 31 m), as the effect of lowering the stack height would be to reduce the risk zone heights, i.e. the original study was the worst case scenario."

8.6 **Visual Effect**

During its operation, the proposed power plant will operate on natural gas. In exceptional circumstances it may operate on its secondary fuel which is low sulphur diesel oil. This would be expected to be for testing purposes only, i.e. less than 18 hours per annum. In both operational profiles, the plant's exhaust stacks will produce minimal visual effects (with no visual effect extending to the Aerodrome's Inner Horizontal Surface which is at 28.8m above).

To illustrate this, a photograph (provided by plant suppliers) of a comparable 5-stack power plant in operation is included opposite >>.

8.5 **Conclusion with regard to Emissions from the Profile Park Power Plant**

As the heights listed in para. 8.4 for the three aviation 'risk zones' above the Profile Park power plant exhaust stacks [i.e. **9m** (re Oxygen), **11m** (re Temperature), & **15m** (re Vertical Velocity)] are significantly lower than Casement Aerodrome's Inner Horizontal Surface elevation (which lies at 131.6m – i.e. at **28.8m above** the tops of the five stacks), the proposed development is not envisioned by AWN to have any adverse effect on aviation (including helicopter operations) at Casement Aerodrome.

8.6 **Further Mitigation**

Taking into account the concerns of the Air Corps and Department of Defence, it is confirmed that, should any negative impacts to Air Corps flight operations occur from flue emissions or otherwise, the owners/operators of the plant will take immediate actions to mitigate any such impacts to an acceptable level.

9. Other Aviation Considerations

9.1 External Lighting

S.D.C.C.'s Condition 3.3 [under "Roads"] states that "prior to commencement of development, a Public Lighting Design for the development must be submitted and agreed by the Public Lighting team of SDCC."

In relation to external lighting in general (including roads lighting) we would advise, from an aviation point of view —

(i) That in this location near an aerodrome, any external lighting should be of the "cut-off" type, i.e. not showing any light above the horizontal which might interfere with air navigation.

(ii) That aviation warning lights be added to the tops of the exhaust stacks, with low-intensity aviation lighting (in accordance with ICAO guidance, and visible from all directions) located to the south-west and north-east edges of the exhaust stack tops.

It may be noted that the developer has agreed that this aviation warning lighting will be provided, and that any observations made by the Air Corps in relation to it (such as compatibility with Night Vision Goggles) will be taken into account.

9.2 Ecology & Landscaping

S.D.C.C.'s Condition 10 "Ecology" states that "prior to the commencement of any permitted development, the developer shall engage the services of an independent qualified ecologist to implement the management recommendations of the Bio-diversity Management Plan", and also states that this Biodiversity Management Plan should include provisions for "wildlife shelters, bat boxes, bird boxes" etc.

From an aviation point of view it should be noted that, while provision for small species (including small non-migrating local birds) should be unproblematical, ecological provision in relation to the larger bird species listed in the Wild Birds Declaration Order (referred to in para. 7.7 above) would be undesirable in the vicinity of an aerodrome (i.e. on this particular site) for bird strike hazard reasons.

9.3 Solar/PV panels

Bearing in mind that reflections from solar/PV panels can affect aviation, it is confirmed that no solar/PV panels are being provided as part of this development.

10. SUMMARY

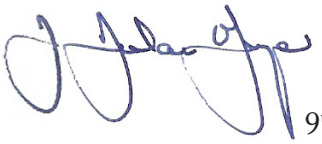
10.1 In regard to the ICAO "Obstacle Limitation Surfaces"—
the site lies under Casement Aerodrome's Inner Horizontal Surface, which is at 131.6m OD, with ground level on the site at 56.8m below it, and with the highest point of the proposed development at 28.8m below that Surface.

10.2 In regard to Cranes on site during construction —
(a) the tallest proposed crane on the site will extend to a maximum of 56m and therefore will not penetrate the I.H.S. (or any of Casement's "obstacle limitation surfaces"); and
(b) in any event, 30 days' advance notice (in accordance with S.I. 215 of 2005) will be given to the IAA, and to the Department of Defence & Casement Aerodrome, of any crane operations on site.

10.3 In regard to Wildlife Aviation Impact it is confirmed —
(a) that all necessary measures to mitigate bird strike hazard will be carried out on site during the construction period;
(b) that no increased bird strike risk is anticipated to arise from the power plant development; and
(c) that any bird-hazard mitigation measures, which the Air Corps may consider necessary, will be carried out at the power plant site.

10.4 In regard to the Power Plant Emissions —
The aviation 'risk zones' above the power plant exhaust stacks extend to 9m (for Oxygen), 11m (for Temperature), & 15m (for Vertical Velocity); and as these are significantly lower than Casement Aerodrome's Inner Horizontal Surface (which lies at 28.8m above the tops of the five stacks), the proposed development is not envisioned to have any adverse effect on flight operations at Casement Aerodrome.

10.5 Overall, it is considered that the permitted power plant development at Profile Park complies with all aviation and aeronautical requirements affecting the location.



9th September 2022
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APPENDIX

Power Plant Emissions — Analysis vis-à-vis Aviation

by AWN – using MITRE "Exhaust Plume Analyser"

[Extract of aviation-related pages contained within the Environmental Impact Assessment Report for this Power Plant Project]

THERMAL PLUME MODELLING

1.1 Introduction

This appendix provides an assessment of the potential impact of the plumes associated with the operational phase of the Profile Park Power Station on aircraft, and in particular helicopters, in the region.

The issue of plume characteristics and the effect on the operation of helicopters in the region of the site has been assessed below. An assessment has been undertaken to determine the region surrounding the facility where levels of excess temperature, turbulence (vertical velocity) and reduced oxygen could potentially be encountered. Studies undertaken by the MITRE Corporation (MITRE, 2012) and outlined in the user manual for the "Exhaust-Plume-Analyzer" model detail the likely impact of an exhaust plume on aircraft based on a range of parameters / criteria including the thermal buoyancy and temperature of the plume.

The current study is based on detailed site-specific information. The site-specific study, using the Cambridge Environmental Research Consultants (CERC) AMDS-5 model for oxygen, temperature and vertical velocity, allows the actual emission data for the facility to be used as input into the model. In addition, meteorological data for the region, based on three full years of data from Casement Aerodrome (2018-2020) and building data also forms part of the inputs to the model to allow an accurate representation of the impact of the facility in the surrounding environment.

1.2 Methodology

The parameters of the plume which are most relevant to helicopters has been investigated by the Mitre Corporation as part of the development of the "Expanded Model For Determining The Effects Of Vertical Plumes On Aviation Safety" (MITRE, 2012). These parameters have been reviewed below.

1.2.1 Oxygen

The Mitre Corporation report confirms that oxygen levels below 12% are potentially hazardous to helicopters (MITRE, 2012) and thus the oxygen content of the plume with distance from the stack has been investigated.

In relation to the gas generator, the oxygen content of the plume at stack top will typically be 13%.

1.2.2 Temperature

The Mitre Corporation report confirms that temperatures in excess of 50°C are potentially hazardous to helicopters (MITRE, 2012) and thus the temperature of the plume with distance from the stack has been investigated.

In relation to the gas generator, the temperature of the plume at stack top is 592.2K (319°C).

1.2.3 Vertical Velocity

High vertical velocities are also a concern when considering helicopter / plume interactions as they can lead to increased turbulence in the atmosphere. The literature (CASA, 2012) suggests that the critical level for vertical velocities is 4.3 m/s. Thus, modelling has been undertaken to understand the worst-case vertical velocities of the gas generator plume with distance from the stacks.

The change in each of these parameters with distance from the stack has been reviewed below. For each of these parameters, three full years of meteorological conditions has been used in the analysis including periods of atmospheric pressure / temperature inversions. Meteorological data for the years 2018-2020 for Casement Aerodrome have been used in the analysis for all scenarios outlined, with results for the worst case year reported. The ADMS-5 model has the capability to process calm conditions by setting the wind speed to 0.3 m/s and allowing an equal probability for all wind directions. This option has been used in this assessment for both the temperature assessment and the vertical velocity assessment.

The model was also run with a high density receptor grid based on 5m horizontal spacing and 0.5m vertical spacing in the region of the stack top to determine the changes in the parameters above over very short distances. The receptor spacing of 0.5m was selected as the change with vertical distance in oxygen, temperature and vertical velocity from the stack top is rapid and would be difficult to determine with a coarser grid resolution.

1.2.4 Process Emissions

The proposed Profile Park Power Station will have six gas generator stacks at a height of 31.8m (~75m OD). The source information for the modelled emission points has been summarised in Table 1.

Table 1: Summary of Source Information

Scenario	Height Above Ground Level (m)	Exit Diameter (m)	Cross-Sectional Area (m^2)	Temp (K)	Max Volume Flow (Nm^3/hr)	Exit Velocity (m/sec actual)	NO_2	
							Conc. (mg/Nm^3)	Mass Emission (g/s)
Individual stacks	31.8m (75m OD)	1.704	2.28	592.2	133,862	29.54	75.0	2.79

1.3 Results & Discussion

1.3.1 Oxygen / Plume Interaction

The Mitre Corporation report (MITRE, 2012) confirms that depleted oxygen is generally of greatest concern when considering helicopter/plume interactions. The Mitre Corporation report confirms that at an oxygen content below 12% oxygen there is a risk of engine cut-out whilst above this level there is no risk to helicopter engines. Thus, modelling has been undertaken to determine the oxygen percentage of operations both on natural gas and diesel oil.

The following equation is used to model the % of oxygen in the plume with distance from the stack top. For a given emission concentration of any pollutant e (in $\mu g/m^3$), the oxygen content O (%), is related to the plume concentration c (in $\mu g/m^3$) by the following relationship (13% is the plume oxygen percentage at release for gas generators):

$$c / e = (20.95-O) / (20.95-13)$$

Thus, the calculation can be re-arranged to determine the oxygen content (%) of the plume as a function of distance from the stack top. The re-arranged equation is:

$$O (\%) = 20.95- [(c/e) * (7.65)]$$

AERMOD was thus run to calculate the pollutant concentration and identify the distance from the plume centreline where the 12% oxygen level was exceeded. Modelling was undertaken using Casement Aerodrome data for 2018-2020. Shown in

Figures 1 and 2 show the results for the full worst-case year of 2020.

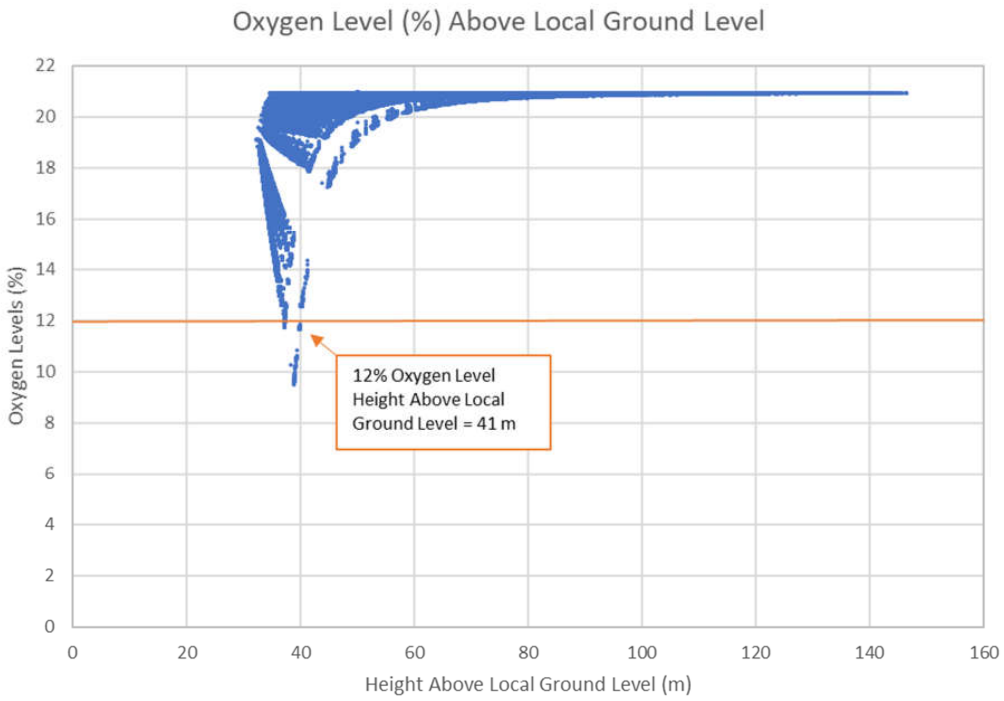


Figure 1: Oxygen Content Of The Plume (%) With Distance Above Ground Level

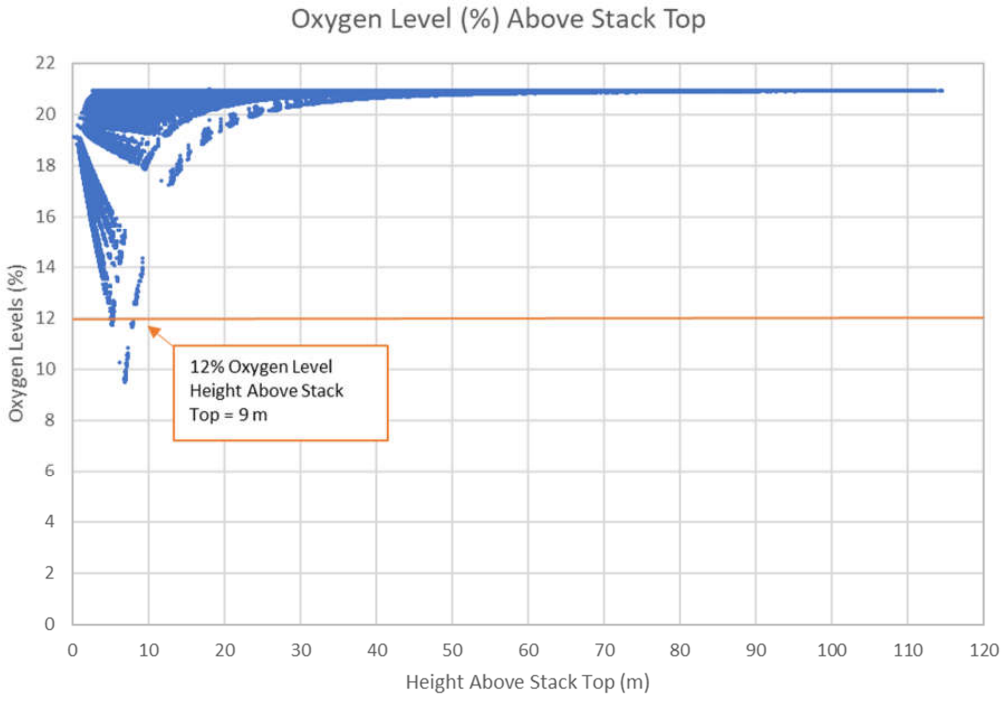


Figure 2: Oxygen Content Of The Plume (%) With Distance From Stack Top

The modelling results confirm that within a distance of 9 m from the stack top (41 m above local ground level) the oxygen content of the stacks plume will be 12% or greater. This analysis is based on every hour of the worst case year 2020 and includes all meteorological conditions including pressure / temperature inversions.

1.3.2 Temperature / Plume Interactions

Temperatures in excess of 50°C are potentially hazardous to helicopters and thus the decrease in the initial temperature of stack plumes (319°C) with distance from the stack has been investigated. Modelling of the temperature of the plume with distance from the stack has been undertaken using the CERC ADMS-5 model for every hour of the year based on Casement Aerodrome 2018-2020 meteorological data. The model has a specific temperature module which can, as part of the model output, give the temperature of the plume centreline with distance from the stack top.

The results are outlined below in Figure 3 and 4 for the worst case year of 2020.

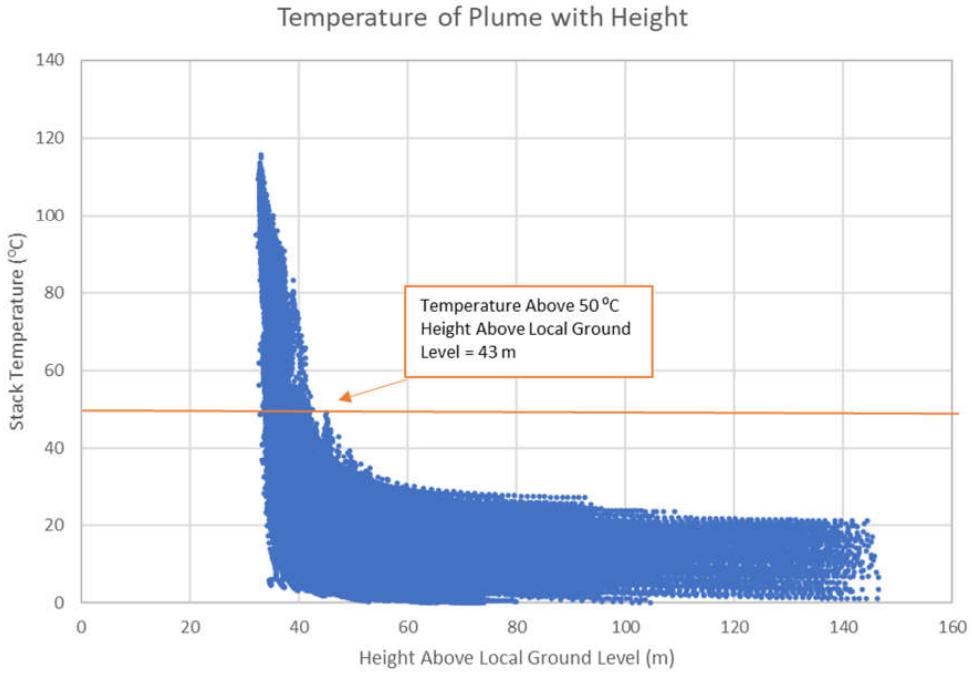


Figure 3: Temperature Of The Plume (°C) With Distance Above Ground Level

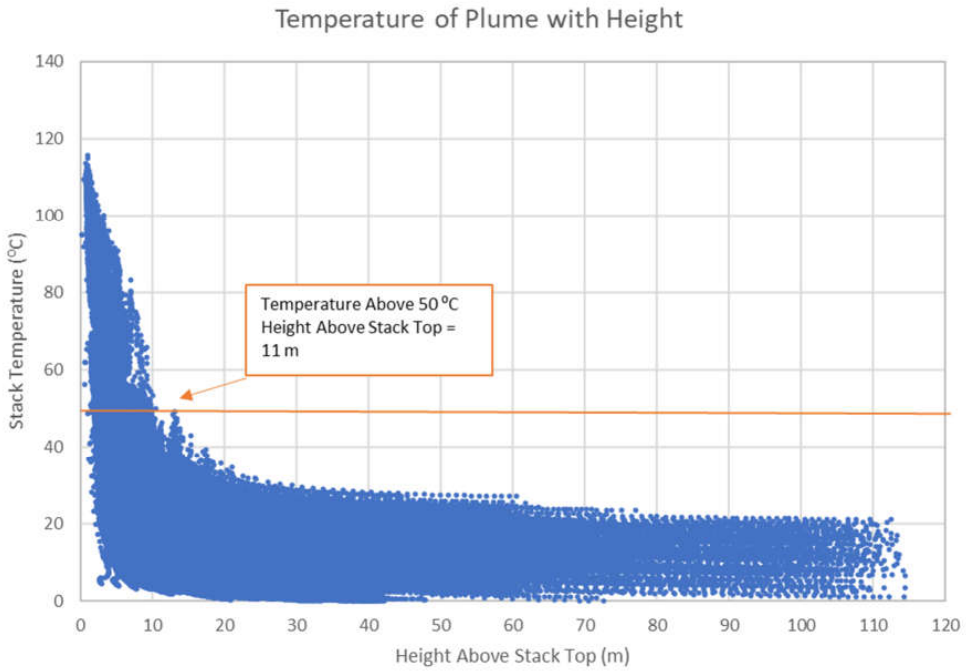


Figure 4: Temperature Of The Plume (°C) With Distance From Stack Top

The results confirm that the plume will be below 50°C within 11 m of the stack top (43 m above ground level) for every hour over the year for the stack including all meteorological conditions including pressure / temperature inversions.

1.3.3 Vertical Velocity / Plume Interactions

High vertical velocities are also relevant when considering helicopter/plume interactions. The Australian CASA (CASA, 2012) consider that the critical level for vertical velocity is 4.3 m/s. Thus, modelling has been undertaken to understand the vertical velocity of the plume with distance from the stack.

Cambridge Environmental Research Consultants (CERC), the developers of the EPA approved AMDS-5 model, were contacted to determine whether vertical velocity could be derived indirectly from the travel time of the plume with distance from the stack. CERC confirmed that the vertical velocity (in m/s) could be derived from an analysis of the plume centreline height (in metres) and the plume travel time (in seconds). The vertical velocity has been calculated for every hour of the year using Casement Aerodrome 2018-2020. The results are outlined below in Figures 5 and 6 for the worst case year of 2020.

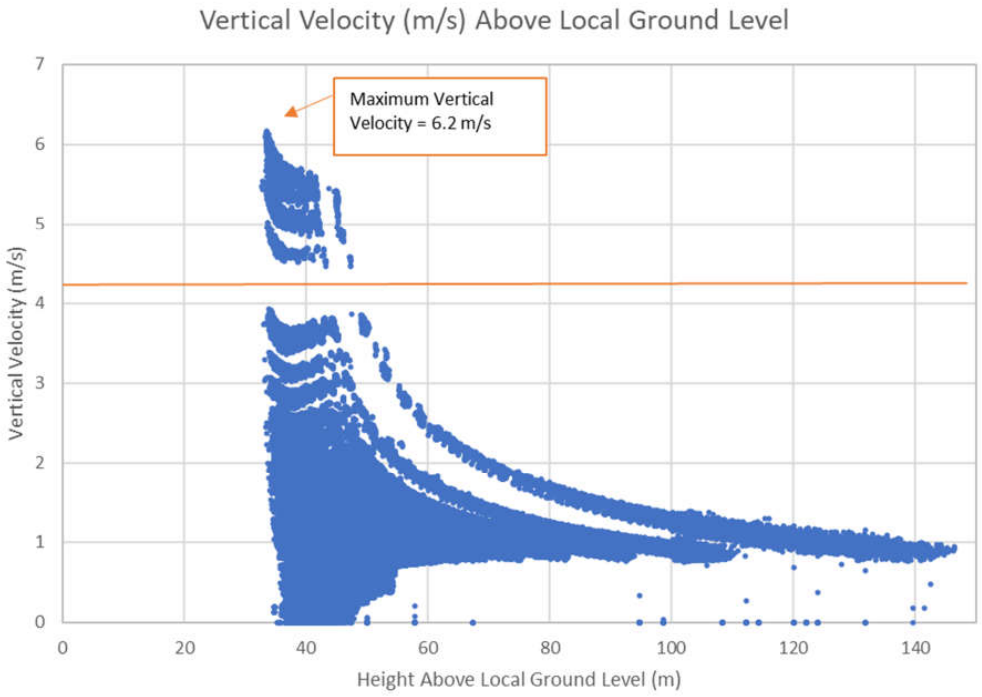


Figure 5: Vertical Velocity Of The Plume (m/s) With Distance Above Ground Level

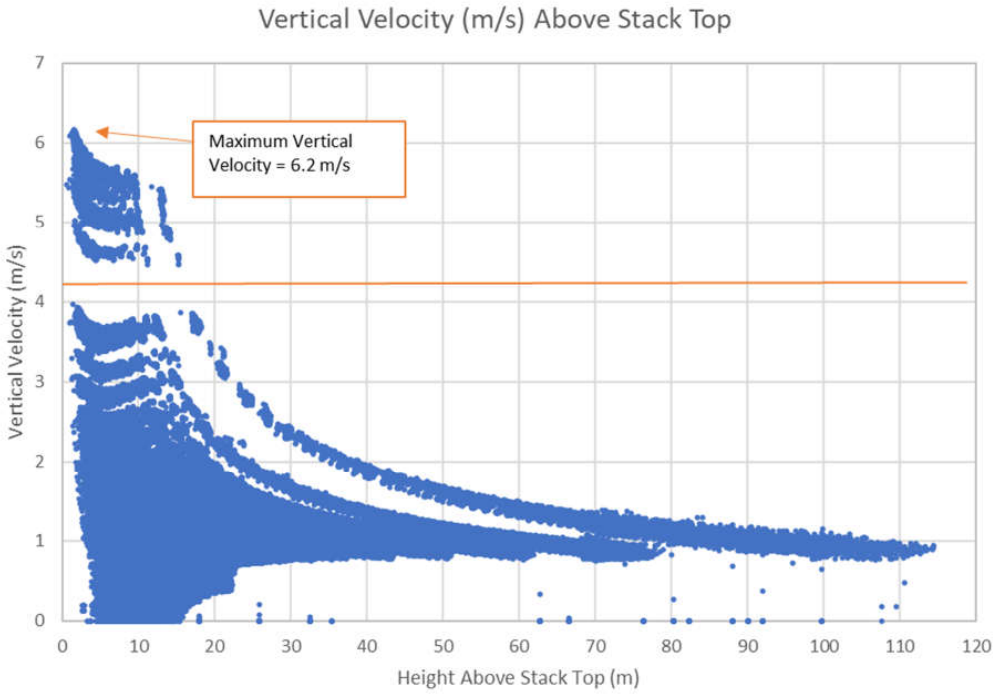


Figure 6: Vertical Velocity Of The Plume (m/s) With Distance From Stack Top

The results confirm that the velocity of the plume will be below 4.3 m/s within 15 m of the stack top (47 m above ground level) of the stack including all meteorological conditions including pressure / temperature inversions.

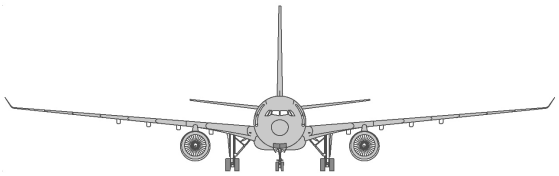
1.4 Summary

Thus, in summary the results of the analysis are as follows.

- **Oxygen Content** – within 9 metres of the stack top the oxygen concentration will increase above the 12% risk level for oxygen.
- **Temperature** – the temperature of the plume will drop to less than 50°C within 11 metres of the stack.
- **Vertical Velocity** – the critical vertical velocity of 4.3 m/s will not be exceeded within 15 metre from the stack top.

Thus, the maximum extent of the risk zone of the plume for each parameter is shown below based on three full years of meteorological data covering all meteorological conditions including pressure / temperature inversions:

- Risk Zone for Oxygen – 9 metres
- Risk Zone for Temperature – 11 metres
- Risk Zone for Vertical Velocity – 15 metres



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