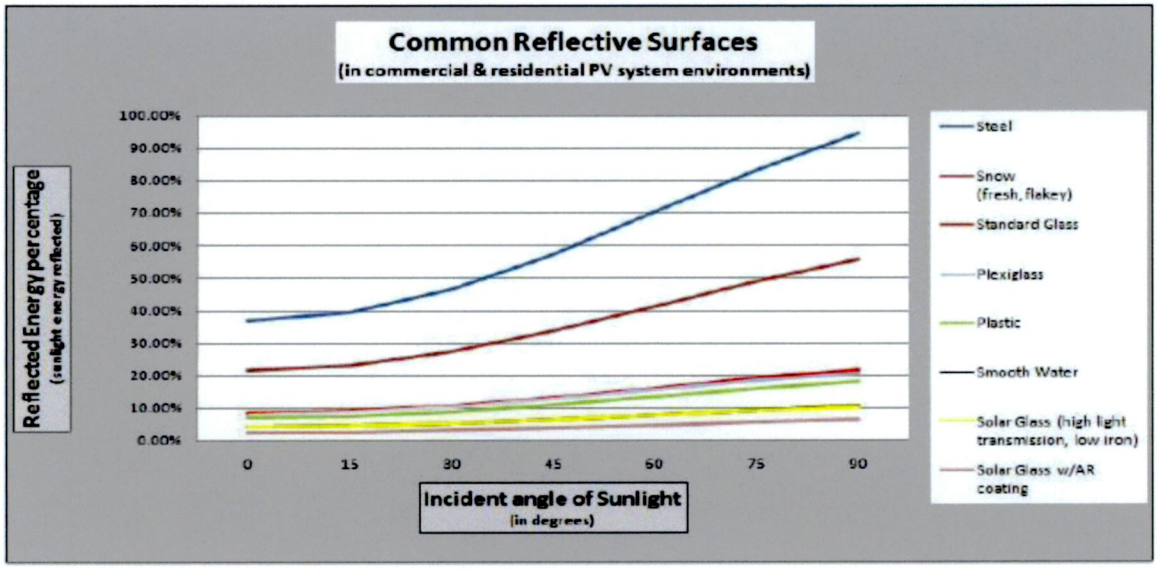
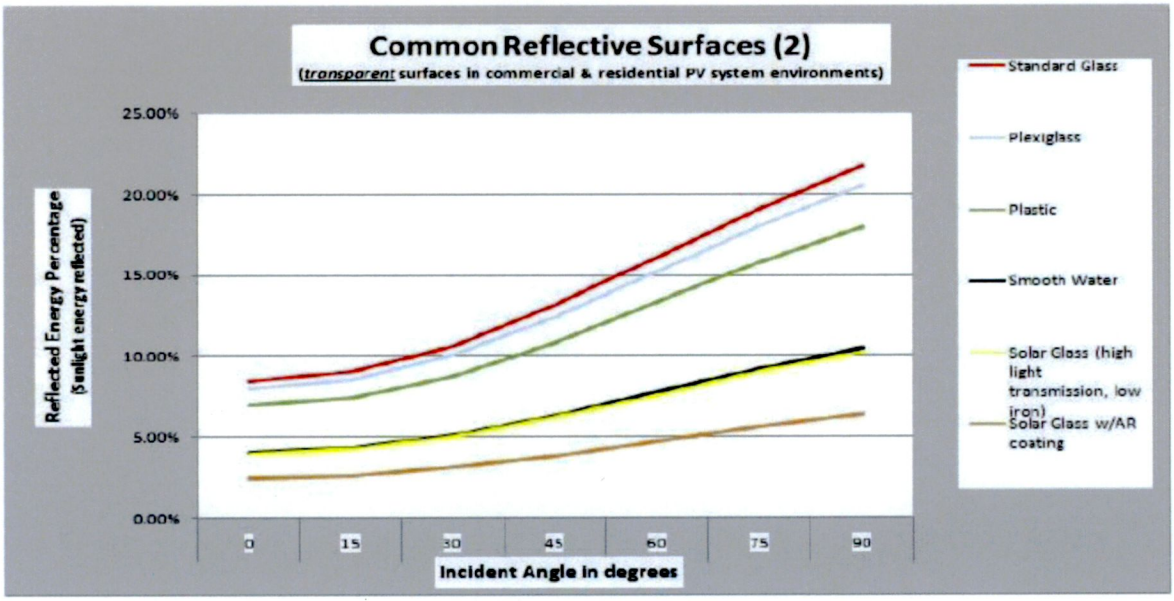
Appendix C

Solar Module Glare and Reflectance Technical Memo

- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.



It should be noted that the reflected energy percentage of Solar Glass is far below that of a standard glass and more on the level of smooth water. Also, below are the ratios of the common reflective surfaces:



Light beam physics resolves that the least amount of light is reflected when the beam is the normal, in other words, least light energy is reflected when the beam is at 0 degrees to the normal. The chart below is a result of light beam physics calculations:

SUNPOWER

Technical Notification

TITLE: SunPower Solar Module Glare and Reflectance
AUTHORS: Technical Support
APPLICATION: Residential/ Commercial
SCOPE: SunPower Modules

SUMMARY:

The objective of this document is to increase awareness concerning the possible glare and reflectance impact of PV Systems on their surrounding environment.

The glare and reflectance levels from a given PV system are decisively lower than the glare andreflectance generated by the standard glass and other common reflective surfaces in the environments surrounding the given PV system. Concerning random glare and reflectance observed from the air: SunPower has several large projects installed near airports or on air force bases. Each of these large projects has passed FAA or Air Force standards and all projects have been determined as "No Hazard toAir Navigation". Although the possible glare and reflectance from PV systems are at safe levels and are usually decisively lower than other standard residential and commercial reflective surfaces, SunPower suggests that customers and installers discuss any possible concerns with the neighbors/cohabitants near the planned PV system installation.

DETAILED EXPLANATION:

In general, since the whole concept of efficient solar power is to absorb as much light as possible while reflecting as little light as possible, standard solar module produces less glare and reflectance than standard window glass. This is pointed out very well in US Patent #6359212 which explains the differences in the refraction and reflection of solar module glass versus standard window glass. Solar modules use "high-transmission, low iron glass" which absorbs more light, producing small amounts of glare and reflectance than normal glass.

In the graph below, we show the reflected energy percentages of sunlight, of some common residential and commercial surfaces. The legend and the graph lists the items from top to bottom in order of the highest percentage of reflected energy.

Northwest Array - Receptor (Casement Baldonnel RWY 28)

No glare found

Northwest Array - Receptor (Dublin RWY 10L)

No glare found

Northwest Array - Receptor (Dublin RWY 10R)

No glare found

Northwest Array - Receptor (Dublin RWY 16)

No glare found

Northwest Array - Receptor (Dublin RWY 28L)

No glare found

Northwest Array - Receptor (Dublin RWY 28R)

No glare found

Northwest Array - Receptor (Dublin RWY 34)

No glare found

Northwest Array - Receptor (Weston RWY 07)

No glare found

Northwest Array - Receptor (Weston RWY 25)

No glare found

Northwest Array - OP Receptor (1-ATCT)

No glare found

Northwest Array - OP Receptor (2-ATCT)

No glare found

Northwest Array - OP Receptor (3-ATCT)

No glare found

Northwest Array - OP Receptor (4-ATCT)

No glare found

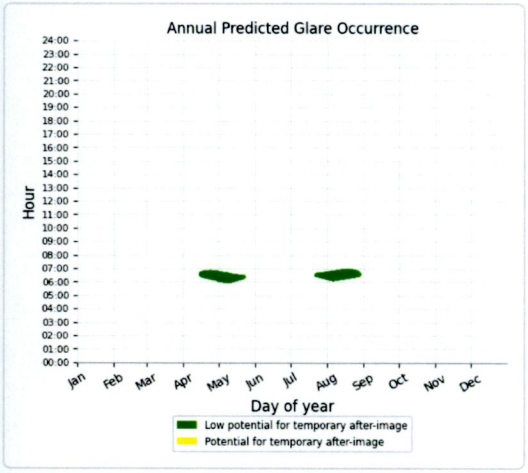
Assumptions

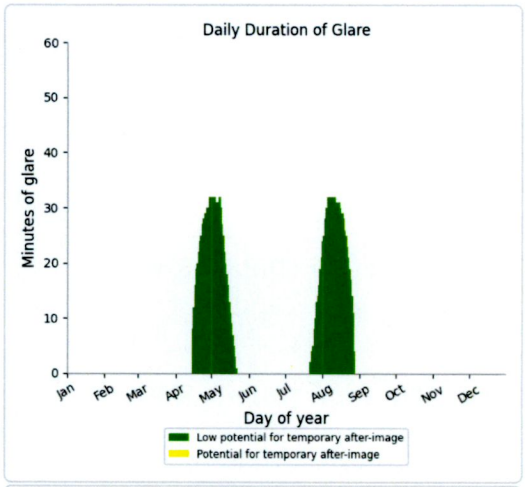
- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not automatically account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
- Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results fc large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
- The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)

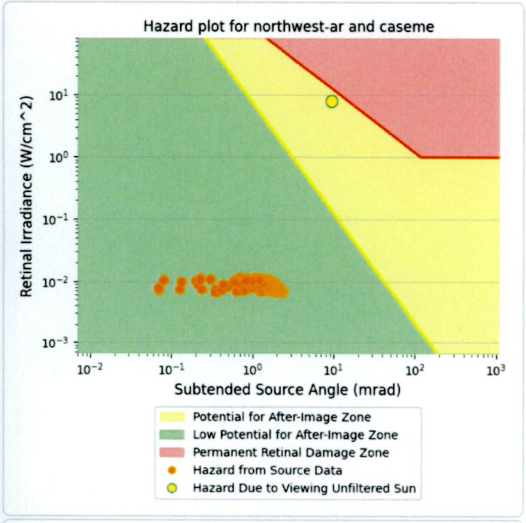
Northwest Array - Receptor (Casement Baldonnel RWY 10)

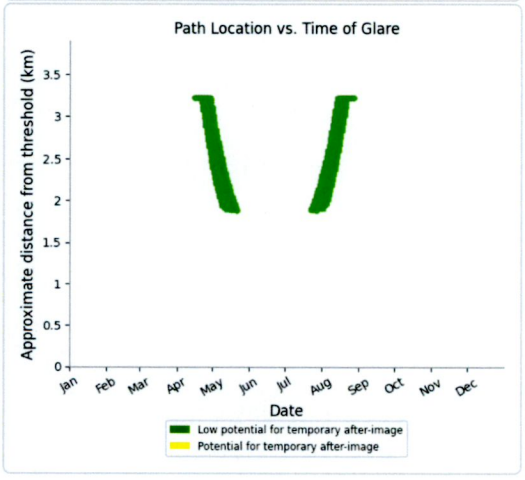
PV array is expected to produce the following glare for observers on this flight path:

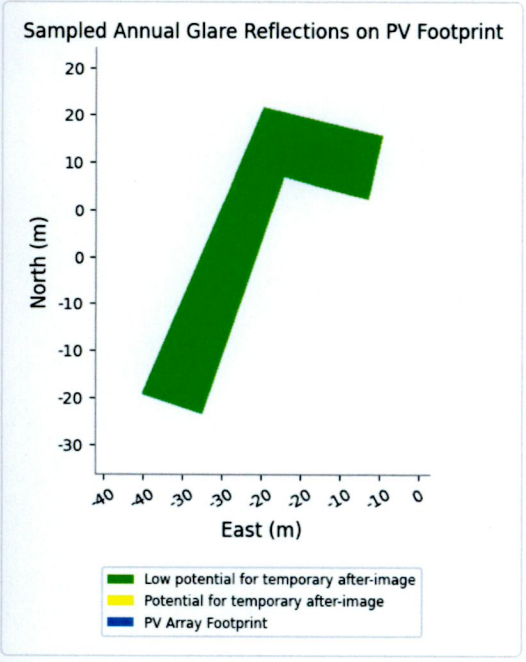
- 1,688 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.

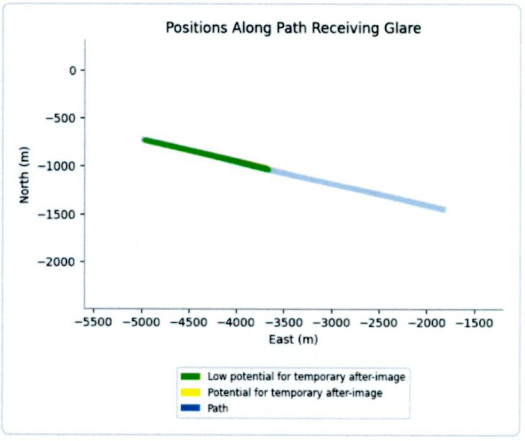












Northwest Array - Receptor (Casement Baldonnel RWY 22)

No glare found

FP: Dublin RWY 34	0	0
FP: Weston RWY 07	0	0
FP: Weston RWY 25	0	0
OP: 1-ATCT	0	0
OP: 2-ATCT	0	0
OP: 3-ATCT	0	0
OP: 4-ATCT	0	0

Northwest Array - Receptor (Casement Baldonnel RWY 04)

No glare found

East Array - Receptor (Casement Baldonnel RWY 28)

No glare found

East Array - Receptor (Dublin RWY 10L)

No glare found

East Array - Receptor (Dublin RWY 10R)

No glare found

East Array - Receptor (Dublin RWY 16)

No glare found

East Array - Receptor (Dublin RWY 28L)

No glare found

East Array - Receptor (Dublin RWY 28R)

No glare found

East Array - Receptor (Dublin RWY 34)

No glare found

East Array - Receptor (Weston RWY 07)

No glare found

East Array - Receptor (Weston RWY 25)

No glare found

East Array - OP Receptor (1-ATCT)

No glare found

East Array - OP Receptor (2-ATCT)

No glare found

East Array - OP Receptor (3-ATCT)

No glare found

East Array - OP Receptor (4-ATCT)

No glare found

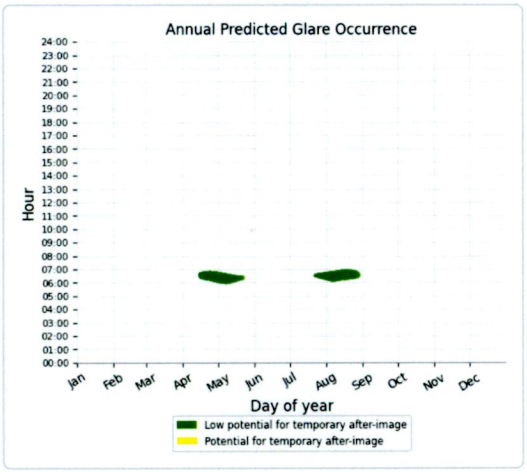
Northwest Array low potential for temporary after-image

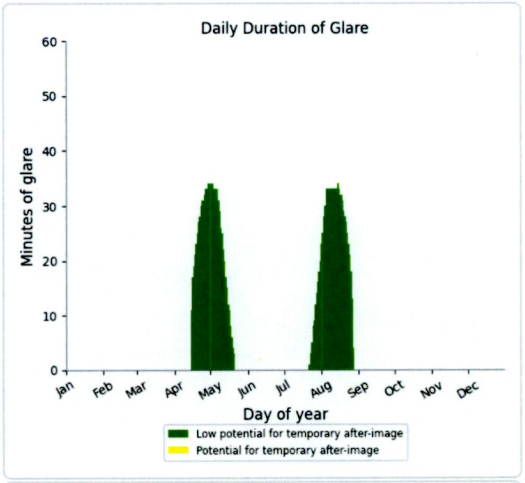
Component	Green glare (min)	Yellow glare (min)
FP: Casement Baldonnel RWY 04	0	0
FP: Casement Baldonnel RWY 10	1688	0
FP: Casement Baldonnel RWY 22	0	0
FP: Casement Baldonnel RWY 28	0	0
FP: Dublin RWY 10L	0	0
FP: Dublin RWY 10R	0	0
FP: Dublin RWY 16	0	0
FP: Dublin RWY 28L	0	0
FP: Dublin RWY 28R	0	0

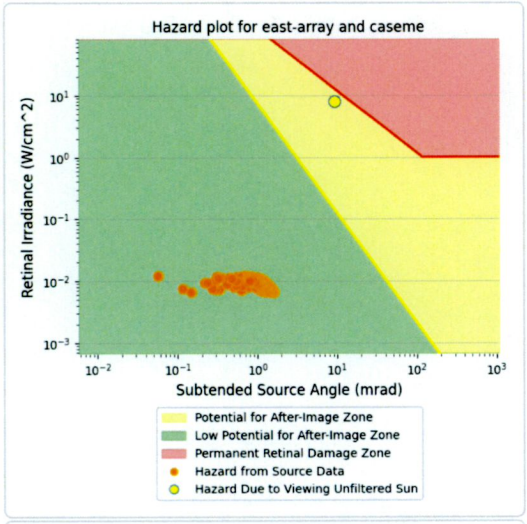
East Array - Receptor (Casement Baldonnel RWY 10)

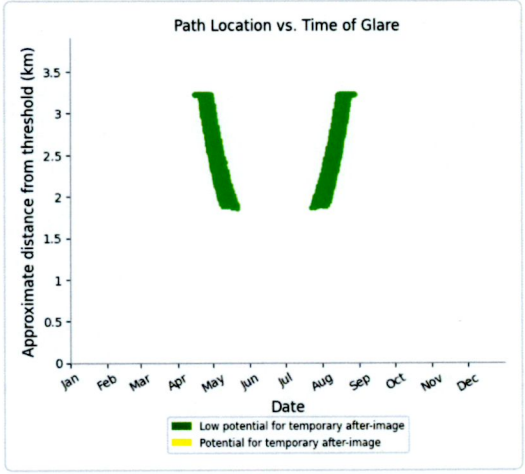
PV array is expected to produce the following glare for observers on this flight path:

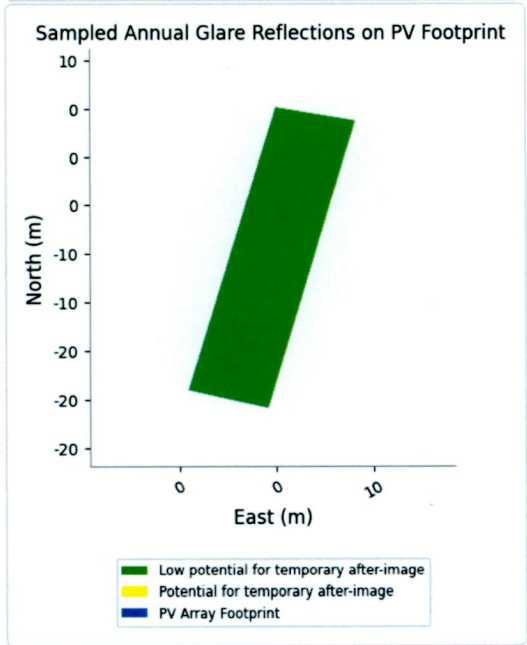
- 1,784 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.

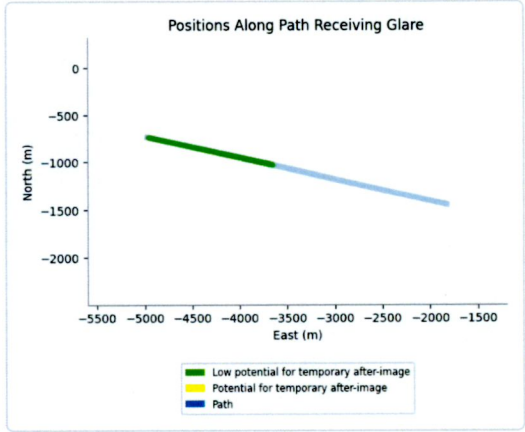












East Array - Receptor (Casement Baldonnel RWY 22)

No glare found

Summary of PV Glare Analysis

PV configuration and total predicted glare

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced	Data File
	deg	deg	min	min	kWh	
East Array	10.0	200.0	1,784	0	-	-
Northwest Array	10.0	200.0	1,688	0	-	-

Distinct glare per month

Excludes overlapping glare from PV array for multiple receptors at matching time(s)

PV	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
east-array (green)	0	0	0	429	463	0	106	786	0	0	0	0
east-array (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
northwest-ar (green)	0	0	0	383	461	0	112	732	0	0	0	0
northwest-ar (yellow)	0	0	0	0	0	0	0	0	0	0	0	0

PV & Receptor Analysis Results

Results for each PV array and receptor

East Array low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: Casement Baldonnel RWY 04	0	0
FP: Casement Baldonnel RWY 10	1784	0
FP: Casement Baldonnel RWY 22	0	0
FP: Casement Baldonnel RWY 28	0	0
FP: Dublin RWY 10L	0	0
FP: Dublin RWY 10R	0	0
FP: Dublin RWY 16	0	0
FP: Dublin RWY 28L	0	0
FP: Dublin RWY 28R	0	0
FP: Dublin RWY 34	0	0
FP: Weston RWY 07	0	0
FP: Weston RWY 25	0	0
OP: 1-ATCT	0	0
OP: 2-ATCT	0	0
OP: 3-ATCT	0	0
OP: 4-ATCT	0	0

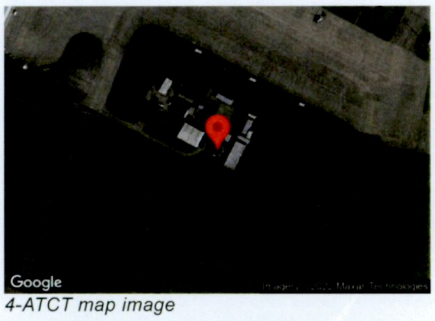
East Array - Receptor (Casement Baldonnel RWY 04)

No glare found

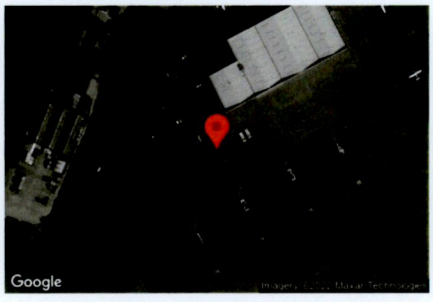
Discrete Observation Receptors

Number	Latitude	Longitude	Ground elevation	Height above ground	Total Elevation
	deg	deg	m	m	m
1-ATCT	53.305502	-6.441790	93.54	0.00	93.54
2-ATCT	53.355589	-6.489455	49.60	15.00	64.60
3-ATCT	53.429047	-6.264260	65.32	87.00	152.32
4-ATCT	53.428536	-6.262179	65.68	22.00	87.68

1-ATCT map image



2-ATCT map image



3-ATCT map image

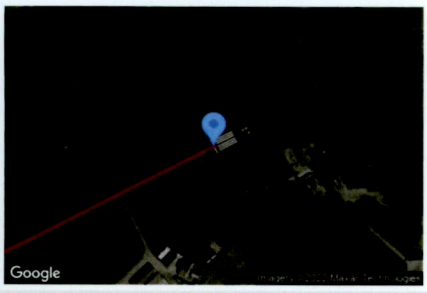
4-ATCT map image

Name: Dublin RWY 34
Description:
Threshold height : 15 m
Direction: 336.6 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.419987	-6.249537	62.20	15.24	77.44
2-mile point	53.393453	-6.230247	49.01	197.11	246.12

Name: Weston RWY 07
Description:
Threshold height : 15 m
Direction: 63.0 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.350432	-6.494490	47.64	15.24	62.88
2-mile point	53.337306	-6.537698	50.72	180.85	231.56



Name: Weston RWY 25
Description:
Threshold height : 15 m
Direction: 243.0 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.354180	-6.482137	46.75	15.24	61.99
2-mile point	53.367306	-6.438926	28.88	201.80	230.68

Name: Dublin RWY 16
Description:
Threshold height : 15 m
Direction: 156.6 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.435666	-6.260973	66.03	15.24	81.27
2-mile point	53.462200	-6.280271	68.00	181.96	249.96

Name: Dublin RWY 28L
Description:
Threshold height : 15 m
Direction: 275.2 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

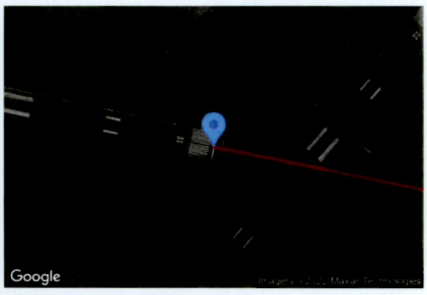
Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.420346	-6.251662	61.98	15.24	77.22
2-mile point	53.417740	-6.203287	42.82	203.08	245.90

Name: Dublin RWY 28R
Description:
Threshold height : 15 m
Direction: 275.3 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.434967	-6.238481	67.87	15.24	83.11
2-mile point	53.432297	-6.190100	32.16	219.64	251.80

Name: Casement Baldonnel RWY 28
Description:
Threshold height : 15 m
Direction: 281.4 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.301637	-6.444621	96.06	15.24	111.30
2-mile point	53.295923	-6.397139	110.47	169.51	279.98



Name: Dublin RWY 10L
Description:
Threshold height : 15 m
Direction: 95.2 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.437366	-6.284126	73.08	15.24	88.32
2-mile point	53.439986	-6.332518	78.30	178.71	257.01

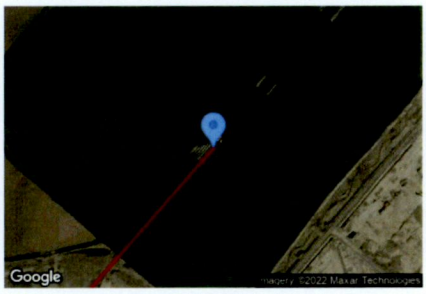
Name: Dublin RWY 10R
Description:
Threshold height : 15 m
Direction: 95.2 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.422441	-6.289949	74.08	15.24	89.32
2-mile point	53.425062	-6.338325	79.46	178.55	258.01

2-Mile Flight Path Receptor(s)

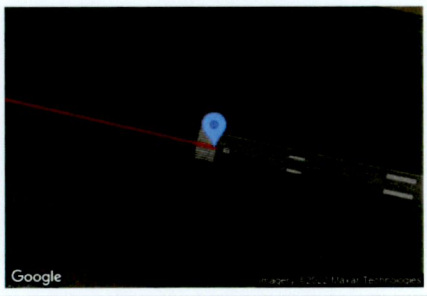
Name: Casement Baldonnel RWY 04
Description:
Threshold height : 15 m
Direction: 41.4 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.293834	-6.453437	98.24	15.24	113.48
2-mile point	53.272160	-6.485489	153.86	128.30	282.16



Name: Casement Baldonnel RWY 10
Description:
Threshold height : 15 m
Direction: 102.9 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.304637	-6.468321	86.26	15.24	101.50
2-mile point	53.311101	-6.515536	72.86	197.32	270.18



Name: Casement Baldonnel RWY 22
Description:
Threshold height : 15 m
Direction: 221.3 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.303279	-6.439777	93.37	15.24	108.61
2-mile point	53.325000	-6.407807	62.87	214.43	277.30

Component Data

PV Array(s)

Total PV footprint area: 494 m^2

Name: East Array
Footprint area: 159 m^2
Axis tracking: Fixed (no rotation)
Tilt: 10.0 deg
Orientation: 200.0 deg

Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.317642	-6.440949	74.09	16.00	90.09
2	53.317433	-6.441056	74.00	16.00	90.00
3	53.317420	-6.440960	74.29	16.00	90.29
4	53.317632	-6.440853	74.17	16.00	90.17

Name: Northwest Array
Footprint area: 334 m^2
Axis tracking: Fixed (no rotation)
Tilt: 10.0 deg
Orientation: 200.0 deg

Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.317738	-6.441185	74.30	16.00	90.30
2	53.317757	-6.441319	74.33	16.00	90.33
3	53.317430	-6.441550	73.94	16.00	89.94
4	53.317408	-6.441437	73.89	16.00	89.89
5	53.317680	-6.441282	74.28	16.00	90.28
6	53.317654	-6.441121	74.22	16.00	90.22
7	53.317725	-6.441094	74.43	16.00	90.43

ForgeSolar

Profile Park DUB13 Solar Array

Profile Park DUB13 Solar Array Aviation

Created Sept. 22, 2022
Updated Sept. 27, 2022
Time-step 1 minute
Timezone offset UTC0
Site ID 76315.13502

Project type Advanced
Project status: active
Category 1 MW to 5 MW

Misc. Analysis Settings

DNI: **varies (1,000.0 W/m^2 peak)**
Ocular transmission coefficient: **0.5**
Pupil diameter: **0.002 m**
Eye focal length: **0.017 m**
Sun subtended angle: **9.3 mrad**

Analysis Methodology: **Version 2**
Enhanced subtended angle calculation: **On**

Summary of Results Glare with low potential for temporary after-image predicted

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
East Array	10.0	200.0	1,784	0	-
Northwest Array	10.0	200.0	1,688	0	-

AERODROME CHART - ICAO

53 25 17 N
006 16 12 W
ELEV 243 FT

TWR 118.600MHz ATIS 124.530
GND 121.800MHz CLEARANCE DELIVERY 122.985
GND 125.885MHz

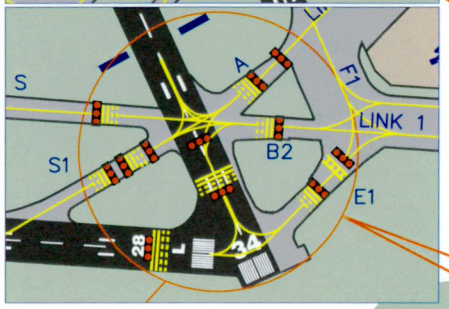
RWY	DIRECTION	THR		BEARING STRENGTH
10R	97°	53 25 20.75 N	006 17 24.27 W	PCN 92/R/B/W/T
28L	278°	53 25 12.94 N	006 15 02.08 W	
16	159°	53 26 13.16 N	006 15 43.12 W	PCN 84/R/B/W/T
34	339°	53 25 11.66 N	006 14 58.54 W	
10L	97°	53 26 13.79 N	006 16 50.22 W	PCN 114/R/C/W/T
28R	278°	53 26 06.73 N	006 14 41.87 W	

LATEST INFORMATION **DUBLIN AIRPORT/ IRELAND**

LEGEND

RVR	
DISUSED PAVEMENT	
STOPBAR	
RUNWAY HOLDING POSITION MARKINGS	
HOT SPOT	
CLEARWAY	
STOPWAY	
ENGINE TEST SITE, ETS	
FIRE SERVICE ROAD	
ARP	
DISPLACED THRESHOLD	
NO ENTRY	

HOTSPOT HS2
- Proceed with caution.
- Complex layout.
- Potential for Taxiing errors and Runway incursions.



HOTSPOT HS1
- Dual RWY Threshold.
- Ensure line up on correct runway and heading.
- Multiple runway entry points and converging taxiways.
- Potential for TWY confusion, disorientation, wingtip collision and RWY incursion.
- Pay attention to signage and ATC instruction.
- Pilots must ensure wingtip clearance.

PRECISION APPROACH CAT I LIGHTING SYSTEM
159°
RADAR MSSR 1 281 (39)
RADAR MSSR 2 272 (30)
RADAR SMR 2 308 (66)
ILS GP / DME 263 (21)
ILS GP / DME 285 (43) PAPI 3° MEHT 57.8 FT
CWY 61m x 150m
097°
ILS LOC 242
WDI LGTD
THR. RWY 16 ELEV 218 GUND 184
3110m x 45m CONCRETE
WDI LGTD
PAPI 3° MEHT 57.6 FT
CWY 60m X 150m
278°
ILS LOC 228
THR. RWY 28R ELEV 213 GUND 184
THR. RWY 10L ELEV 235 GUND 184
CWY 60m x 150m
N7 N6 N5 (RET) M
PERIMETER ROAD
ILS GP/DME 280 (38)
PAPI 3° MEHT 62.3 FT
N4 N3 (RET) N2 N1
F-OUTER F-INNER E-OUTER
LINK 6 LINK 7 LINK 5
LIGHT AIRCRAFT PARK B
GATEPOST 1 BRAVO
ETS 4 ETS 5
PIER 1 PIER 2 PIER 3 PIER 4
HANGARS HANGAR
PASSENGER TERMINAL1 PASSENGER TERMINAL 2
CARGO TERMINAL
South Apron West Apron
SAR HANGAR 254 (12)
ETS 2
HANGARS
TWR 526 (328) SMR1 367 (125) TWR 314 (72)
FIRE STATION 249 (7)
VAR 2° W 2022
ANNUAL RATE OF CHANGE - 11' W
2072m x 45m ASPHALT
HOTSPOT HS2
ETS 1
PAPI 3° MEHT 65.6 FT
PAPI 3° MEHT 68.9 FT
PRECISION APPROACH CAT III LIGHTING SYSTEM
097°
ILS LOC 260 (18)
THR. RWY 10R ELEV 243 GUND 184
S7 S6 S5 (RET) S4 S3 S2 S1
ARP
2637m x 45m ASPHALT
ILS GP / DME 294 (52)
WDI LGTD
CWY 213m x 150m
SWY 56m x 45m
PAPI 3° MEHT 65.6 FT
HOTSPOT HS1
ILS GP / DME 259 (17)
CWY 213m X 150m
278°
ILS LOC 207
THR.RWY 28L ELEV 203 GUND 184
PRECISION APPROACH CAT III LIGHTING SYSTEM
AIRFIELD MAINTENANCE BASE
RADAR SMR 3 343 (101)
SWY 91m x 45m
ILS LOC 204
CWY 183m x 150m
SIMPLE APPROACH LIGHTING SYSTEM
THR. RWY 34 ELEV 202 GUND 184
339°

SCALE
METRES 0 500 1000
FEET 0 1000 2000 3000

NOTE 1	RWY 10R/28L IS PROVIDED WITH 7.5M WIDE ASPHALT SHOULDERS
NOTE 2	RWY 10L/28R IS PROVIDED WITH 7.5M WIDE CONCRETE SHOULDERS
NOTE 3	ALL TAXIWAYS 23M WIDE EXCEPT TWY W4: 15M, LINK 1: 33M, LINK 2: 65M, LINK 3: 42M, LINK 4: 73M, B1, B2 AND N1: 24M, S5: 30M, F1, M1 AND W2: 25M, N2: 27M, N6: 26M, N7: 25M.
NOTE 4	TAXIWAYS S5, N3, AND N5 ARE THE ONLY RAPID EXIT TAXIWAYS (RET) AT DUBLIN AIRPORT
NOTE 5	BEARINGS ARE MAGNETIC
NOTE 6	LINEAR DIMENSION IN METRES
NOTE 7	ELEVATIONS IN FEET AMSL
NOTE 8	HEIGHT IN FEET ABOVE AERODROME ELEVATION SHOWN IN BRACKETS

CHANGES: New Northern Runway, New Note 2 and Note 3 revised along with old Note 8 removed and New Legend,

AERODROME CHART – ICAO 53 21 08.25 N 006 29 17.92 W ELEV 155FT

TWR 122.4
GND 119.425
ATIS 118.875

CONSULT NOTAM FOR LATEST INFORMATION

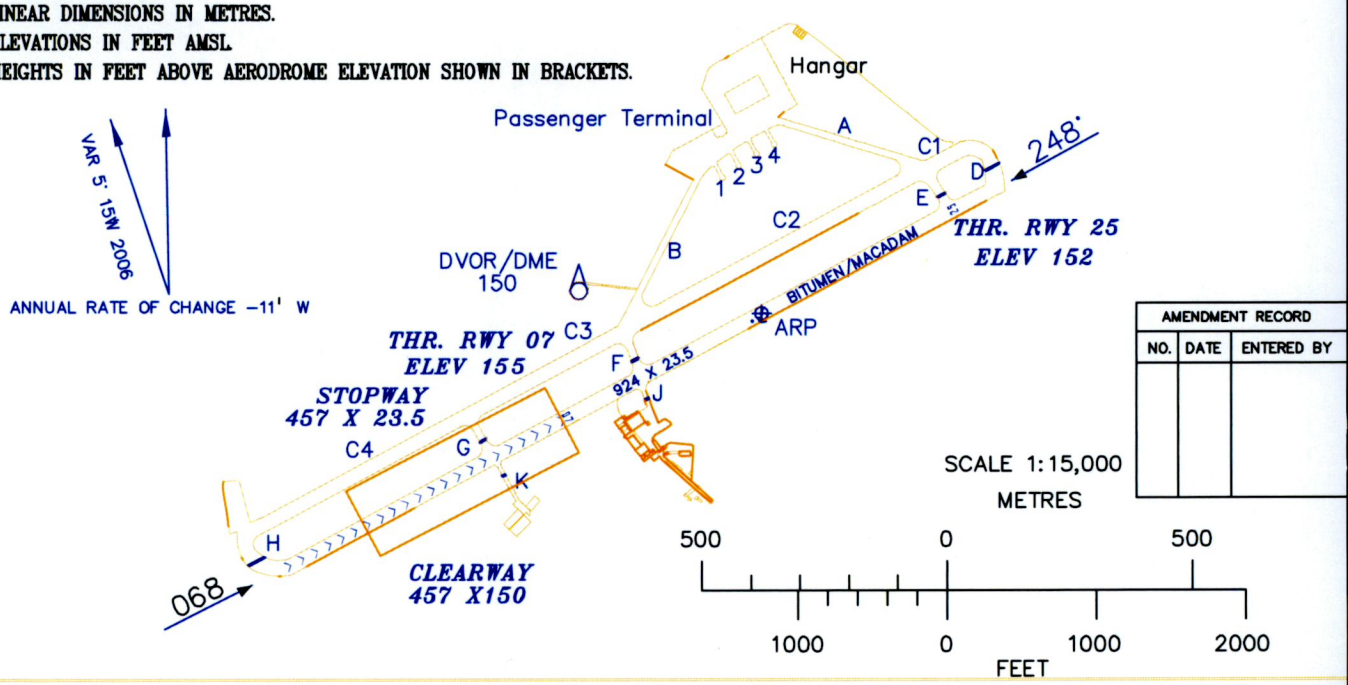
WESTON AIRPORT/ DUBLIN

RWY	DIRECTION	THR		BEARING STRENGTH
07	068°	53 21 01.48 N	006 29 40.17 W	PCN 45/F/A/W/T
25	248°	53 21 15.03 N	006 28 55.66 W	

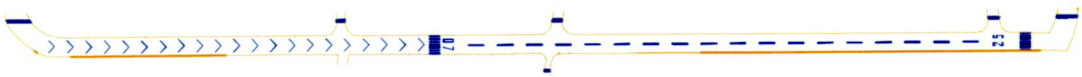
LEGEND

HELICOPTER STANDS	1
RUNWAY HOLDING POSITION MARKING	

BEARINGS ARE MAGNETIC.
LINEAR DIMENSIONS IN METRES.
ELEVATIONS IN FEET AMSL.
HEIGHTS IN FEET ABOVE AERODROME ELEVATION SHOWN IN BRACKETS.



AMENDMENT RECORD		
NO.	DATE	ENTERED BY



MARKING AIDS RUNWAY 07/25

NIL

LIGHTING AIDS RUNWAY 07/25

Helicopter Stand	Latitude	Longitude	Max Wingspan	Max Length	Conditions
01	53 21 17.18 N	006 29 22.05 W			
02	53 21 17.96 N	006 29 20.18 W			
03	53 21 18.67 N	006 29 18.25 W			
04	53 21 19.31 N	006 29 16.26 W			

NOTE 1: TAXIWAY AND APRON : PCN 45/F/A/W/T.
NOTE 2: TAXIWAY C1, C2, C3 AND C4: 30M WIDE.
NOTE 3: TAXIWAY A, B, D, E, F, G, H AND J: 16M WIDE.
NOTE 4: TAXIWAY K: 7M WIDE.

CHANGES: NEW ARP COORDINATES; NEW THRESHOLD COORDINATES FOR RUNWAY 25 AND 07; NEW THRESHOLD ELEVATION RUNWAY 07

IRISH AIR CORPS

RNAV STANDARD ARRIVAL CHART INSTRUMENT (STAR) - ICAO

TRANS ALT 5000ft
TRANS LEVEL by ATC

TWR	123.500
BAL RADAR	122.000
ATIS	122.805
DUBLIN LOWER SOUTH	120.755
DUBLIN LOWER NORTH	132.580

EIME AD 2.24-29

BALDONNEL/CASEMENT (MIL)
RWY 22/28

NIMAT 1K, BOYNE 1K, BAGSO 1K, LIPGO 1S, VATRY 1S, BUNED 1S, SUTEX 1S, OSGAR 1S, OLAPO 1K, BAMLI 1K.

NOTES:
1. ASKUP may be used tactically by ATC to ensure aircraft routings are clear of EI D1.
2. MAX IAS 250kt below FL100.
3. DME/DME or GNSS navigation required.
4. Aircraft routeing via ASKUP who experience radio communication failure should follow the appropriate procedure for the runway in use remaining clear of EI D1.

VERTICAL PLANNING INFORMATION
1. ACTUAL DESCENT CLEARANCE WILL BE AS DIRECTED BY ATC.
CAUTION
2. Pilots must inform ATC if unable to comply with any level or speed constraint.

WARNING
Do not proceed beyond KERAV/SORIN without ATC clearance, enter hold.

BEARINGS ARE MAGNETIC
ALTITUDES, ELEVATIONS AND HEIGHTS IN FEET
DISTANCE IN NM

MNM SECTOR ALTITUDE BASED ON BAL VOR/DME

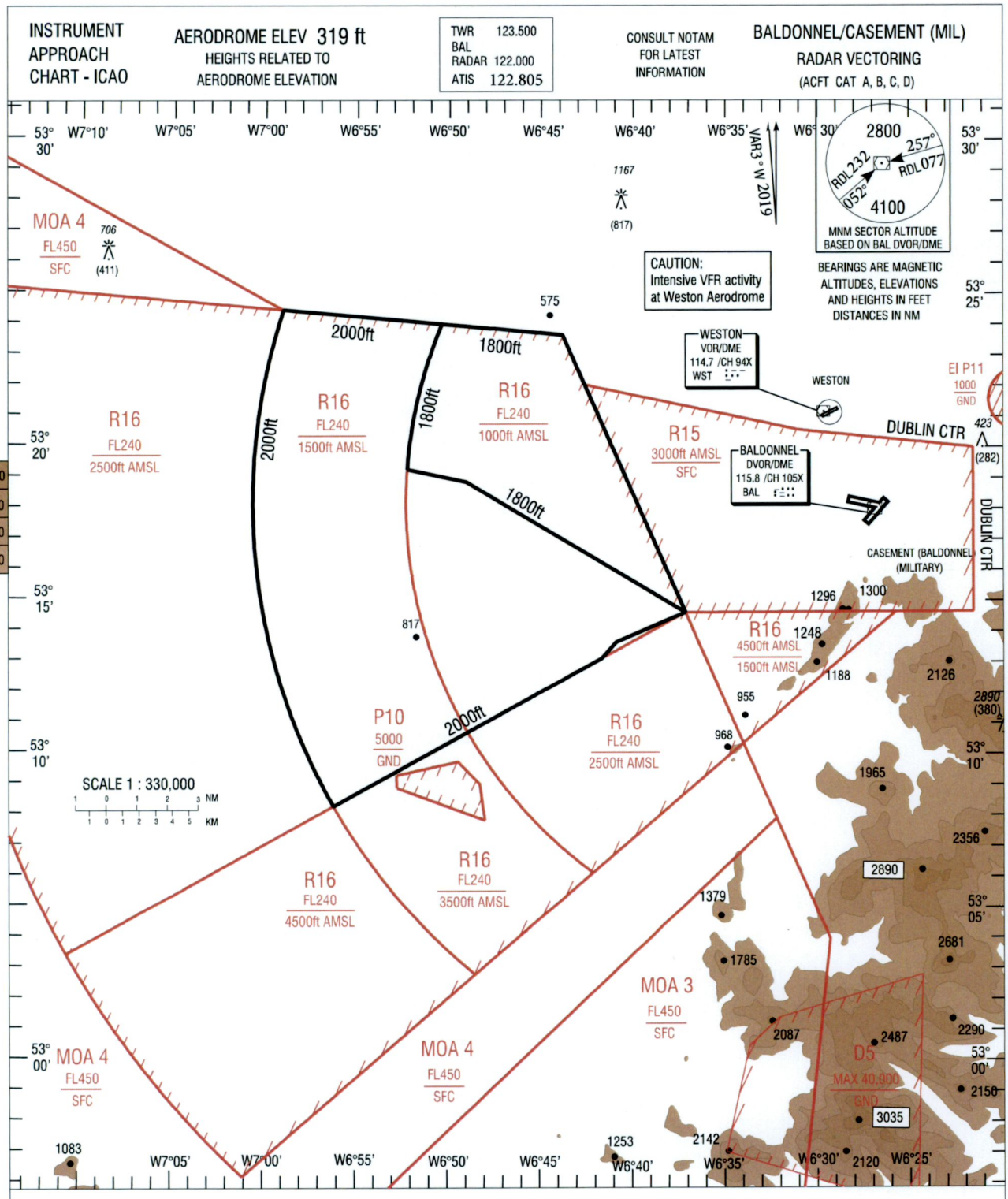
VAR 3° W 2019

NOTES
a. RNAV standard arrival procedure is followed by conventional VOR/DME approach to EIME.
b. ATC shall be provided by Civil ATC for arrival procedure. Aircraft can expect transfer of communications to Baldonnel (MIL) TWR frequency when established on final approach.
c. Aircraft can expect the following routings for arrival:
i VOR/DME RWY28 - STAR terminates at SORIN hold (IAF RWY28)
ii VOR/DME RWY22 - STAR terminates at KERAV hold (IAF RWY22).

SCALE 1 : 750,000 NM

Approved by GOC Air Corps

31 DEC 2020



NOTES :

1. RADAR service normally available MON to FRI 0900 - 1630 (1)
2. Vectors available to establish on Final Approach for all instrument procedures
3. SRAs to RWY 10 and RWY 22 on request

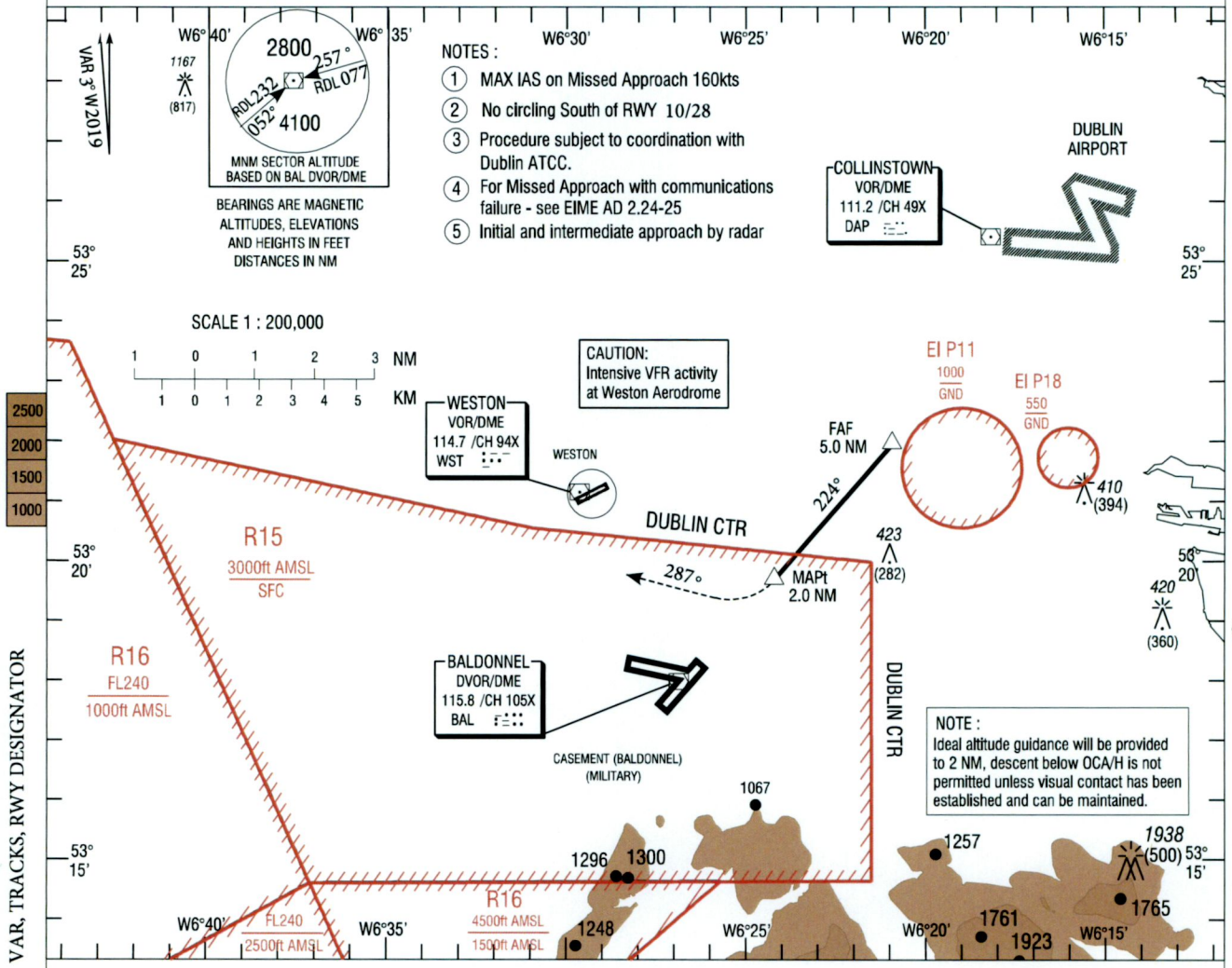
INSTRUMENT APPROACH CHART - ICAO

AERODROME ELEV 319 ft
HEIGHTS RELATED TO AERODROME ELEVATION

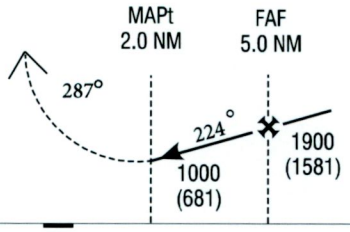
TWR 123.500
BAL
RADAR 122.000
ATIS 122.805

CONSULT NOTAM FOR LATEST INFORMATION

BALDONNEL/CASEMENT (MIL)
SRA RWY 22 ① ② ③ ④ ⑤
(ACFT CAT A, B, C)



TRANSITION ALTITUDE 5000 ft



ELEV 306ft (THR RWY22)

MISSED APPROACH:
At 2.0 NM turn right onto track 287° climb 2000ft. Contact ATC.
Do NOT exceed IAS 160kts until established on track 287°.

5 4 3 2 1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
NM FROM THR RWY 22

	CAT	A	B	C
STRAIGHT IN LANDING RWY22 OCA (H) 1000 (681)	CEILING	700	700	700
	VIS	2000	2000	3600
	ALS OUT	2400	2400	4000
CIRCLE TO LAND (Heights AAL)	OCA (H)	1000 (681)	1000 (681)	1000 (681)
	CEILING	700	700	700
	VIS	2000	2000	3600

LIGHTING
PAPI 3°
REIL
RWY LTs
SALS

IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH								
Distance (NM)	5.0		4.0		3.0		2.0	
ALT (HT)	1900 (1581)		1590 (1271)		1280 (961)		970 (651)	
GROUND SPEED	kts	60	80	100	120	140	160	180
Rate of descent gradient 5%	ft/min	304	405	506	608	709	810	911

Approved by GOC Air Corps

31 DEC 2020

CHANGE: VAR, TRACKS, RWY DESIGNATOR

INSTRUMENT APPROACH CHART - ICAO

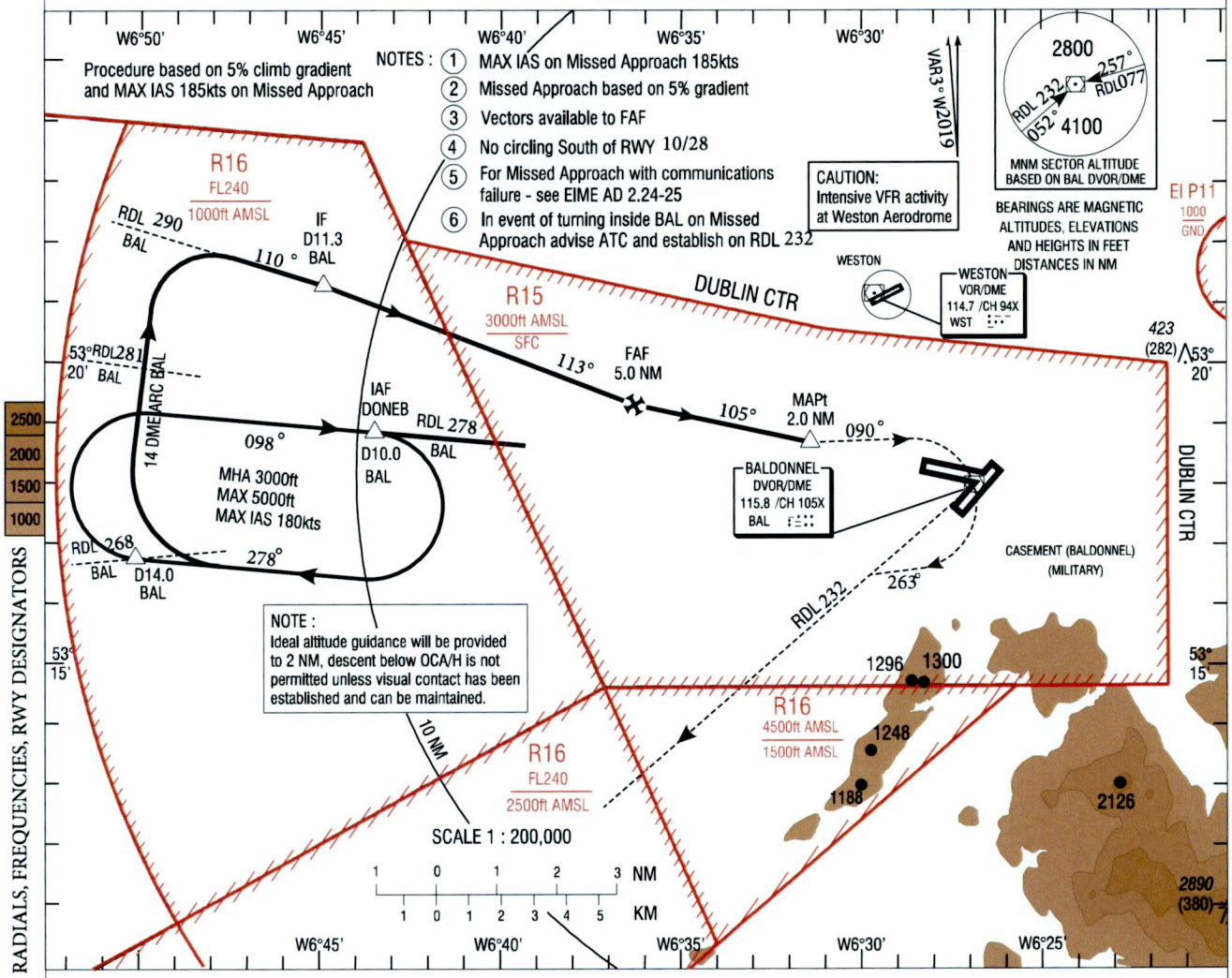
AERODROME ELEV 319 ft
HEIGHTS RELATED TO
THR RWY 10 - ELEV 283ft

TWR 123.500
BAL
RADAR 122.000
ATIS 122.805

CONSULT NOTAM FOR LATEST INFORMATION

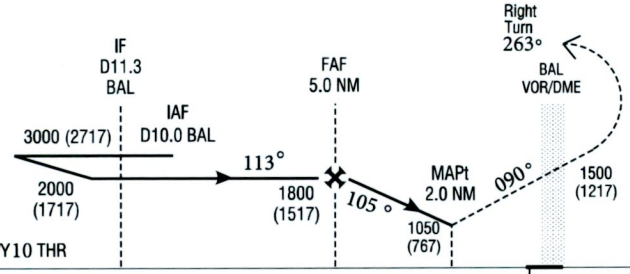
BALDONNEL/CASEMENT (MIL)

SRA RWY 10 ① ② ③ ④ ⑤ ⑥
(ACFT CAT A, B, C)



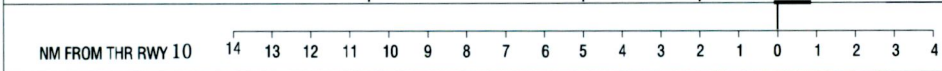
CHANGES: VAR, TRACKS, RADIALS, FREQUENCIES, RWY DESIGNATORS

TRANSITION ALTITUDE 5000 ft



MISSED APPROACH:
At 2.0 NM turn left onto track 090° climb 3000ft, at 1500ft turn right onto track 263° to intercept RDL 232 from BAL. Contact ATC.
Do not exceed IAS 185kts 3000ft
Maintain 5% climb gradient until 2800ft.

ELEV 283ft (THR RWY 10)



	CAT	A	B	C
STRAIGHT IN LANDING RWY 10 OCA (H) 1050 (767)	CEILING	800	800	800
	VIS	2000	2000	3600
	ALS OUT	2400	2400	4000
CIRCLE TO LAND (Heights AAL)	OCA (H)	1050 (731)	1050 (731)	1050 (731)
	CEILING	800	800	800
	VIS	2000	2000	3600

OCAs based on 2.5% Missed Approach climb gradient

CAT	A	B	C
OCA	1130	1280	1460

LIGHTING
PAPI 3°
REIL
RWY LTs
SALS

IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH				
Distance (NM)	5.0	4.0	3.0	2.0
ALT (HT)	1800 (1517)	1500 (1217)	1200 (917)	900 (617)

GROUND SPEED	kts	60	80	100	120	140	160	180
Rate of descent gradient 5%	ft/min	304	405	506	608	709	810	911

GROUND SPEED	kts	60	80	100	120	140	160	180
Rate of climb gradient 2.5%	ft/min	152	203	254	304	355	406	456

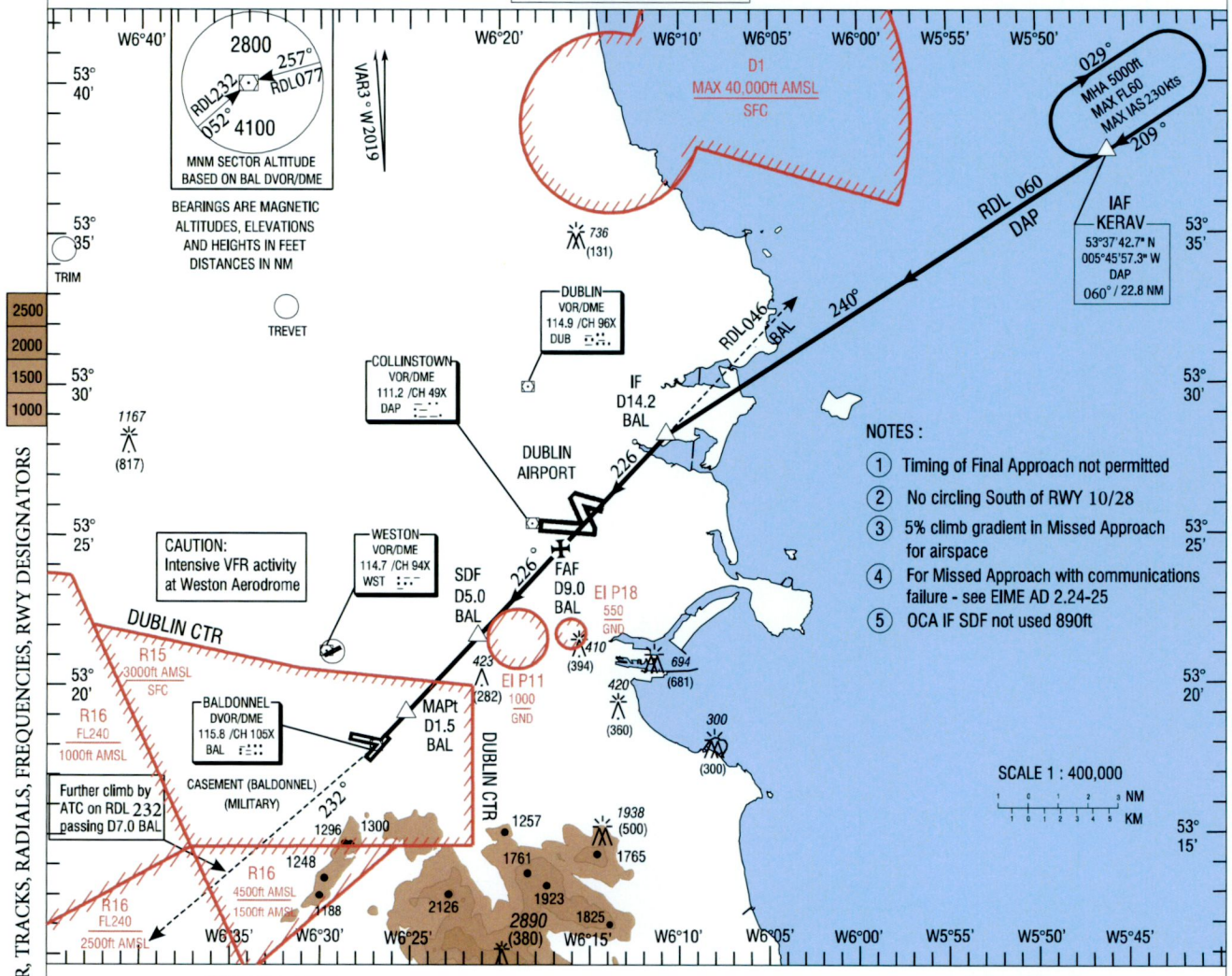
INSTRUMENT APPROACH CHART - ICAO

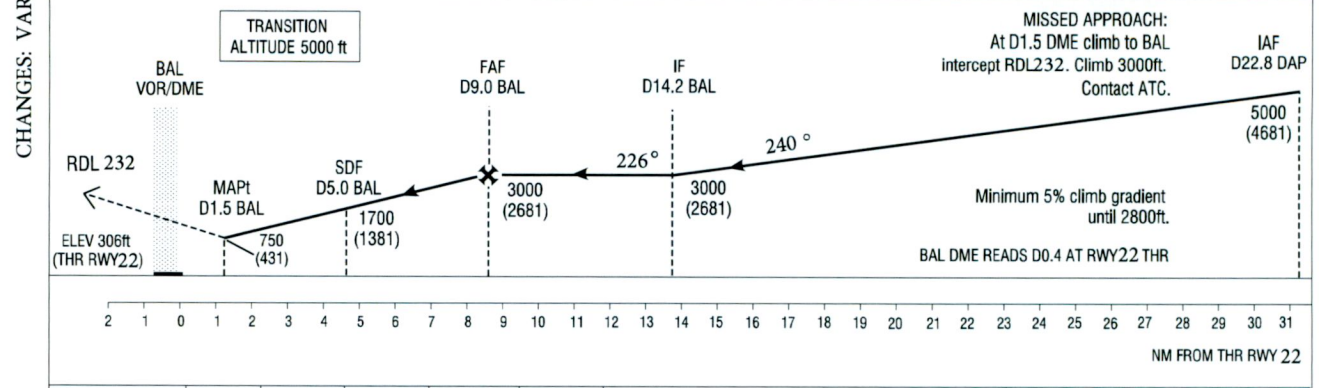
AERODROME ELEV 319 ft
HEIGHTS RELATED TO AERODROME ELEVATION

TWR	123.500
BAL RADAR	122.000
ATIS	122.805
DUBLIN LOWER SOUTH	120.755
DUBLIN LOWER NORTH	132.580

CONSULT NOTAM FOR LATEST INFORMATION

BALDONNEL/CASEMENT (MIL)
VOR/DME RWY 22 ① ② ③ ④ ⑤
(ACFT CAT A, B, C, D)





	CAT	A	B	C	D
STRAIGHT IN LANDING RWY 22	CEILING	500	500	500	500
OCA (H) 750 (431)	VIS	2000	2000	2400	2800
	ALS OUT	2400	2400	2800	3200
CIRCLE TO LAND (Heights AAL)	OCA (H)	750 (431)	820 (501)	910 (591)	1010 (691)
	CEILING	500	600	600	700
	VIS	2000	2000	2800	3600

IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH

DME (BAL)	9.0	8.0	7.0	6.0	5.0	4.0	3.0	2.0
ALT (HT)	3000 (2681)	2690 (2371)	2390 (2071)	2090 (1771)	1780 (1461)	1480 (1161)	1180 (861)	870 (551)

LIGHTING
PAPI 3°
REIL
RWY LTs
SALS

GROUND SPEED	kts	60	80	100	120	140	160	180
Rate of descent gradient 5%	ft/min	304	405	506	608	709	810	911

CHANGES: VAR, TRACKS, RADIALS, FREQUENCIES, RWY DESIGNATORS

Approved by GOC Air Corps

31 DEC 2020

INSTRUMENT APPROACH CHART - ICAO

AERODROME ELEV 319 ft
HEIGHTS RELATED TO AERODROME ELEVATION

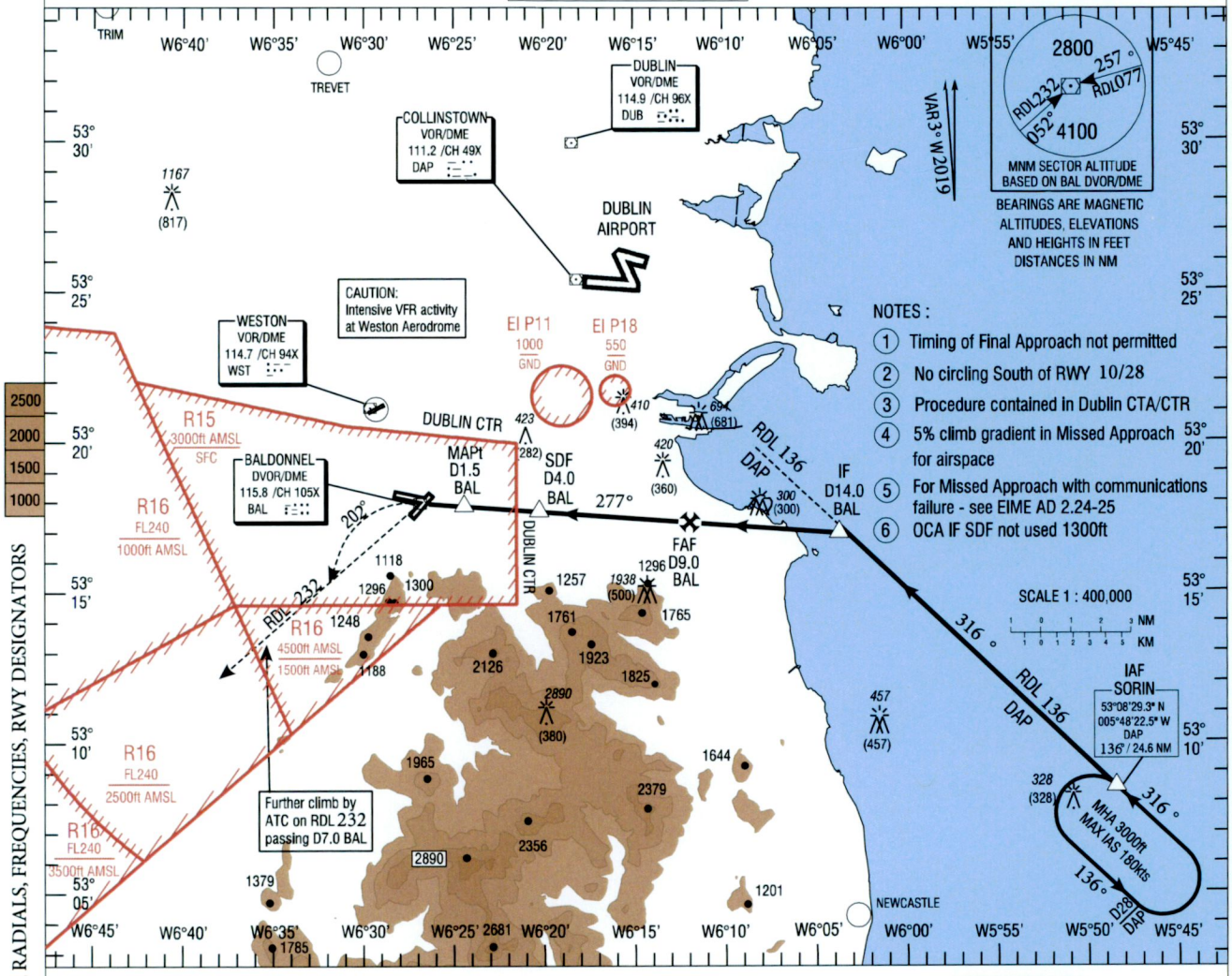
TWR	123.500
BAL RADAR	122.000
ATIS	122.805
DUBLIN LOWER SOUTH	120.755
DUBLIN LOWER NORTH	132.580

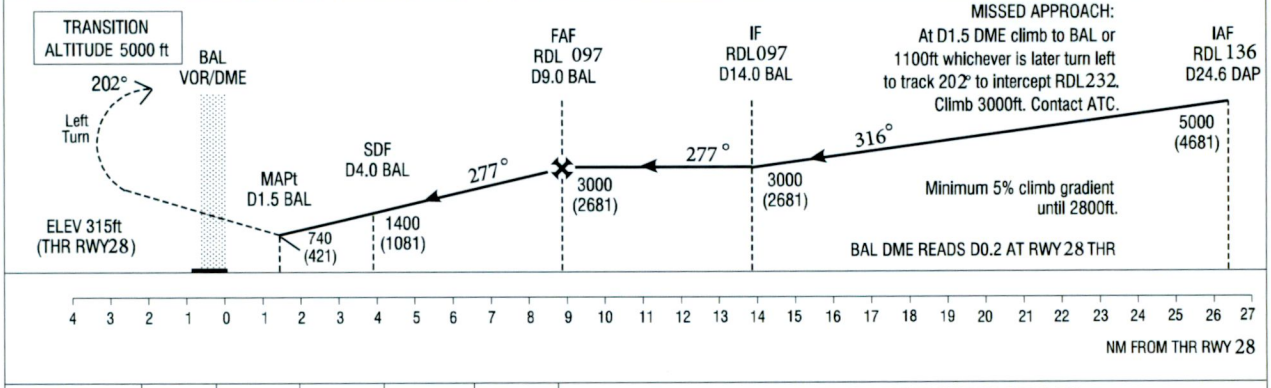
CONSULT NOTAM FOR LATEST INFORMATION

BALDONNEL/CASEMENT (MIL)

VOR/DME RWY 28 ① ② ③ ④ ⑤ ⑥

(ACFT CAT A, B, C, D)





	CAT	A	B	C	D
STRAIGHT IN LANDING RWY28	CEILING	500	500	500	500
OCA (H) 740 (421)	VIS	2000	2000	2400	2800
	ALS OUT	2400	2400	2800	3200
CIRCLE TO LAND (Heights AAL)	OCA (H)	740 (421)	820 (501)	910 (591)	1010 (691)
	CEILING	500	600	600	700
	VIS	2000	2000	2800	3600

LIGHTING
PAPI 3°
REIL
RWY LTs
SALS

IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH

DME (BAL)	9.0	8.0	7.0	6.0	5.0	4.0	3.0	2.0
ALT (HT)	3000 (2681)	2710 (2391)	2410 (2091)	2120 (1801)	1820 (1501)	1530 (1211)	1230 (911)	930 (611)

GROUND SPEED	kts	60	80	100	120	140	160	180
Rate of descent gradient 4.88%	ft/min	297	395	494	593	692	791	890

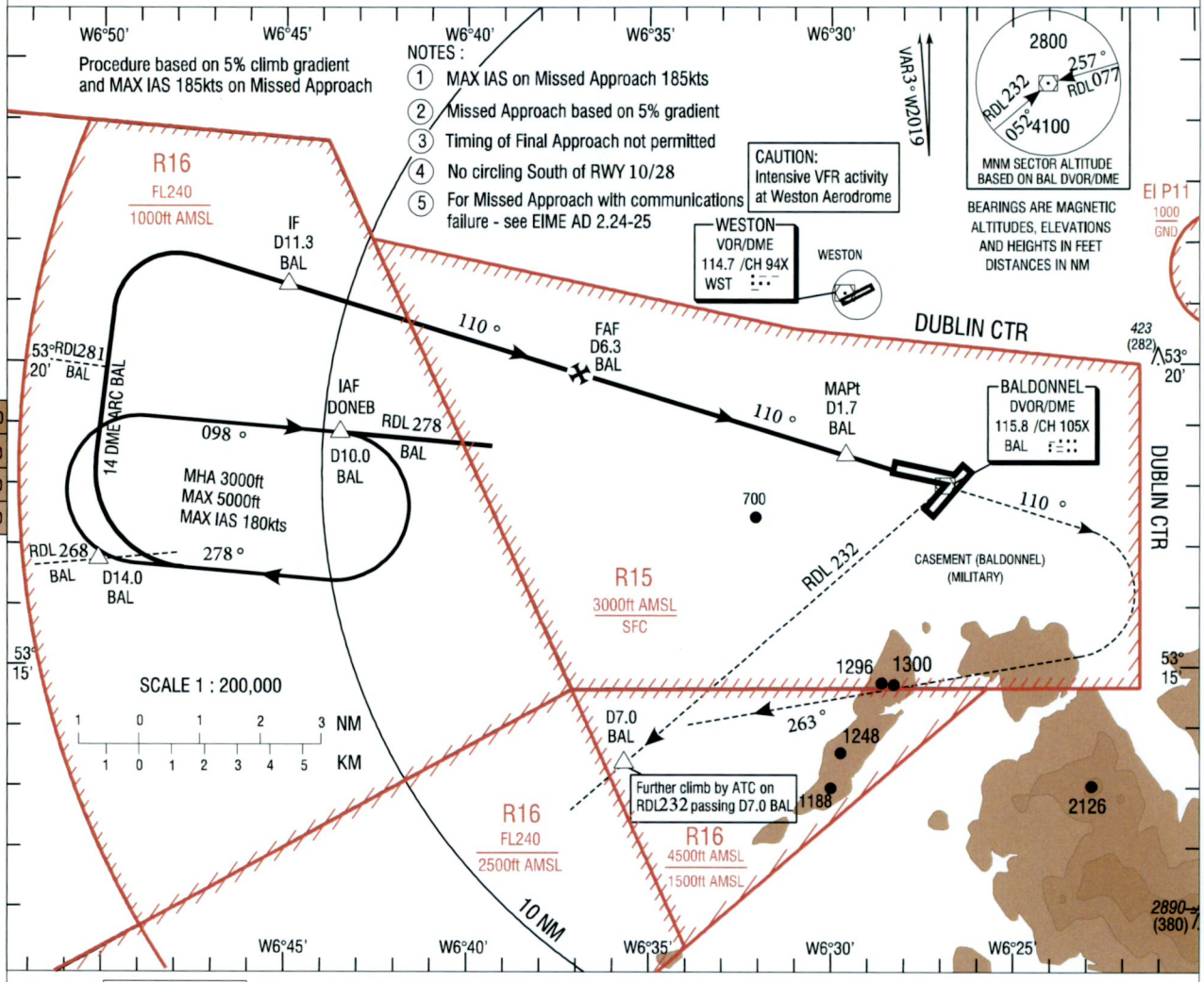
INSTRUMENT APPROACH CHART - ICAO

AERODROME ELEV 319 ft
HEIGHTS RELATED TO
THR RWY 10 - ELEV 283ft

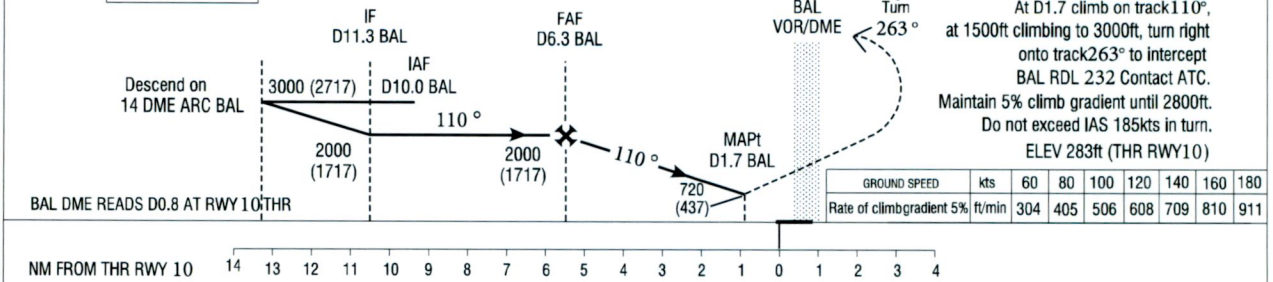
TWR	123.500
BAL	
RADAR	122.000
ATIS	122.805

CONSULT NOTAM FOR LATEST INFORMATION

BALDONNEL/CASEMENT (MIL)
VOR/DME RWY 10 ① ② ③ ④ ⑤
(ACFT CAT A, B, C, D)



TRANSITION ALTITUDE 5000 ft



MISSED APPROACH:
Initial climb 3000ft
At D1.7 climb on track 110°,
at 1500ft climbing to 3000ft, turn right
onto track 263° to intercept
BAL RDL 232 Contact ATC.
Maintain 5% climb gradient until 2800ft.
Do not exceed IAS 185kts in turn.
ELEV 283ft (THR RWY10)

GROUND SPEED	kts	60	80	100	120	140	160	180
Rate of climb gradient 5%	ft/min	304	405	506	608	709	810	911

	CAT	A	B	C	D
STRAIGHT IN LANDING RWY 10 OCA (H) 720 (437)	CEILING	500	500	500	500
	VIS	2000	2000	2400	2800
	ALS OUT	2400	2400	2800	3200
CIRCLE TO LAND (Heights AAL)	OCA (H)	720 (401)	820 (501)	910 (591)	1010 (691)
	CEILING	500	600	600	700
	VIS	2000	2000	2800	3600

OCAs based on 2.5% Missed Approach climb gradient

CAT	A	B	C	D
OCA	1000	1230	1400	1420

LIGHTING	IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH				
PAPI 3° REILS RWY LTs SALS	DME (BAL)	6.0	5.0	4.0	3.0	2.0
	ALT (HT)	1910 (1627)	1610 (1327)	1300 (1017)	1000 (717)	700 (417)

GROUND SPEED	kts	60	80	100	120	140	160	180
Rate of descent gradient 5%	ft/min	304	405	506	608	709	810	911

GROUND SPEED	kts	60	80	100	120	140	160	180
Rate of climb gradient 2.5%	ft/min	152	203	254	304	355	406	456

CHANGE: MAGVAR, TRACKS AND RADIALS, RUNWAY DESIGNATORS, PROCEDURE NAME, ATIS FREQUENCY

Approved by GOC Air Corps

31 DEC 2020

INSTRUMENT APPROACH CHART - ICAO

AERODROME ELEV 319 ft
HEIGHTS RELATED TO
THR RWY 10 - ELEV 283 ft

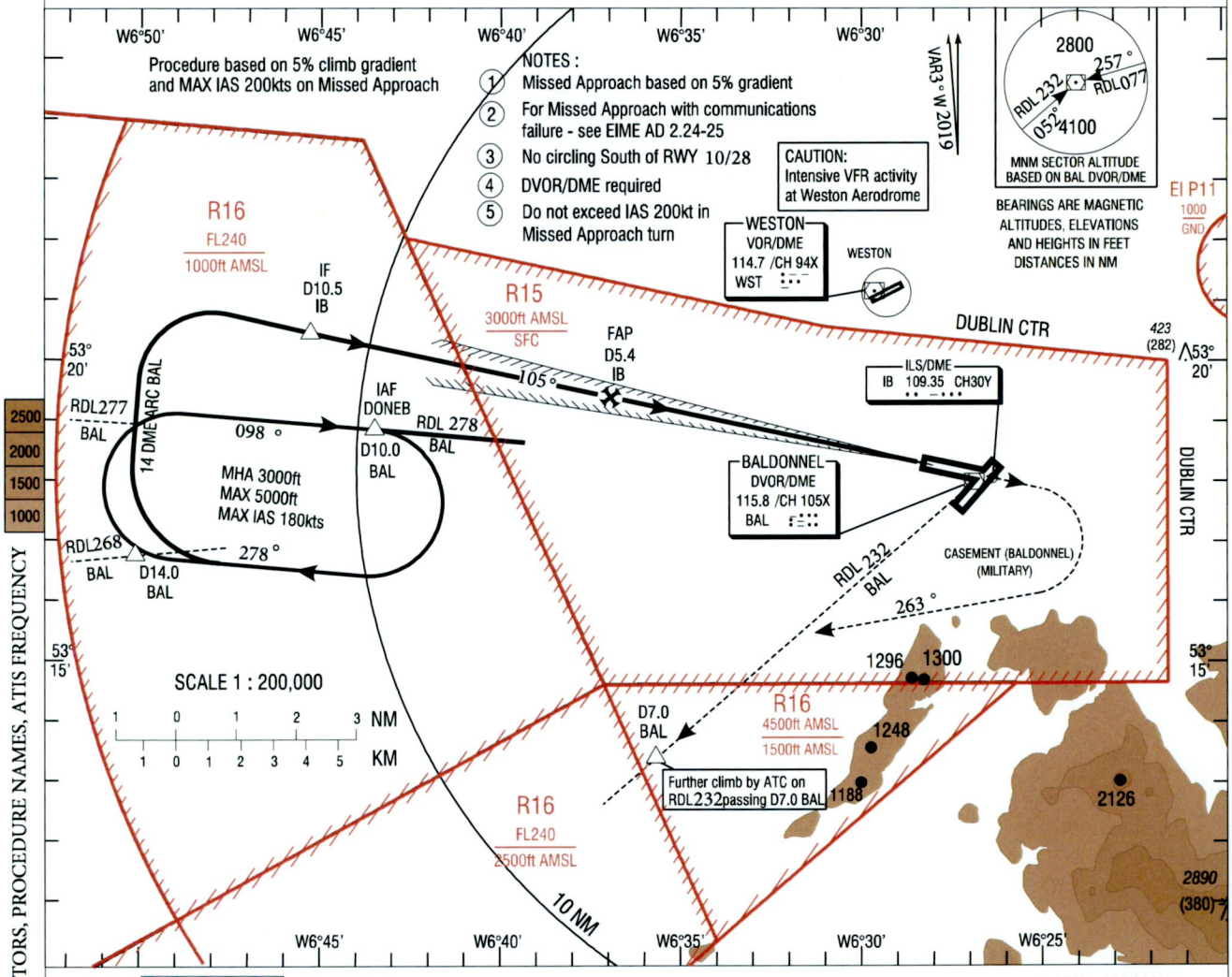
TWR 123.500
BAL
RADAR 122.000
ATIS 122.805

CONSULT NOTAM FOR LATEST INFORMATION

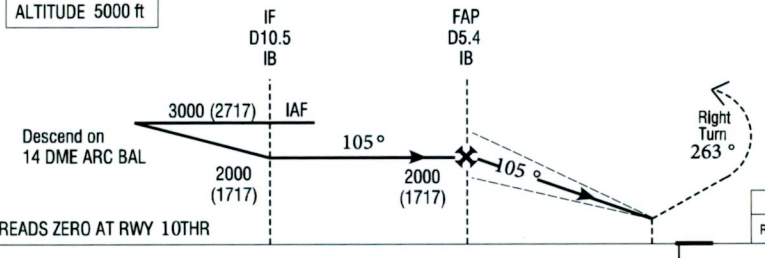
BALDONNEL/CASEMENT (MIL)

ILS y RWY 10 ① ② ③ ④ ⑤

(ACFT CAT C, D)



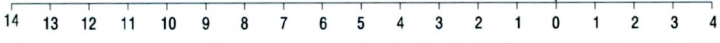
TRANSITION ALTITUDE 5000 ft



MISSED APPROACH:
Initial climb 3500ft
Climb on track 105°, at 2000ft,
ZERO DME IB whichever is later, climbing
to 3500ft turn right onto track 263°
to intercept BAL RDL232 . Contact ATC.
Maintain 5% climb gradient until 2800ft.
Do not exceed IAS 200kt in turn.
ELEV 283ft (THR RWY10)

GROUND SPEED	kts	100	120	140	160	180	200
Rate of climb gradient 5%	ft/min	506	608	709	811	912	1013

NM FROM THR RWY 10



STRAIGHT IN LANDING RWY 10				
	OCA(H)	CEILING	RVR/VIS	ALS OUT
C	456 (173)	200	800m	1200m
D	467 (184)	200	800m	1200m
OCAs based on 2.5% Missed Approach climb gradient				
C	1030 (747)	800	4000m	4200m
D	1030 (747)	800	4400m	4600m

CIRCLE TO LAND (heights AAL)			
	OCA (H)	CEILING	VIS
C	910 (591)	600	2400m
D	1010 (691)	700	2800m

LIGHTING	IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH						
PAPI 3° REILS RWY LTs SALS	NM	5.3	5.0	4.0	3.0	2.0	1.0
	ALT (HT)	2000 (1717)	1880 (1597)	1560 (1277)	1240 (957)	920 (637)	600 (307)

GROUND SPEED	kts	100	120	140	160	180
Rate of descent gradient 3°	ft/min	530	636	743	849	955

Rate of climb missed approach 2.5%							
GROUND SPEED	kts	100	120	140	160	180	200
Rate of climb gradient 2.5%	ft/min	254	304	355	406	456	507

CHANGE: MAGVAR, TRACKS AND RADIALS, RUNWAY DESIGNATORS, PROCEDURE NAMES, ATIS FREQUENCY

Approved by GOC Air Corps

31 DEC 2020

INSTRUMENT APPROACH CHART - ICAO

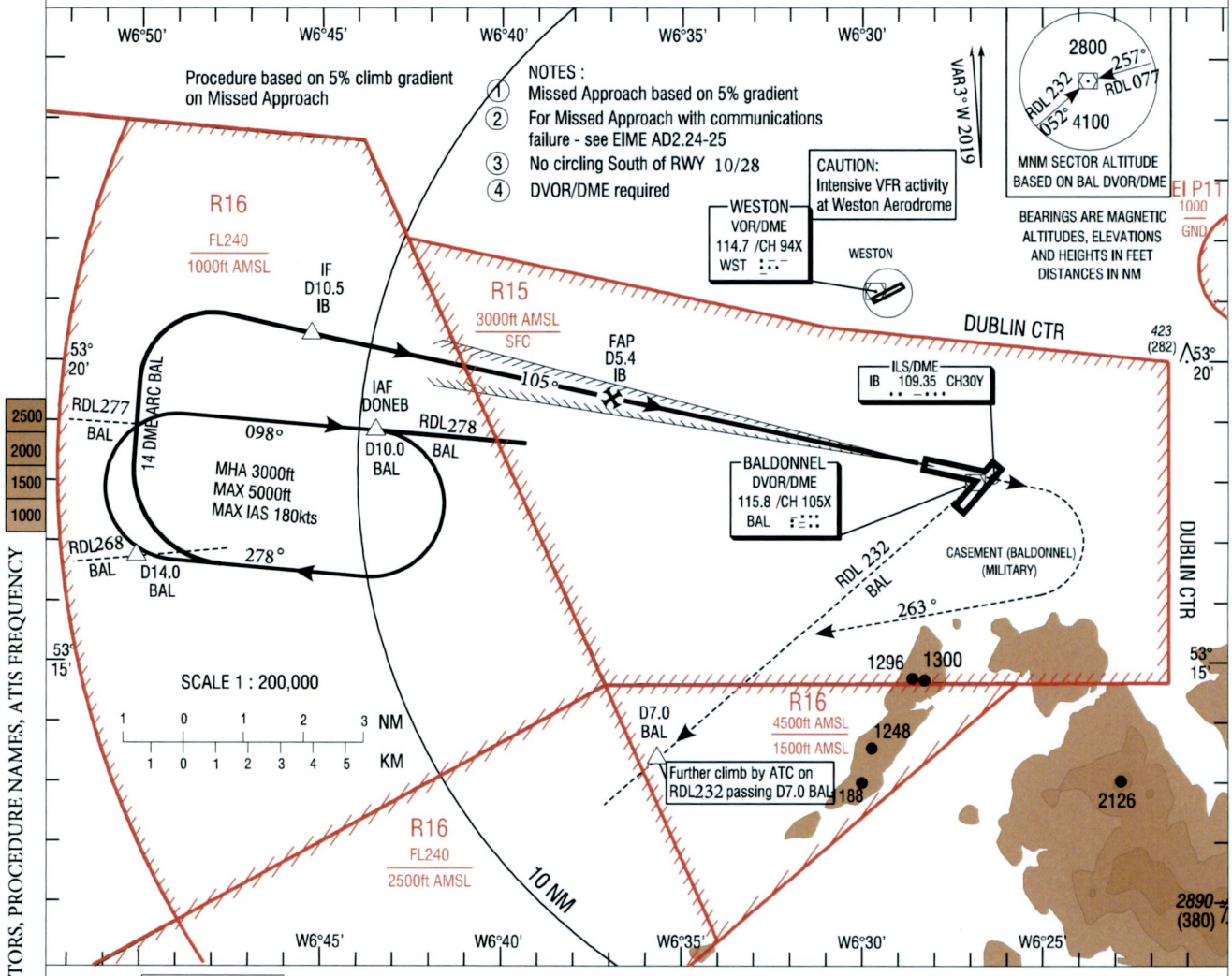
AERODROME ELEV 319 ft
HEIGHTS RELATED TO
THR RWY 10 - ELEV 283 ft

TWR 123.500
BAL
RADAR 122.000
ATIS 122.805

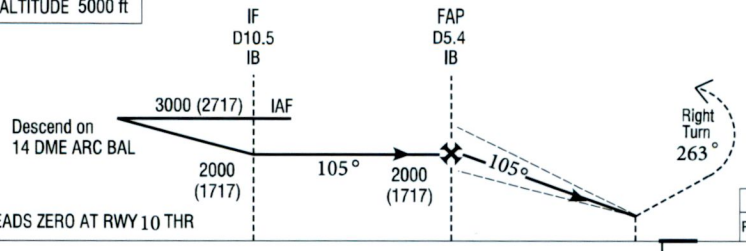
CONSULT NOTAM FOR LATEST INFORMATION

BALDONNEL/CASEMENT (MIL)

ILS z RWY 10 ① ② ③ ④
(ACFT CAT A, B)



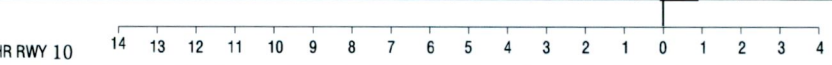
TRANSITION ALTITUDE 5000 ft



MISSED APPROACH:
Initial climb 3000ft
Climb on track 105°, at 1300ft,
ZERO DME IB whichever is later, climbing to 3000ft turn right onto track 263°
to intercept BAL RDL 232, Contact ATC.
Maintain 5% climb gradient until 2800ft.

ELEV 283ft (THR RWY10)

GROUND SPEED	kts	60	80	100	120	140	150
Rate of climb gradient 5%	ft/min	304	405	506	608	709	760



STRAIGHT IN LANDING RWY 10				
	OCA(H)	CEILING	RVR/VIS	ALS OUT
A	438 (155)	200	800m	1200m
B	446 (163)	200	800m	1200m
OCAs based on 2.5% Missed Approach climb gradient				
A	870 (587)	600	1000m	1400m
B	960 (677)	700	1000m	1400m

CIRCLE TO LAND (heights AAL)			
	OCA (H)	CEILING	VIS
A	720 (401)	500	2000m
B	820 (501)	600	2000m

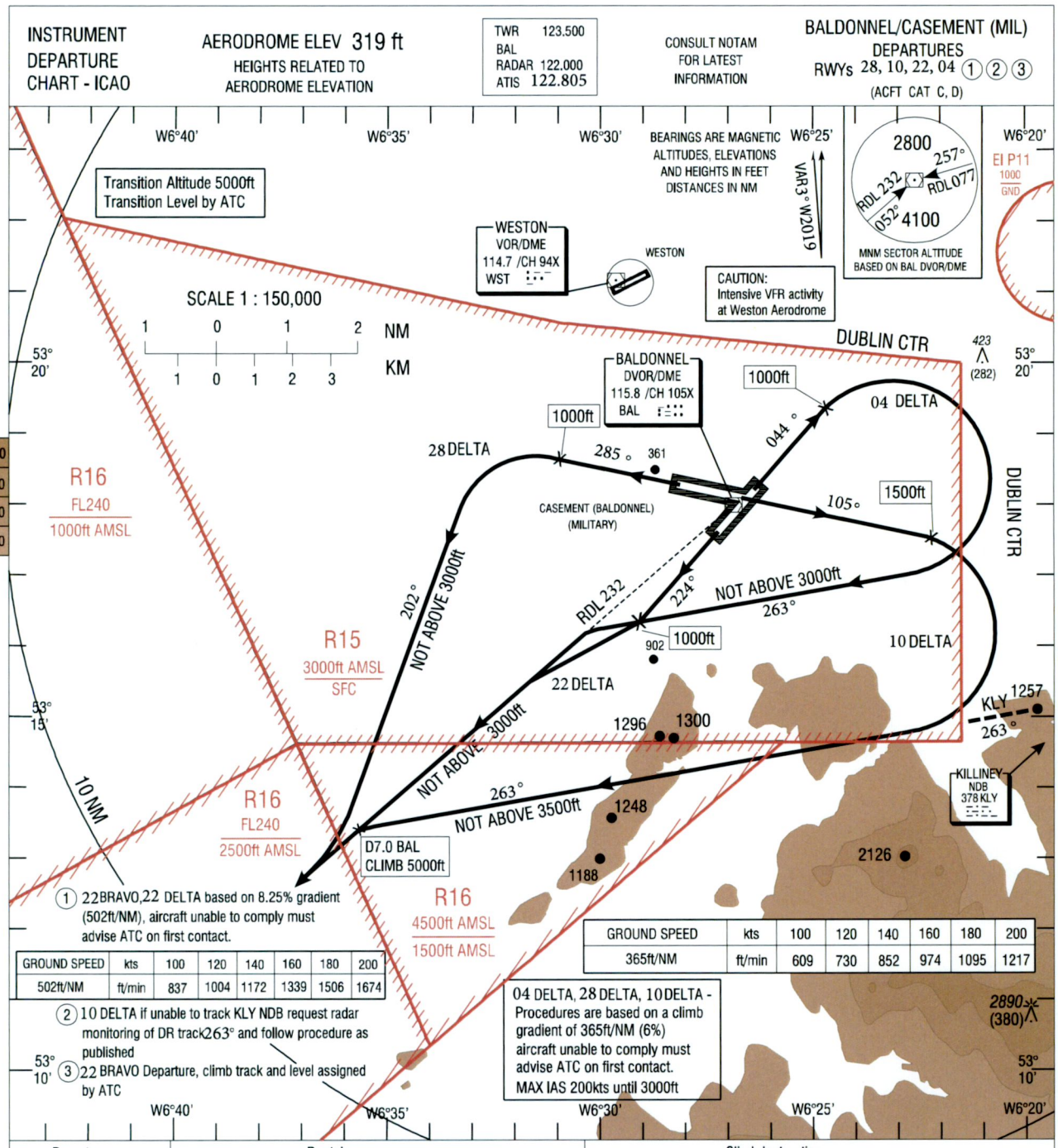
LIGHTING
PAPI 3°
REILS
RWY LTs
SALS

IDEAL ALTITUDE (HEIGHT) ON FINAL APPROACH						
NM	5.3	5.0	4.0	3.0	2.0	1.0
ALT (HT)	2000 (1717)	1880 (1597)	1560 (1277)	1240 (957)	920 (637)	600 (307)

GROUND SPEED	kts	60	80	100	120	140	150
Rate of descent gradient 3°	ft/min	318	424	530	636	743	796

Rate of climb missed approach 2.5%							
GROUND SPEED	kts	60	80	100	120	140	150
Rate of climb gradient 2.5%	ft/min	152	203	254	304	355	380

CHANGE: MAGVAR, TRACKS AND RADIALS, RUNWAY DESIGNATORS, PROCEDURE NAMES, ATIS FREQUENCY



GROUND SPEED	kts	100	120	140	160	180	200
502ft/NM	ft/min	837	1004	1172	1339	1506	1674

GROUND SPEED	kts	100	120	140	160	180	200
365ft/NM	ft/min	609	730	852	974	1095	1217

Departure	Routeing	Climb Instruction
04 DELTA	Climb on runway track, at 1000ft turn right TO TRACK 263° to intercept RDL 232 BAL outbound	Climb 3000ft Passing D7.0 BAL outbound on RDL 232 continue climb to 5000ft Maintain 6% climb gradient until 2800ft
28 DELTA	Climb on runway track, at 1000ft turn left to track 202°, to intercept RDL 232 BAL outbound	Climb 3000ft Passing D7.0 BAL outbound on RDL 232 continue climb to 5000ft Maintain 6% climb gradient until 2800ft
10 DELTA ②	Climb on runway track, at 1500ft turn right to intercept bearing263° from KLY to intercept RDL 232 BAL outbound	Climb 3500ft Passing D7.0 BAL outbound on RDL 232 continue climb to 5000ft Maintain 6% climb gradient until 3100ft.
22 DELTA	Climb on runway track, at 1000ft turn right to intercept RDL 232BAL outbound	Climb 3000ft Passing D7.0 BAL outbound on RDL 232 continue climb to 5000ft Maintain 8.25% climb gradient until 2800ft
22 BRAVO ③	Climb on track239°, at 1000ft turn right onto track assigned by ATC	Climb to assigned level Maintain 8.25% gradient until initial assigned level

CHANGE : MAGVAR, TRACKS AND RADIALS, RUNWAY DESIGNATORS, PROCEDURE NAMES, ATIS FREQUENCY

INSTRUMENT DEPARTURE CHART - ICAO

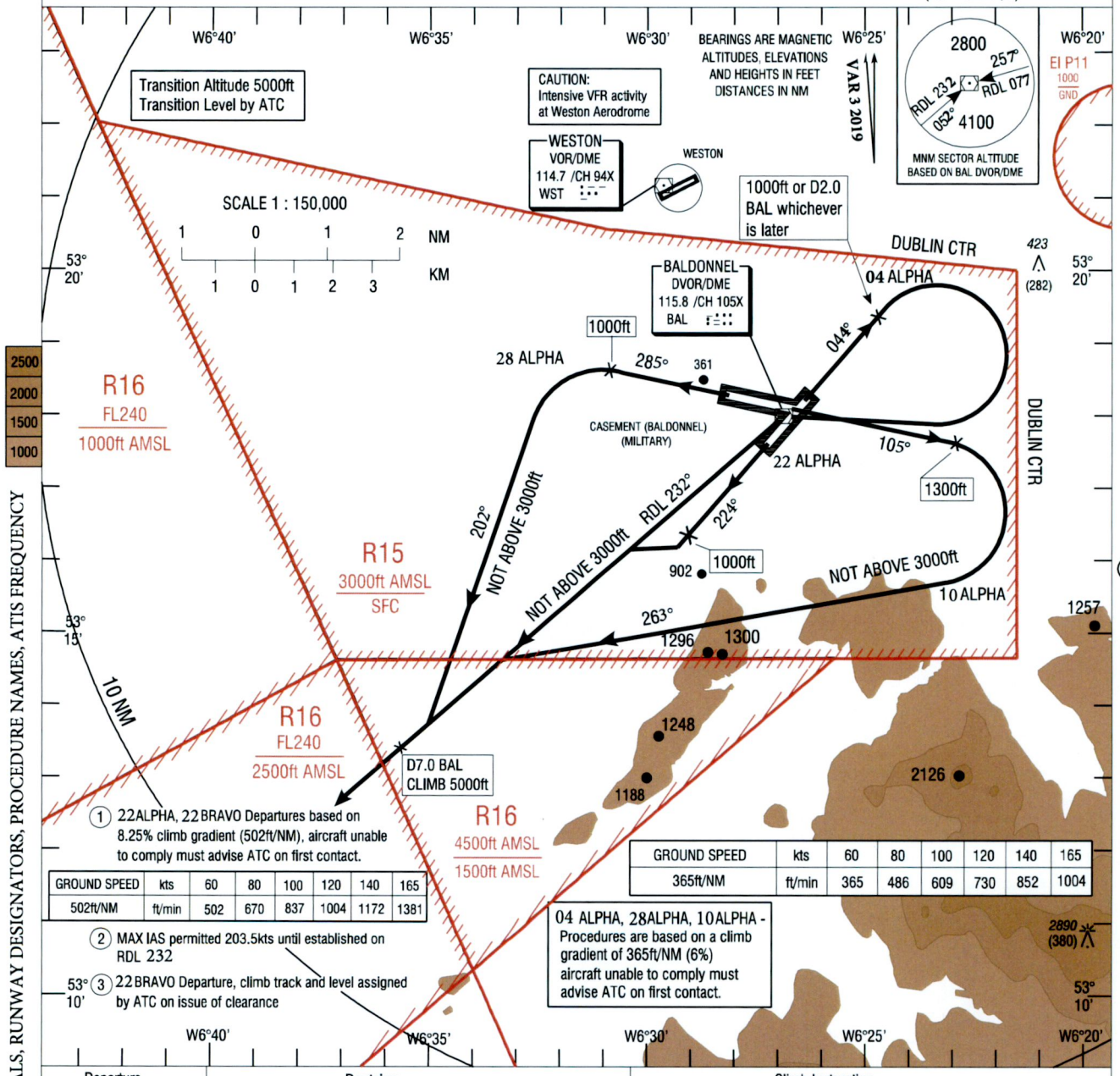
AERODROME ELEV 319 ft
HEIGHTS RELATED TO AERODROME ELEVATION

TWR	123.500
BAL	
RADAR	122.000
ATIS	122.805

CONSULT NOTAM FOR LATEST INFORMATION

BALDONNEL/CASEMENT (MIL)

DEPARTURES
RWYs 28, 10, 22, 04 (1) (2) (3)
(ACFT CAT A, B)



(1) 22ALPHA, 22BRAVO Departures based on 8.25% climb gradient (502ft/NM), aircraft unable to comply must advise ATC on first contact.

GROUND SPEED	kts	60	80	100	120	140	165
502ft/NM	ft/min	502	670	837	1004	1172	1381

(2) MAX IAS permitted 203.5kts until established on RDL 232

(3) 22BRAVO Departure, climb track and level assigned by ATC on issue of clearance

GROUND SPEED	kts	60	80	100	120	140	165
365ft/NM	ft/min	365	486	609	730	852	1004

04 ALPHA, 28ALPHA, 10ALPHA - Procedures are based on a climb gradient of 365ft/NM (6%) aircraft unable to comply must advise ATC on first contact.

Departure	Routeing	Climb Instruction
04 ALPHA	Climb on runway track, at 1000ft or D2.0 BAL DME, whichever is later, turn right inbound to BAL VOR, from BAL track RDL 232	Climb 3000ft Passing D7.0 BAL outbound on RDL 232 continue climb to 5000ft Maintain 6% climb gradient until 2800ft
28 ALPHA	Climb on runway track, at 1000ft turn left to track 202°, to intercept RDL 232 BAL outbound	Climb 3000ft Passing D7.0 BAL outbound on RDL 232 continue climb to 5000ft Maintain 6% climb gradient until 2800ft
10 ALPHA	Climb on runway track, at 1300ft turn right to track 263°, to intercept RDL 233 BAL outbound	Climb 3000ft Passing D7.0 BAL outbound on RDL 232 continue climb to 5000ft Maintain 6% climb gradient until 2800ft.
22 ALPHA	Climb on runway track, at 1000ft turn right to intercept RDL 232 BAL outbound	Climb 3000ft Passing D7.0 BAL outbound on RDL 232 continue climb to 5000ft Maintain 8.25% climb gradient until 2800ft
22 BRAVO	Climb on track 239°, at 1000ft turn right to track assigned by ATC	Climb to assigned level Maintain 8.25% climb gradient until initial assigned level

CGANGE: MAGVAR, TRACKS AND RADIALS, RUNWAY DESIGNATORS, PROCEDURE NAMES, ATIS FREQUENCY

AERODROME CHART N 53°18'10.77" W 006°27'19.46" ICAO

ELEV 319ft

TWR 123.500
GND **121.755**
ATIS 122.805

CONSULT NOTAM FOR LATEST INFORMATION

BALDONNEL/CASEMENT

RWY	DIRECTION	THR	BEARING STRENGTH
04	044°	N 53°17'36.90" W 006°27'13.73"	PCN 46/F/D/W/T
10	105°	N 53°18'16.88" W 006°28'07.75"	PCN 52/F/D/W/T
22	224°	N 53°18"12.63" W 006°26'22.02"	PCN 46/F/D/W/T
28	285°	N 53°18'05.85" W 006°26'40.68"	PCN 52/F/D/W/T

BEARINGS ARE MAGNETIC.

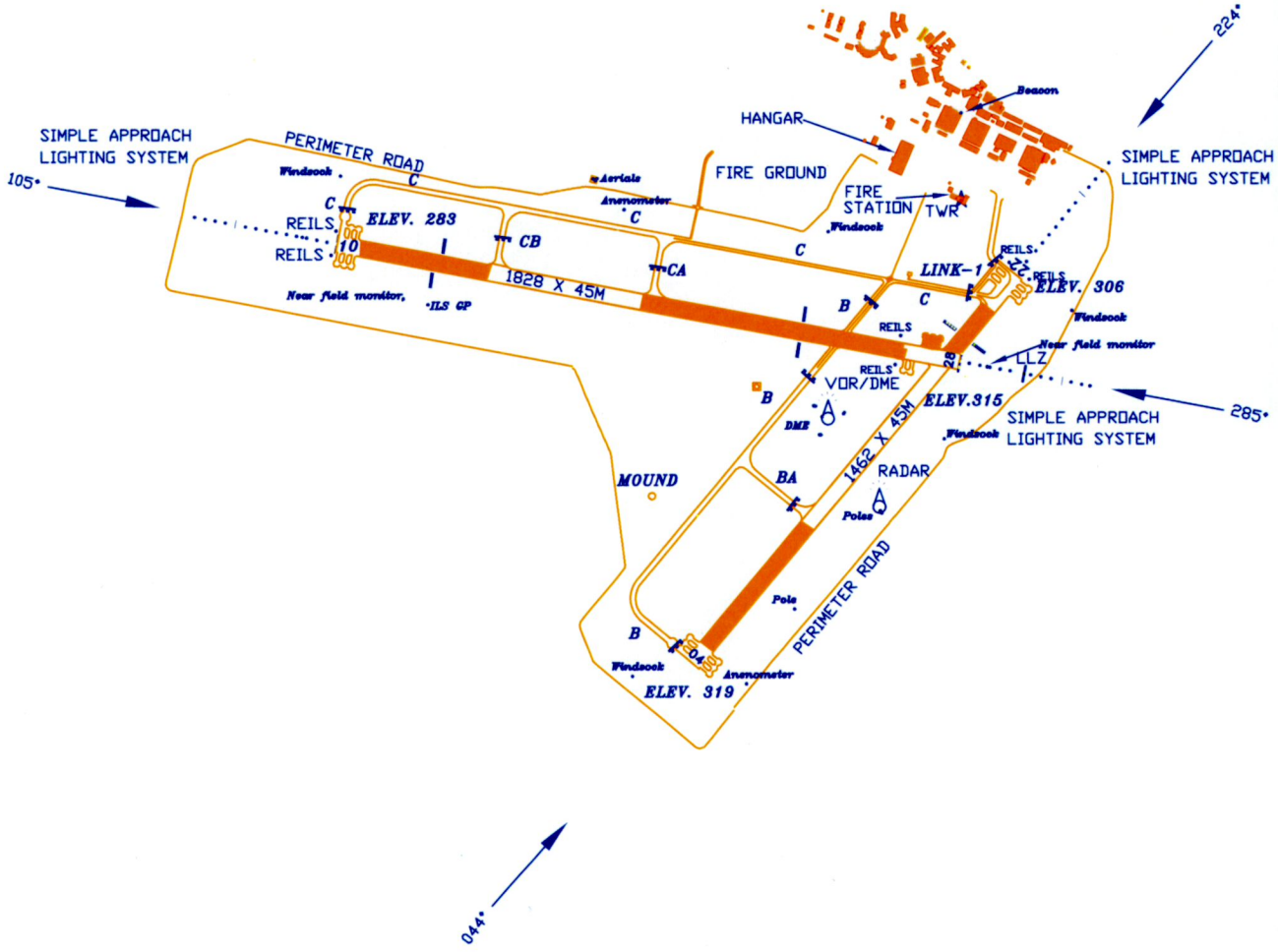
ELEVATIONS SHOWN IN FEET AMSL.

HEIGHTS IN FEET ABOVE AERODROME ELEVATION SHOWN IN BRACKETS.

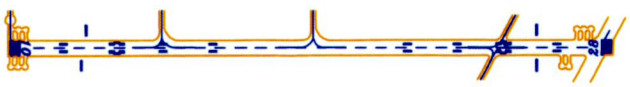
LINEAR DIMENSIONS IN METRES.

VAR 3° W 2019

ANNUAL RATE OF CHANGE −11' W

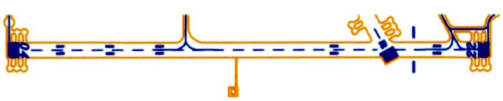


MARKING AIDS RWY 10/28

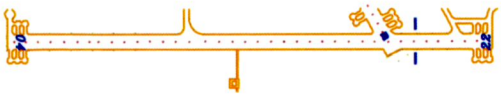


LIGHTING AIDS RWY 10/28

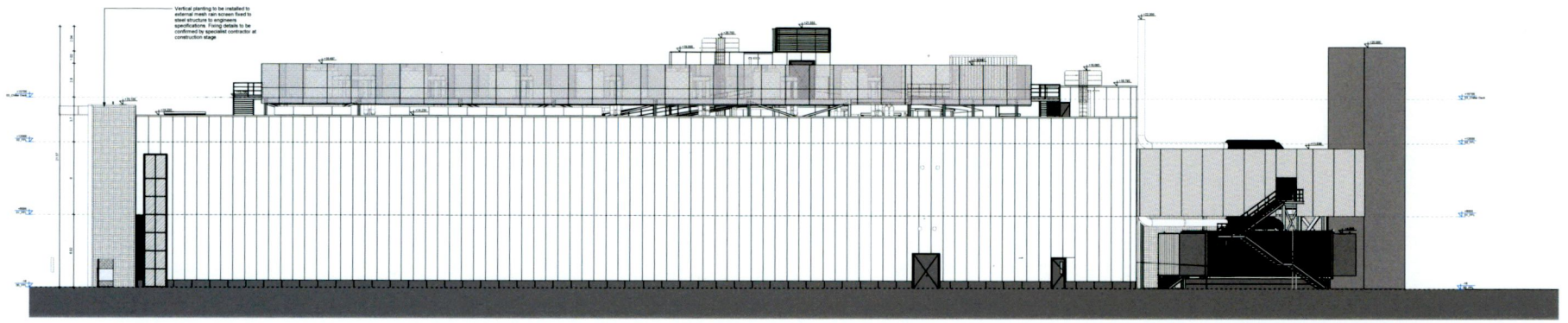
MARKING AIDS RWY 04/22



LIGHTING AIDS RWY 04/22



CHANGES : MAGNETIC VARIATION, BEARINGS, RUNWAY DESIGNATORS AND FREQUENCIES.



DUB13 WestElevation

1 : 100

DUB13 East Elevation

1 : 100

BURNS McDONNELL

www.burnsmcd.com/locations/London

www.burnsmcd.com/services

0 200 400 600 800 1000mm

LEGEND

- Clear glass
- Frilted glass
- Mesh metal grating
- Sandwich Panel Colourcoat Prisma Natural hot-dip aluminium zinc coating Colour: Pure White (RAL 9010)
- Sandwich Panel Colourcoat Prisma Natural hot-dip aluminium zinc coating Colour: Light Grey (RAL 7035)
- Sandwich Panel Colourcoat Prisma Natural hot-dip aluminium zinc coating Colour: Reseda Green (RAL 6011)
- Sandwich Panel Colourcoat Prisma Natural hot-dip aluminium zinc coating Colour: Moss Green (RAL 6005)
- Insulated structural plinth below façade cladding Colour: Cement Grey (RAL 7033)
- Powder coated aluminium rainscreen cassette Colour: Vantage Blue (Pantone PMS 3945 / RAL 5017)
- Ground
- Gravel
- Demountable Panels

Client: VANTAGE DATA CENTRES

Architect: Hyphen

Mechanical Electrical Public Health Fabrication Telecoms Security: BURNS McDONNELL

Structural / Civil Engineer: PINNACLE

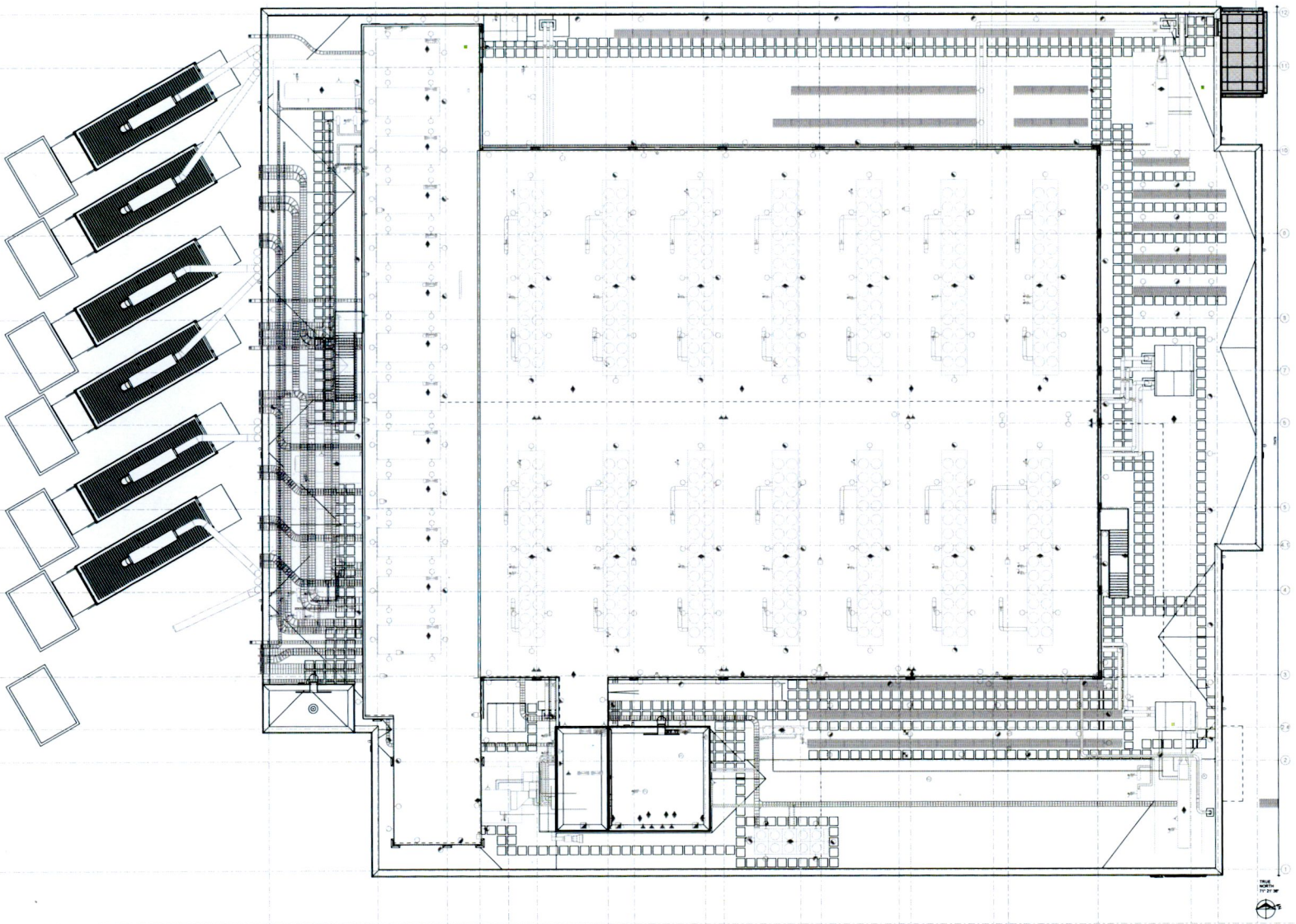
Drawn by	Approved by	Checked by	Scale @ A1
Oeirgin Beggan	MM	DB	DB

Project address:
DUB13
Profile Park, Dublin 22, Ireland
53°19'1.40"N , 6°26'40.80"W

Drawing title:
DUB13 Architectural Elevations
Elevations 1
East and West

Sheet number: A201

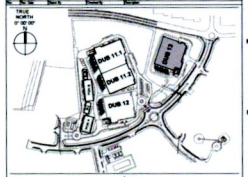
Format / Size	Scale	Status	Date	File Code	Rev
A1	1 : 100	ISSUED	24/06/2022	DUB13-DR-ZZ-A201-V0-PL-HYP	V0



BURNS MCDONNELL

www.burnsmcd.com/locations/London

www.burnsmcd.com/services



VANTAGE DATA CENTERS

Hyphen

BURNS MCDONNELL

PINNACLE

DM

DM

DM

DUB13
Profile Park, Dublin 22, Ireland
53°19'1.40"N , 6°26'40.80"W

Architectural
Planning Floor Plans
Roof Plan

A152

1 : 100

ISSUED

24/09/2022

DUB13-DR-03-A152-V0-PL-HYP

V0

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Common Reflective Surfaces (in surrounding environments for PV systems)		Incident angle in degrees						
		0	15	30	45	60	75	90
Material Reflectivity (percent of incident light reflected)	Steel	36.73%	39.22%	46.34%	57.11%	70.02%	83.15%	94.40%
	Snow (fresh, flakey)	21.63%	23.09%	27.29%	33.63%	41.23%	48.96%	55.59%
	Standard Glass	8.44%	9.01%	10.65%	13.12%	16.09%	19.10%	21.69%
	Plexiglass	8.00%	8.54%	10.09%	12.44%	15.25%	18.11%	20.56%
	Plastic	6.99%	7.46%	8.82%	10.87%	13.33%	15.83%	17.97%
	Smooth Water	4.07%	4.35%	5.14%	6.33%	7.76%	9.22%	10.47%
	Solar Glass (high light transmission, low iron)	3.99%	4.26%	5.03%	6.20%	7.61%	9.03%	10.26%
	Solar Glass w/AR coating	2.47%	2.64%	3.12%	3.84%	4.71%	5.59%	6.35%

(Note: Index of refraction values may vary slightly depending on suppliers and reference documentation. The values for the above calculations are averages or single values obtained from the list of references for this document).

Important reference – "Stipples glass": In addition to the superior refractive/reflective properties of solar glass versus standard glass, SunPower uses stippled solar glass for our modules. Stippled glass is used with high powered telescopes and powerful beacons and lights. The basic concept behind stippling is for the surfaces of the glass to be textured with small types of indentations. As a result, stippling allows more light energy to be channeled/ transmitted through the glass while diffusing the reflected lightenergy. This concept is why the reflection of off a SunPower solar module will look hazy and less-defined than the reflection from standard glass, this occurs because the stippled SunPower glass is transmitting a larger percentage of light to the solar cell while breaking up the intensity of the reflected light energy.

SUMMARY/ACTION REQUIRED:

The studies, data and light beam physics behind the charts and graphs prove beyond a reasonable doubt that solar glass has less glare and reflectance than standard glass. The figures also make it clear that the difference is very decisive between solar glass and other common residential/commercial glasses. In addition, not to be lost in the standard light/glass equations and calculations, the SunPower solar glass is stippled and has a very photon-absorbent solar cell attached to the back side, contributing two additional factors which results in even less light energy being reflected.