Weathering the Storm

Dublin Airport's Winter Ops Evolution

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DublinAirport

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DAA Group

A Brief Overview

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Ireland's primary and largest airport welcoming 32.9M passengers in 2019

International gateway to the south of Ireland and second largest airport

One of the world's most dynamic travel retailers, with 26 operations across 14 countries

Our airport management and aviation advisory services business, established in 20 locations across 16 countries

Duty Free & Retail Services

International Airport Operator

Dublin Airport

Dublin Airport - 80 years and counting

1936 Plans put forward by Irish Govt for Dublin Airport

1940 Dublin Airport starts with one flight per day to Liverpool

1942 First terminal building opens

1948 Completion of concrete runways

1949 Passenger numbers reach 200,000/year

1958 First transatlantic services as passenger numbers top 500,000/year

1959 New North Terminal

1960s New piers introduced

1963 Dublin Airport welcomes over 1 million passengers

1970s Land aquisition ensures scope for continued growth

1972 New Terminal building

1989 New runway

1990 Celebrates 50th birthday

1997 More than 10 million passengers welcomed

2004 Planning process commences for North Runway

2007 Planning permission granted for North Runway

2010 Terminal 2 opens

2015 75th birthday 25 million passengers welcomed

2016 North Runway construction commences

2022 North Runway opens

Passenger growth

For over 80 years, Dublin Airport has acted as Ireland's gateway to the world. Continued sustainable development of the airport is critical to our national economic well-being, global connectivity and future growth.

The number of passengers travelling through Dublin Airport has been steadily increasing over several years.

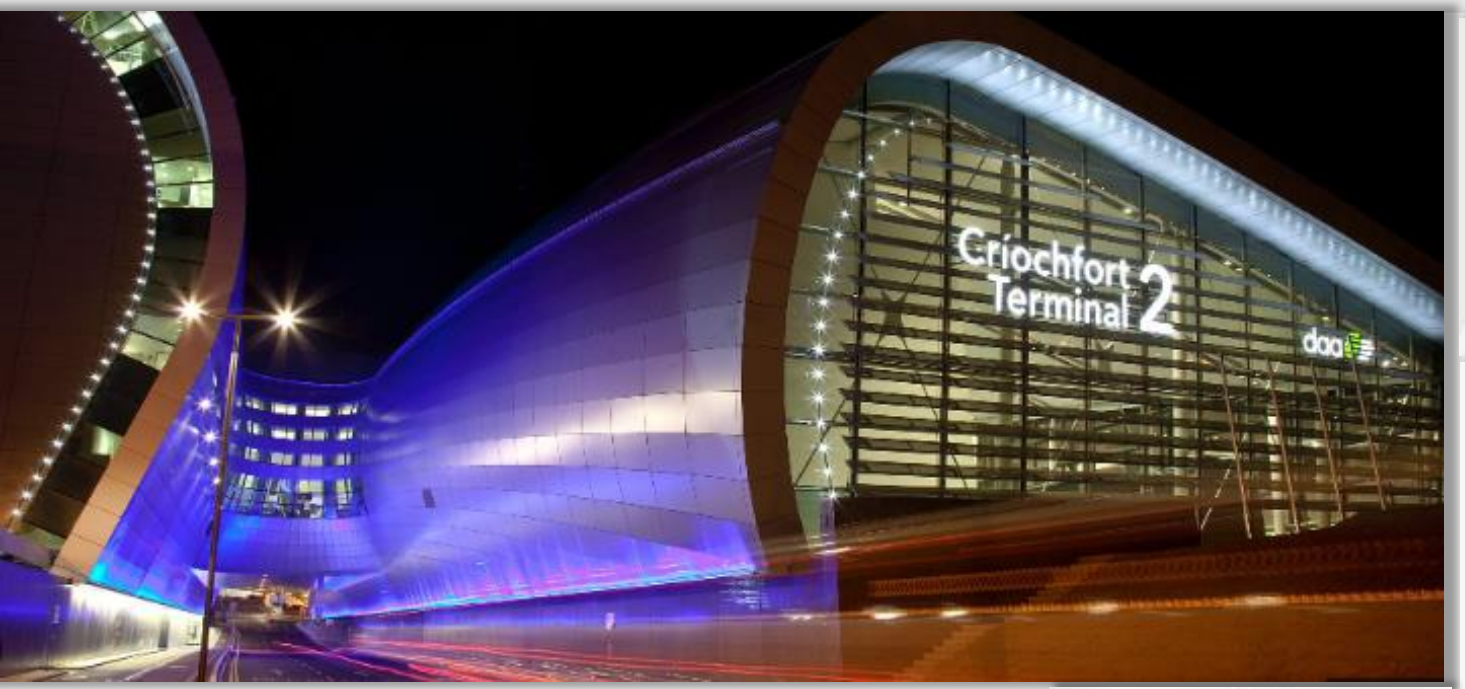
Almost **50** airlines

to over **180** destinations

in **38** countries

(Economic Impact Report 2023)

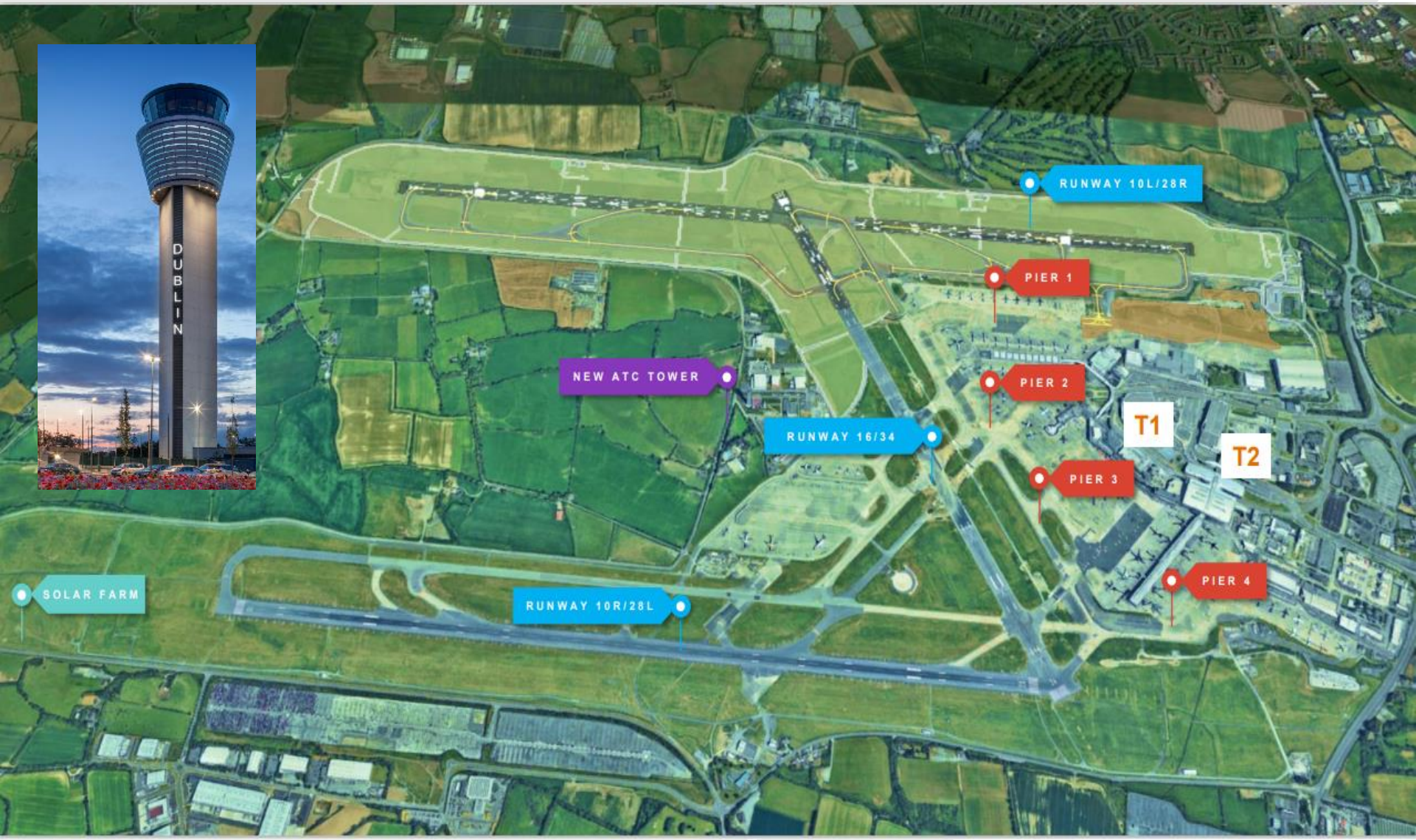
Dublin Airport



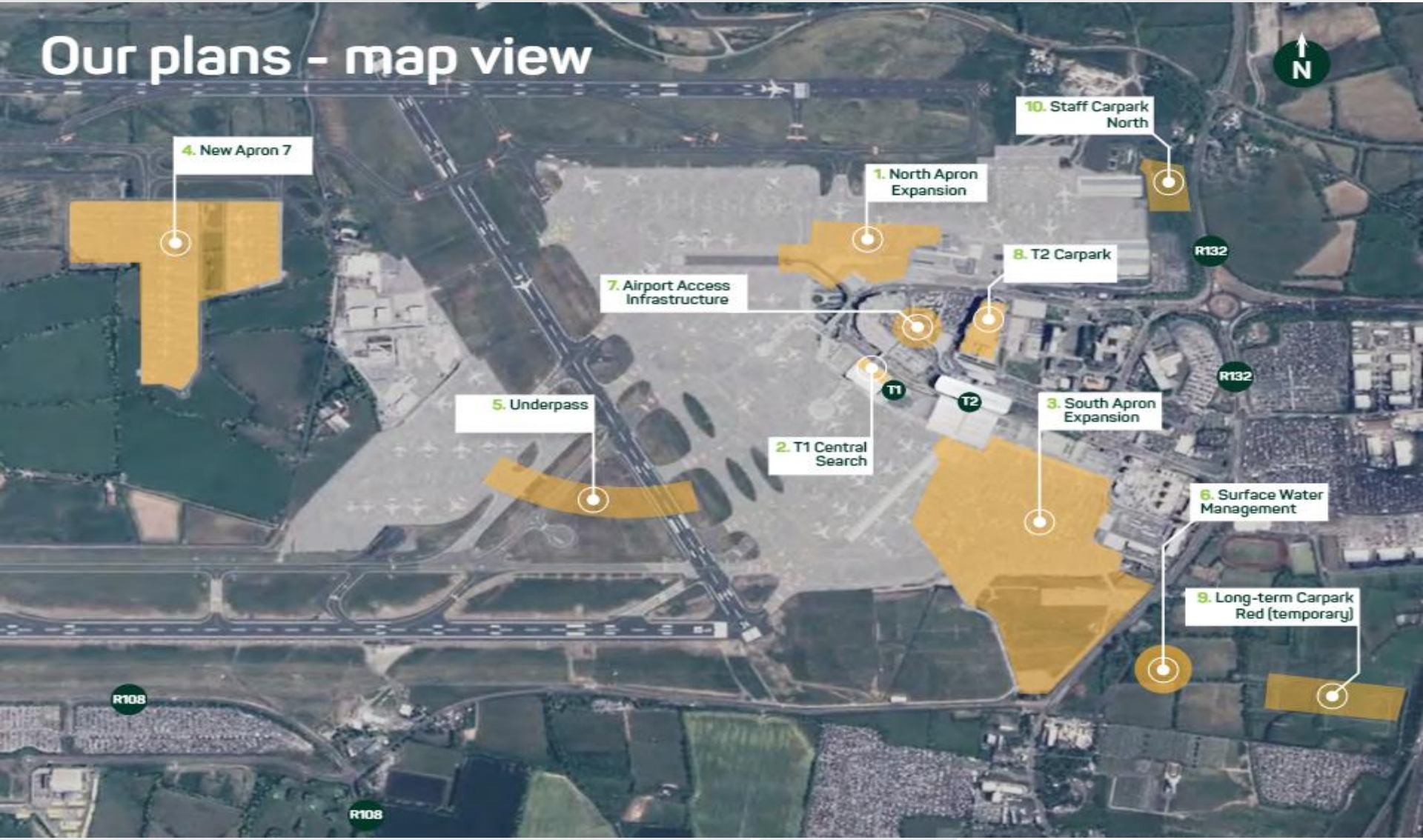
Dublin Airport by Numbers

- Busiest year 2019 (32.9 million passengers)
- 13th busiest Airport in Europe
- Employees 2250 directly through daa
- 750 aircraft movements each day
- 241,595 aircraft movement in 2023
- Busiest route Londen – Heathrow (1.85 million pax in 2019)

Dublin Airport: Airfield Layout



Dublin Airport: Expansion Plans



Dublin Airport: Sustainable Fleet Operations

100% HVO
Landside & Airside
Since June 2023

HVO
UP TO 90% CO^2 REDUCTION

81% of Light Fleet are low emissions vehicles

The Beast From The East

Pre 2018 & Storm Emma

Feb 27th – March 4th 2018

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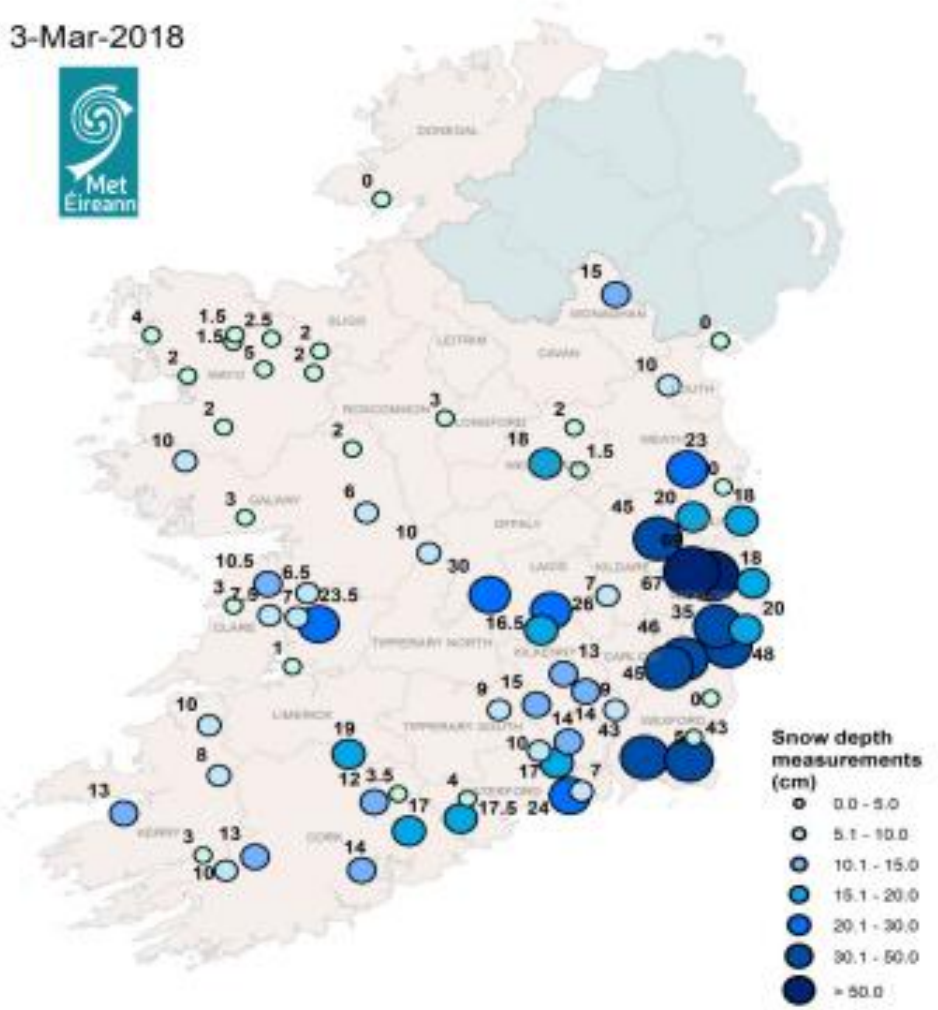
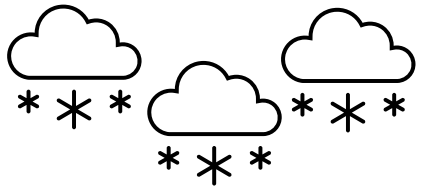
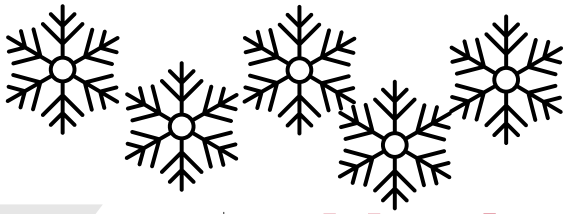
Storm Emma Weather Summary



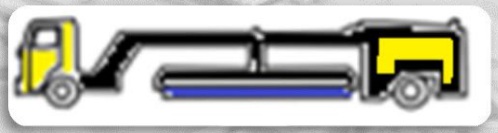
Storm Emma



- Feb 27th – March 4th
- Temperature range -0.2 - -4.5 degrees
- Record low temperature for March
- First day in recorded history where temperature didn't rise above 0 degrees
- Snow accumulation (DAP) 71cm
- Wind speeds gusting to 60mph
- Max snow drifts – 9.84 meters



Dublin Airport Equipment and Resourcing Pre 2018



6 x Tow Jet Sweepers

4 x De-icers

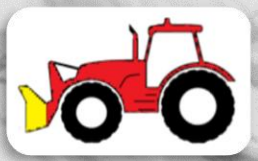
2 x Snow Cutters

1 x Gritter

2 x Glycol Recovery

12 x Multihogs

66 x Dublin Airport & Contractor team members



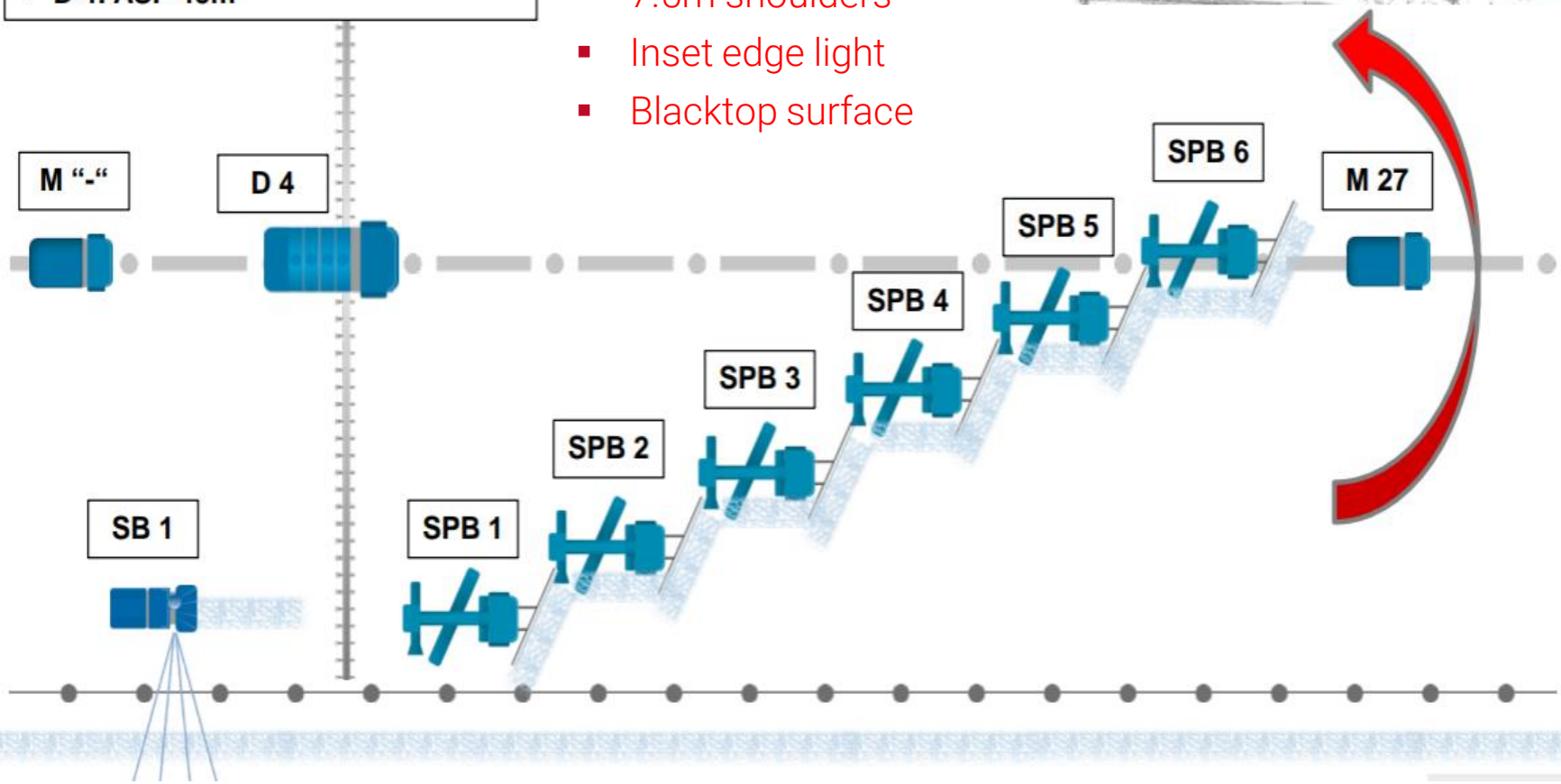
40 x Hire Tractors with Attachment

Plenty of shovels and brushes

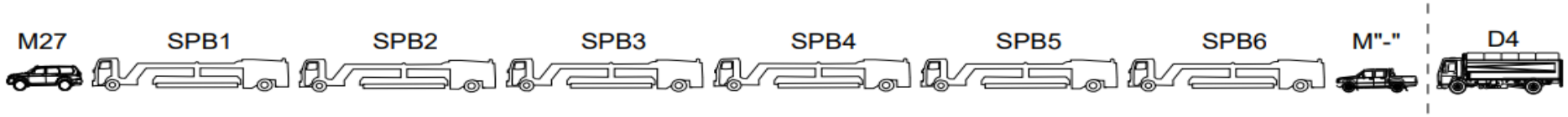
Dublin Airport Snow Plan Pre 2018

- SPB overlap: approx. 0.78m
- SPB plough working width: 6.78m
- SB 1 working with: 3.4m
- D 4: ASP 45m

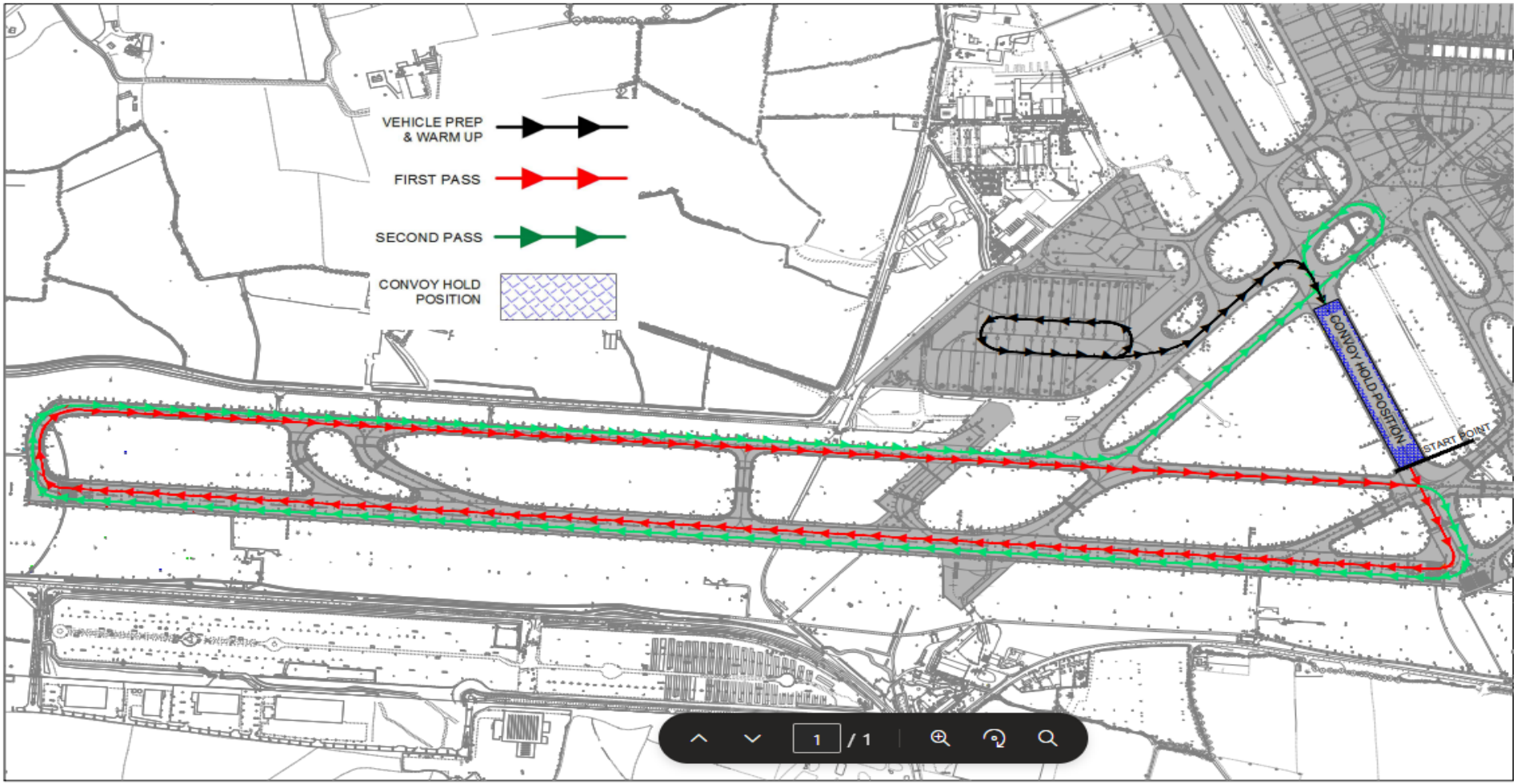
- Runway width 45m
- 7.5m shoulders
- Inset edge light
- Blacktop surface



Convoy Arrangement



Priority 1 - Snow Clearance Route



Dublin Airport Storm Emma – Day1 – 28th Feb

- Dublin Airport Snow Plan was activated on the 27th in advance of first snow fall
- Snow teams were brought in, hotels rooms were booked at the airport, food and supplies were sourced to ensure resilience
- Weather meetings were held with airlines and key stakeholders
- Snow showers started on Tuesday 27th Feb moving south easterly hitting DAP in the evening.
- Visibility was reduced to near zero with snow accumulation of 8cm
- A pre-emptive de-icing spray was carried out on the active runway
- Tow-jet sweepers were staged at our west apron

Dublin Airport Storm Emma – Day2 – 1st March

- Air temperatures never rose above zero degrees for the first time in recorded history (1948)
- Snow accumulation 13cm
- Decision taken to not spray unless temp dropped to conserve stock and pervert dilution of anti-icing chemical
- Snow cutter was utilised to remove banking and on our interior perimeter road as snow was too heavy to clear

Dublin Airport Storm Emma – Day 3 – 2nd March

- Visibility reduced to zero for prolonged periods of the night
- Snow accumulation of 18cm
- Drivers became disorientated in the blizzards and trucks deviated off course entering soft margins parallel to the runway
- Snow cutter deployed to spread banks into grasslands around links and taxiways
- Vehicles became hard to see even with upgraded lighting

Dublin Airport Storm Emma – Day 3 – 2nd March

In adverse weather conditions driver experience became paramount, small error of judgement can lead to big consequences

Dublin Airport Storm Emma – Day 3 – 2nd March

- Over 1000 flights cancelled cross the 5 days
- 120,000 passengers affected directly at the airport
- Carparks closed and impassable
- T2 facade caused issues with falling snow

Dublin Airport Storm Emma – Day 3 – 3rd March

- Further snow accumulation of 17cm
- Dublin airport closed for 2 days to the public due to the risk to commuters trying to get to the airport
- External roads were largely impassable
- Snow drifts ranging from 7 -9.5 meters high
- Snow drifts caused a security concern at the external perimeter fencing

Dublin Airport Storm Emma – Day 5 – 4th March

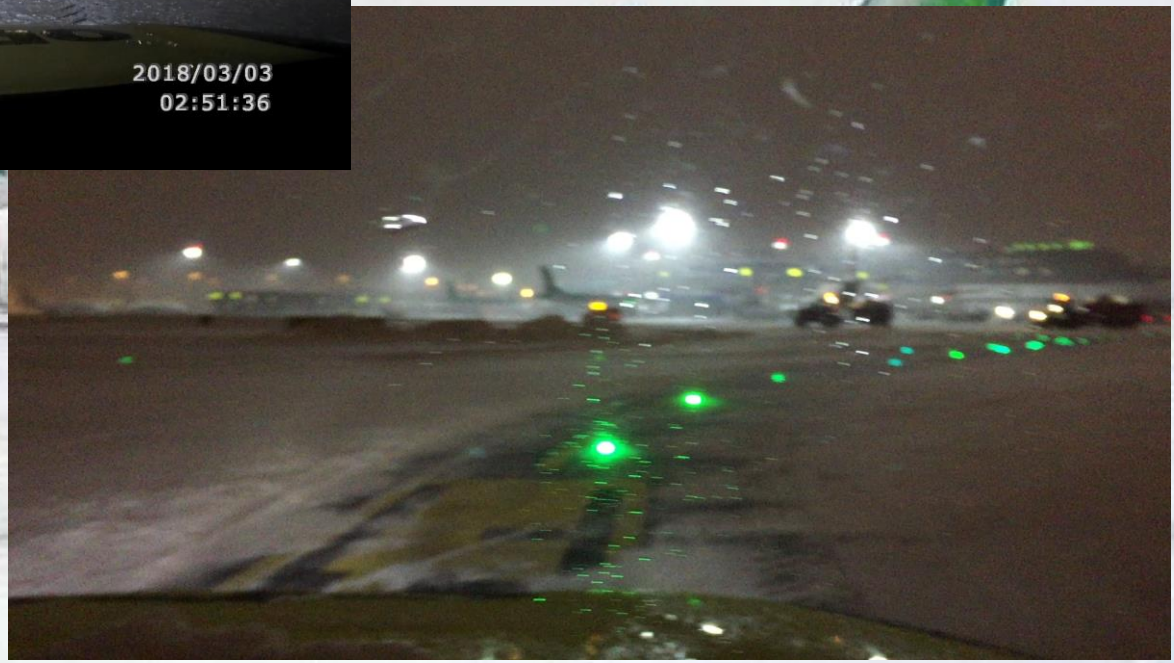
- Snow accumulation of 13cm
- Interior perimeter roads were blocked, and vehicles bogged down in the snow

Dublin Airport Storm Emma – Day 5 – 4th March

- Risk to staff working on ramp due to poor visibility
- Risk of FOD from incorrectly stored / unsecured GSE chalks, towbars and steps
- Tugs and baggage dollies couldn't operate forcing more flight cancelations

Dublin Airport Storm Emma – Day 5 – 4th March

Contractors brought in 2, 5t JCB loaders and local farmers helped by providing 47 dump trailers to clear mounded snow from the ramp area.



Approach to Dublin Airport

- **Although the airport closed due to public safety and external roads being impassable our runway was always open, maintaining black top to provide emergency landings if required**
- **Snow clearing continued 24 hours a day for 6 days**
- **Airfield snow teams were onsite at the airport for 5 days constitutively working in shift between 30 operators and 6 managers**
- **Airfield electricians were also onsite to maintenance critical systems.**
- **All team members stayed either in the onsite hotel or in our airfield maintenance base for the duration of the storm**

Dublin Airport Storm Emma – Day 6 – Clean Up

Dublin Airport Storm Emma – Day 6 – Clean Up

Post 2018 Operational Review

Snow Fleet & Equipment Updates

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Aebi Schmidt Planning and Support

Aebi Schmidt Proposal

DublinAirport

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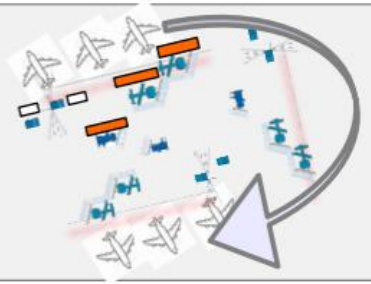
5. Executive Summary

Current Snow Removal Plan:

- Warm-Up Phase: Split team to faster support northern and south apron
- → Increased efficiency to open taxiways and apron areas
- → Higher resiliance in case of machine failure

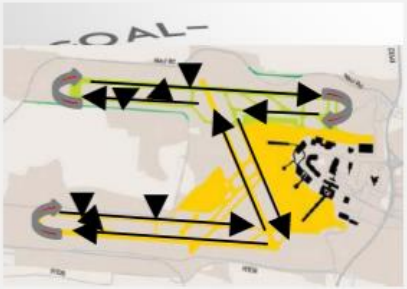
Next Step Clearing Concept: Apron Support

- Warm-Up Phase: Split team to faster support northern and south apron
- Additional machines needed: 2x TJS 630, 1x CJS
- → Increased efficiency to open taxiways and apron areas & support apron team
- → Higher resiliance in case of machine failure



Future Clearing Concept: Northern Runway

- Warm-Up Phase: Split team to faster support northern and south apron
- Additional machines needed: 4x TJS 630, 1x Supra 5002, 1x ASP 30 (replacement)
- → Increased efficiency to open taxiways and apron areas, keep one runway constantly open (1 team to open RWY 10/28 &Northern RWY via TWY and Aprons)
- → Higher resiliance in case of machine failure

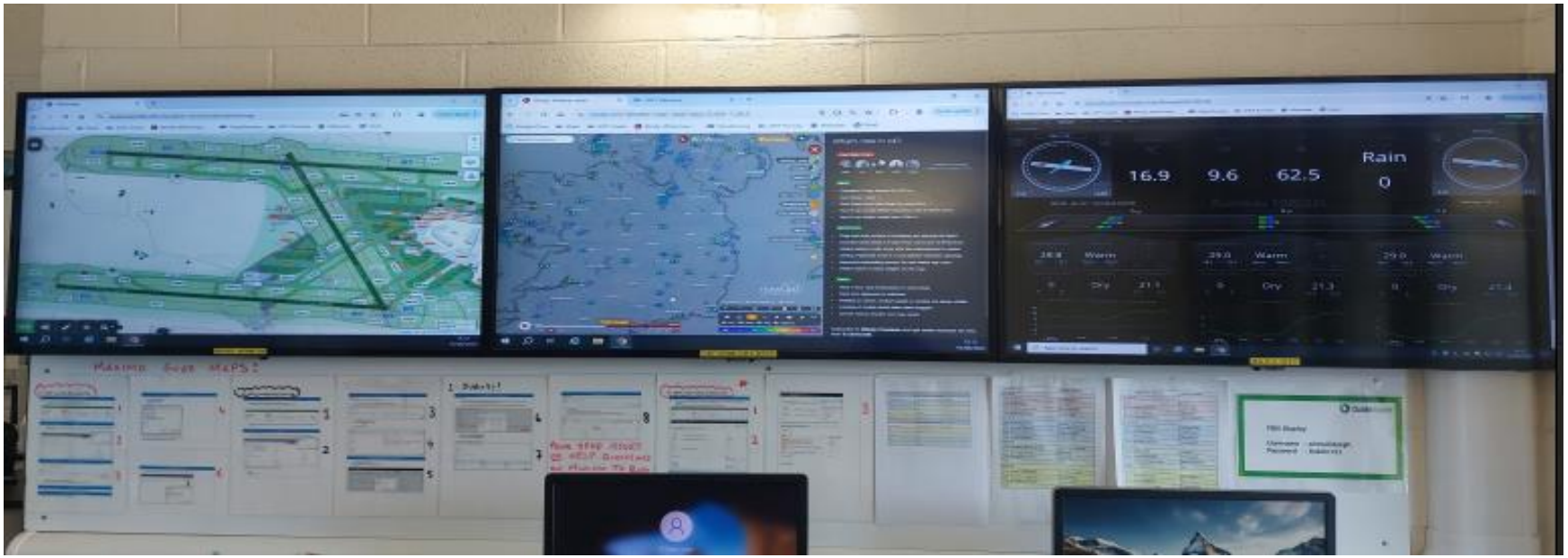


Weather Forecasting

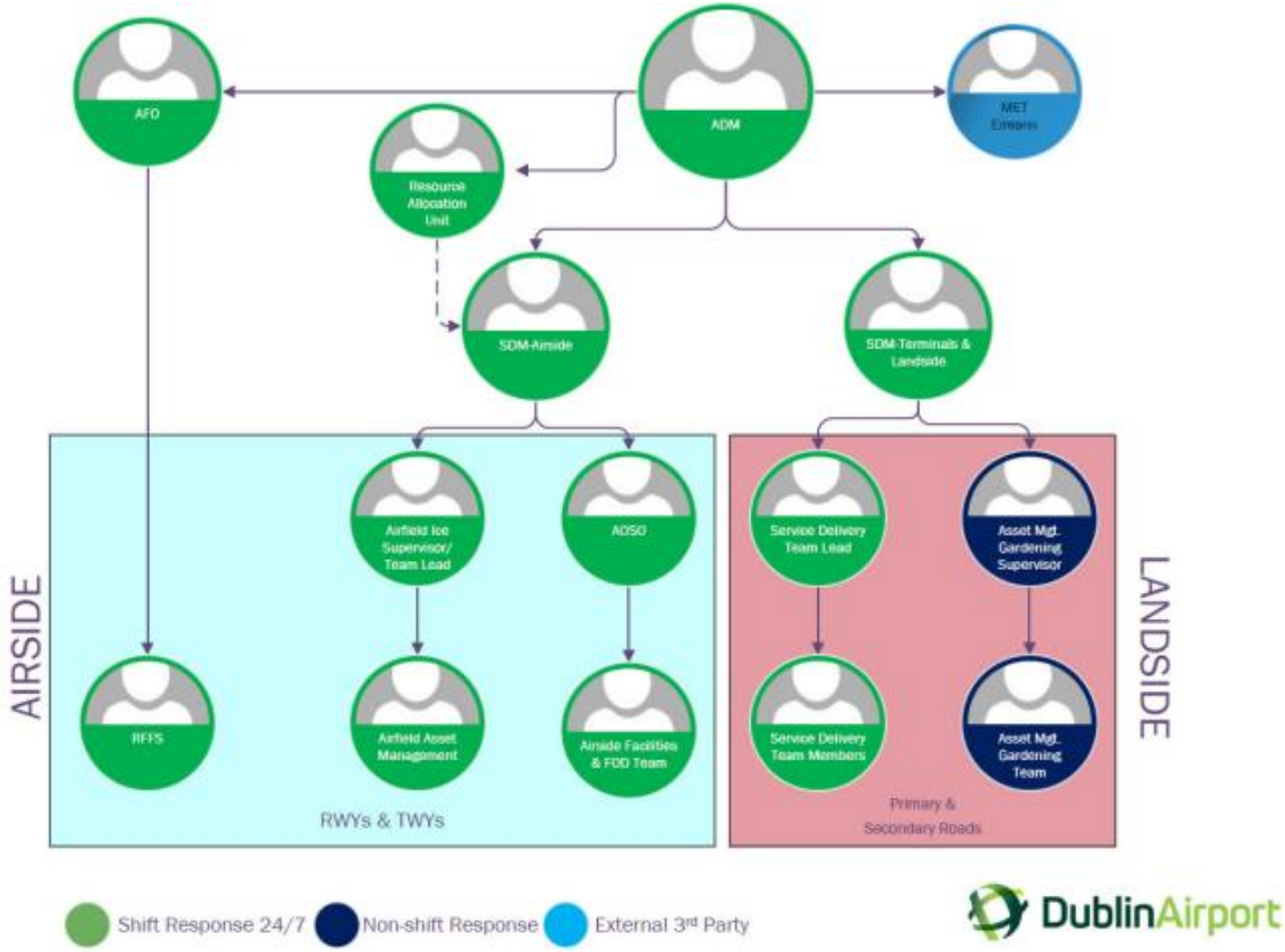
ASFT airport weather information system was further developed and utilised to monitor the weather conditions and forecast airfield pavement temp and determine freezing points

Met Eireann weather forecaster stationed onsite at Dublin Airport to support Airport Duty Manger

IAA, and provide best available data



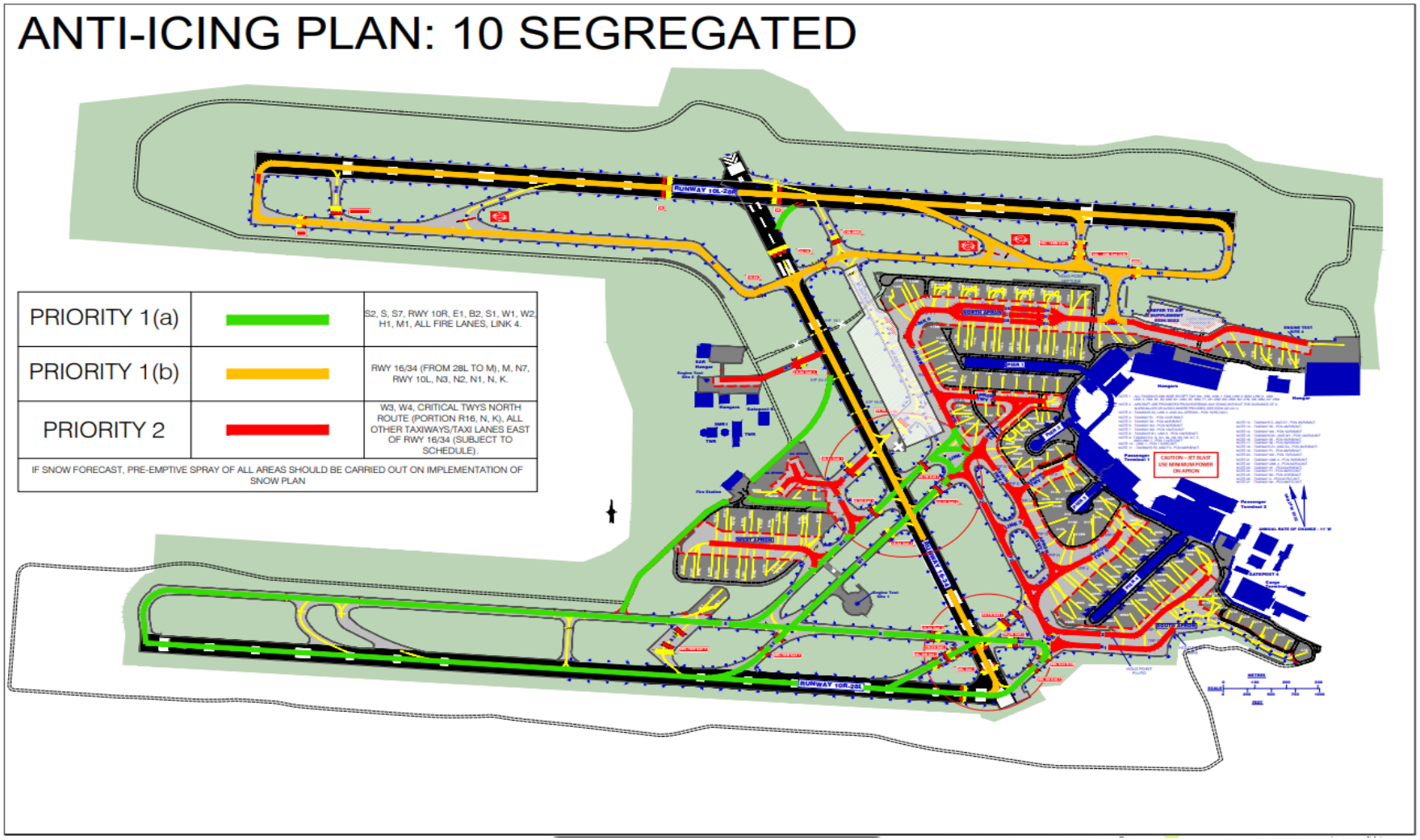
Anti-icing Strategy & Plan (post 2018)



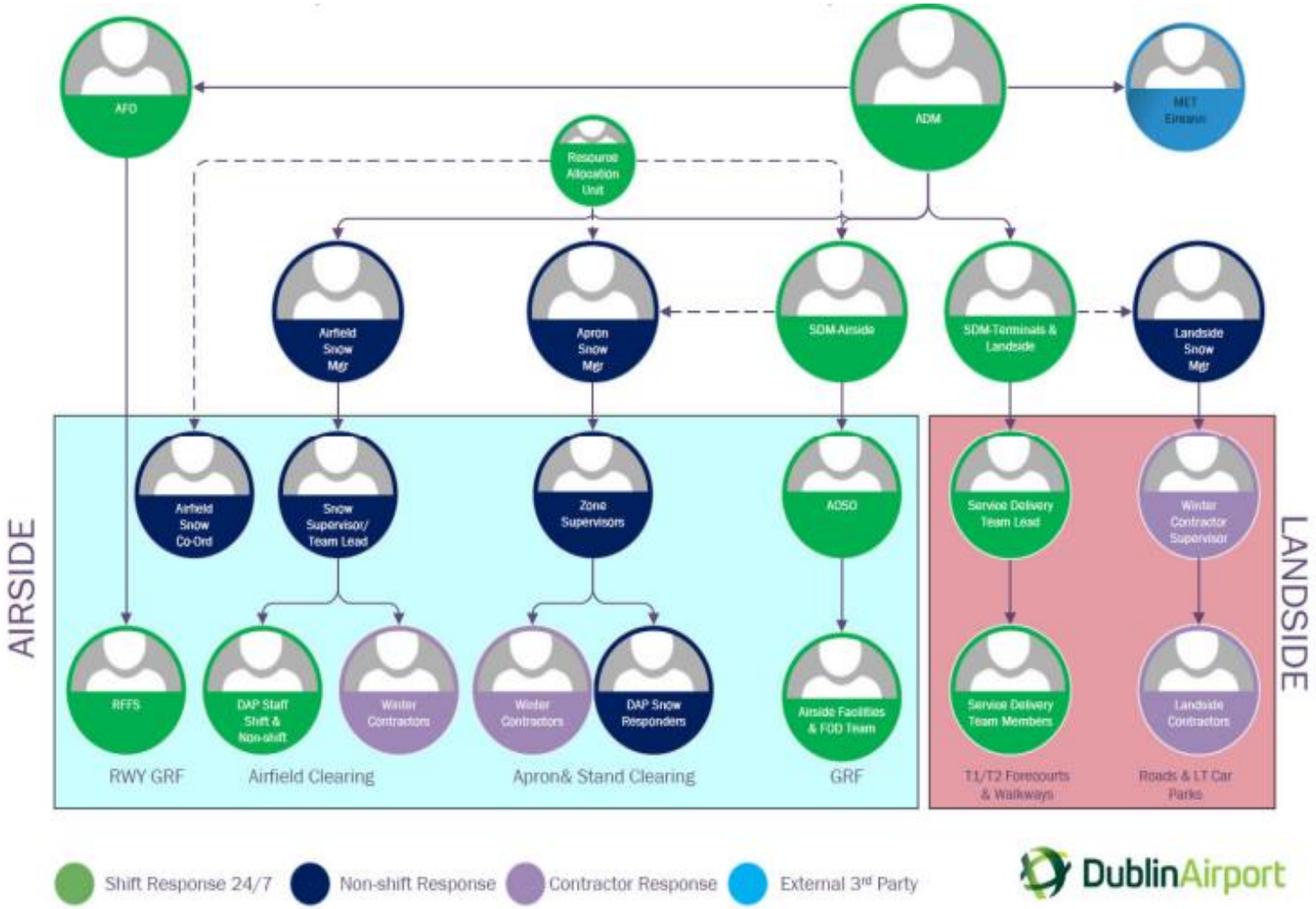
Airfield Anti-icing Strategy

- Pre 2018 Anti-icing plan was to use 1No. 45-meter de-icer with 2 spotter vehicles one front and one rear.
- Allowed anti-icing of full runway width in one journey but required 2 operators due to vehicle size
- We decided to move to two 30m so we can now capture the full runway and the shoulder area including inset runway edge lights and then split the de-icers for better utilisation across the north and south of the airfield
- The use of the 30m is favoured by operators as it is more manoeuvrable and quicker to deploy and retract the booms under ATC time constraints in live operations

Airfield Anti-icing Plan

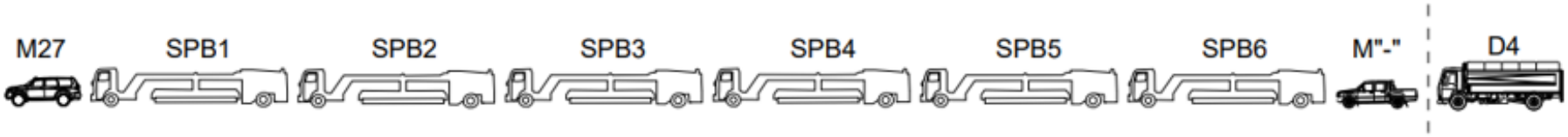


Snow Clearing Plan Post 2019



Snow Clearing Strategy Pre 2018

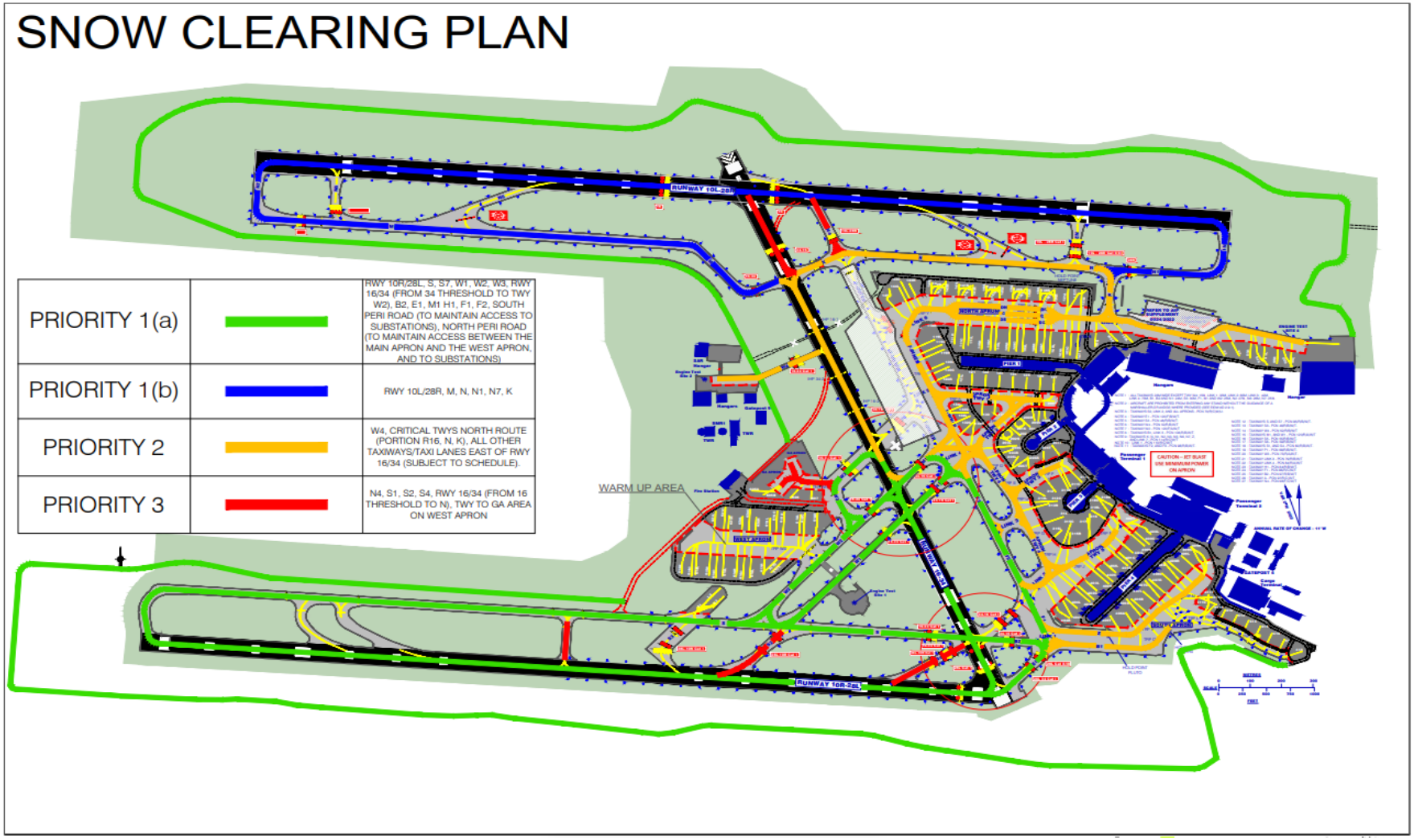
Convoy Arrangement



Current Snow Removal Plan for Runway 10/28, TWY H1 & H2:
Snow removal in 2 passes: 6 TJS 630, 1 ASP 45m & 1 Supra 5001

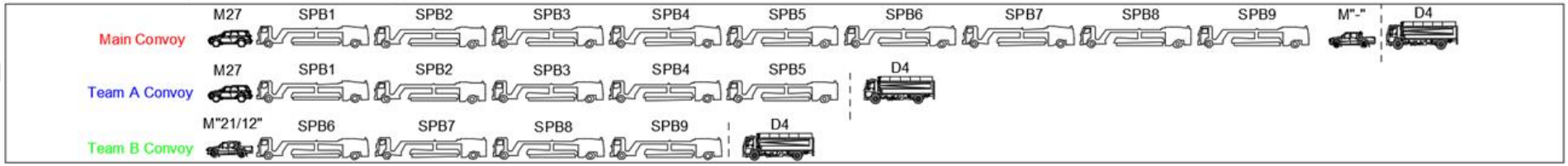
- Warm-Up Phase (approx. 20 minutes)
  - West Apron: 6 TJS 630
  - Move to the convoy hold position
- Runway 10/28 Phase (approx. 25 minutes)
  - Runway: 6 TJS 630
  - Bravo taxiway to circle back onto runway 10/28
  - Loop back to convoy hold position via TWY H1 & H2
  - Including friction measurement
- Total snow removal **time: approx. 45 minutes**

Snow Clearing Plan Post 2019



Convoy Arrangement

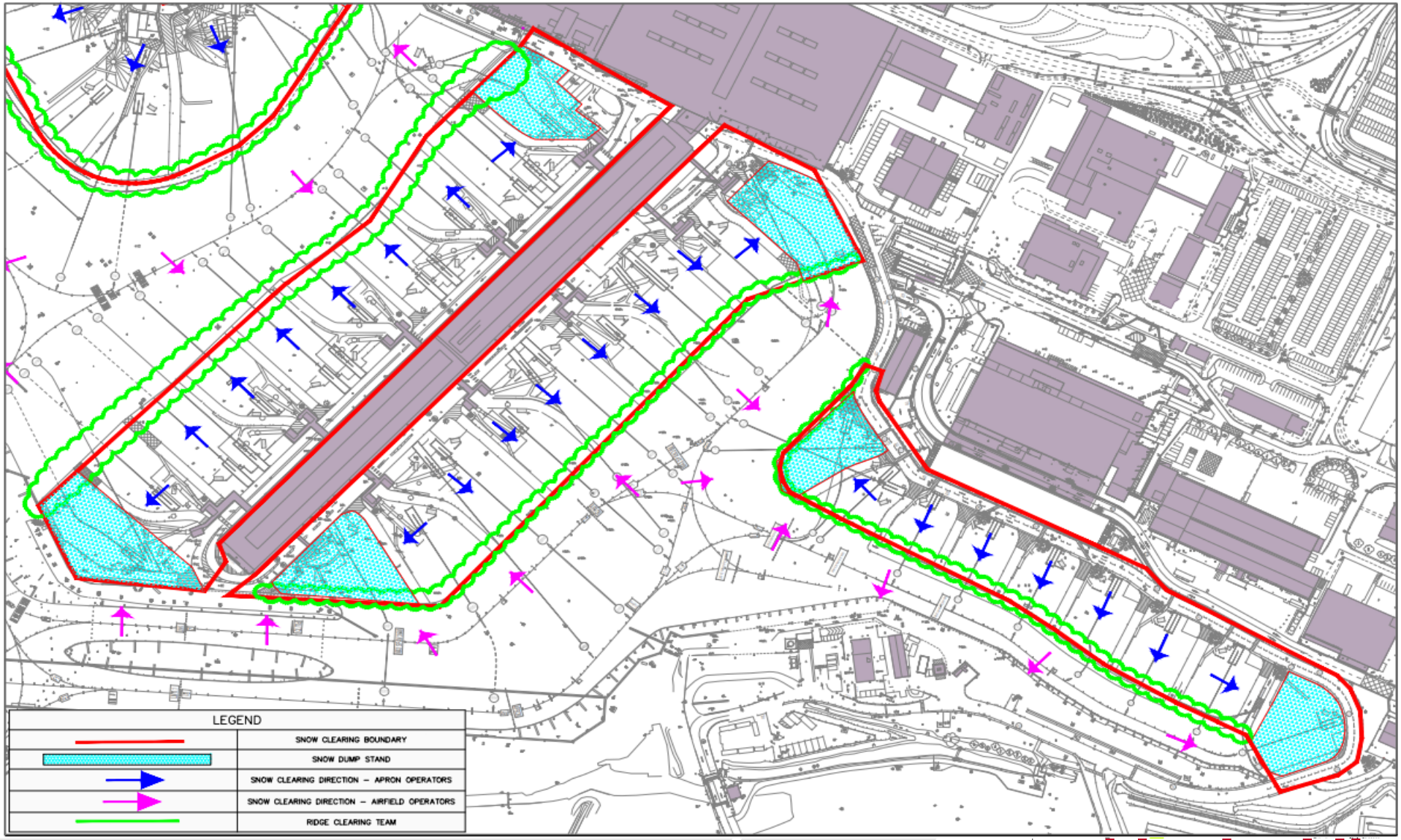
Snow Clearing Plan Post 2021



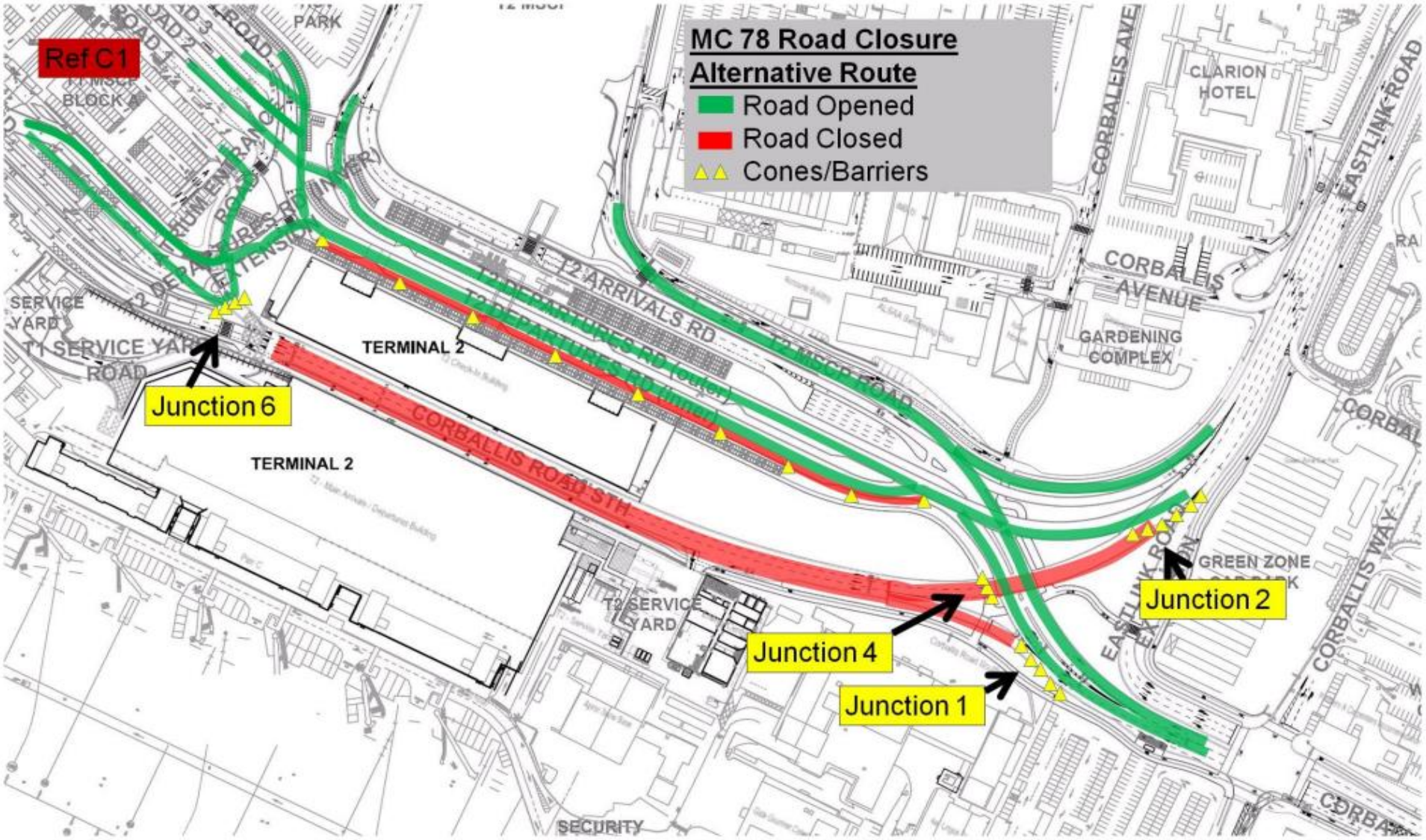
Proposed - Rwy. 10R/28L & Critical Twy. Clearance Route P1

Closed works sites, changes year to year and updated into plan

Apron Snow Clearing plan



Landside Snow Plan



	2021/2022 Runway Snow Clearing Operation H24		2022/2023 Planned Future Snow Clearing Operation (0700 – 2300)	2022/2023 Planned Future Runway Operations (2300-0700)
Runway Mode:	10R	28L	All aircraft movements moved to the southern runway in advance of impending snow event, assuming either 10R or 28L subject to wind direction **Decision Maker**: ADM – ATC Station Manager **Suggested Decision point:** Upon Snow Plan Level 2 or more implementation	All aircraft movements moved to the southern runway in advance of impending snow event (ADM – ATC Station Manager)
Anti-Icing pre-snowfall	Pre-emptively sprayed with 40mg/l prior to snowfall (ADM activation)	Pre-emptively sprayed with 40mg/l prior to snowfall (ADM activation)	Pre-emptively spray both runways @ 40mg/l upon implementation of Snow Plan (Level 1-3) Associated taxiways sprayed at 25mg/l 2 No. 30m sprayers + 1 No. 45m sprayer utilised	Pre-emptively spray both runways @ 40mg/l upon implementation of Snow Plan (Level 1-3) Associated taxiways sprayed at 25mg/l 2 No. 30m sprayers + 1 No. 45m sprayer utilised
Snow Clearing Activation:	Snow Clearing commences **@ 11mm** snow depth confirmed by RFFS (3 no. RFFS required)	Snow Clearing commences **@ 11mm** snow depth confirmed by RFFS (3 no. RFFS required)	Ideally snow clearing commences once snow falling Steps: 1) **+3mm** on runway surface as confirmed by RFFS GRF 2) Convoy departs W.Apron & clears LVP routes to runway HP 3) Access provided by ATC 4) Single Sweep performed & anti-icing spray applied 5) RFFS GRF inspection following convoy 6) Repeat sweep based on forecast and immediate need 7) RFFS continue to monitor pavement condition	Snow clearing of RWY10L/28R only undertaken following clearance of RWY10R/28L, LVP routes, associated taxiways and apron areas i.e. always a runway available for Operations
Snow Removal Equipment Available:	6 TJS 1 No. 45m De-icer	6 TJS 1 No. 45m De-icer	9 TJS 2 No. 30m De-icers or 1 No. 45m De-icer	9 TJS 2 No. 30m De-icers or 1 No. 45m De-icer
Runway Clearance Time **(from ATC clearance to enter runway until last snow vehicle departs runway)**	Double Sweep 35 – 45 mins	Double Sweep 35 - 45 mins	Single Sweep 15 - 25 minutes Double Sweep 35 – 45 minutes (only in exception) Snow clearing crews focus efforts on a single runway and supporting LVP routes to ensure availability of a minimum runway operation	Single Sweep 15 - 25 minutes Double Sweep 35 – 45 minutes (only in exception) 25- minutes required to clear 10R/28L in a single pass (9 TJS clearing, followed by 2 No. 30m De-icers) Snow clearing crews focus efforts on 10R/28L and supporting LVP routes to ensure availability of runway operation
Infrastructure Cleared	E1, RWY 10R/28L, S7, S, W2, W1, M1, P1, H1, F1, F2, F3	E1; RWY 10R/28L, S7, S, W2, W1, M1, P1, H1, F1, F2, F3	RWY 10R/28L: E1; RWY 10R/28L, S7, S, W2, W1, M1, P1, H1, F1, F2, F3 RWY10L/28R:	E1; RWY 10R/28L, S7, S, W2, W1, M1, P1, H1, F1, F2, F3
Impact to Operation	ATC create gap in arrivals (holding) + departures Impact to runway availability as noted above (30-45 mins)	ATC create gap in arrivals (holding) + departures Impact to runway availability as noted above (30-45 mins)	Minimal gap required in aircraft movements, snow clearing performed under ATC control to allow RWY 10L/28R & LVP routes to be cleared	Minimal gap required in aircraft movements, snow clearing performed under ATC control to allow RWY 10L/28R & LVP routes to be cleared
Apron Clearance Support	Airfield teams available to support apron twy/cul-de-sacs after c.45 mins	Airfield teams available to support apron twy/cul-de-sacs after c.45 mins	Airfield teams available to support apron twy/cul-de-sacs after c.25 mins - Convoy can be split to increase Apron clearing efficiencies	Airfield teams available to support apron twy/cul-de-sacs after c.25 mins - Convoy can be split to increase Apron clearing efficiencies
Runway Operations	Single Runway operation mode. Aircraft movements/hour in LVP only	Single Runway operation only (RWY 10R/28L)	1. Once RWY 10R/28L operations sustained (snow cleared on E1, S7 + LVP route), snow clearing team will move to RWY 10L/28R, clearing RWY 16/34 (LVP Route) on route northbound. 2. 5 TJS + 1 No. 30m De-icer clearing RWY 10L/28R with no planned movements on that runway. 3. 4 No. TJS + 1 No. 30m de-icer will clear apron areas 4. Once RWY 10L/28R cleared and treated, all aircraft movements to be moved to that runway. 5. Snow clearing team will then revert to RWY10R/28L to fully clear and treat. 6. The sequence of movements between North and South to be sustained until risk period abates, with minimal impact to flight operations as a benefit	- Single runway operations can meet demand of ATC in LVP conditions. - No benefit in trying to maintain 2 active runway in snow/LVP conditions RWY 10L/28R not in operation. **should the north runway be needed in exception inside this timeframe**

Winter Operations Resourcing

- 3 new airfield snow teams were created on a week on week off roster ensuring a resourcing numbers increase to a maximum of 18 in a level 3 snow event.
- This provides operational resilience and coincides with new vehicle introductions since 2018

Snow Warning Level	*Airfield Snow Manager*	*Airfield Snow Co-Ordinator*	*Airfield Supervisor/Team Lead*	*Airfield Team Response*	*AirfieldWinter Contractor*
Level 1	*1*	*1*	*1*	*6*	*6*
Level 2	*1*	*1*	*1*	*6*	*9*
Level 3	*1*	*1*	*1*	*6*	*9*

- Similar to the airfield, 3 separate apron snow teams were created operating across 6 different zones.
- Resourcing numbers remained similar to 2019 but the number of skilled external contractors increased improving snow clearing efficiency

Snow Warning Level	ApronSnow Manager	Zone Supervisor (DAP Staff)	Snow Responder (DAP Staff)	Apron Winter Contractor	Ridge Clearing Team	Total per12-hour shift
Level 1	1	6	20	5	0	34
Level 2	1	6	20	26	0	55
Level 3	1	6	20	26	Up to 12	67

Vehicle & Equipment Improvements – Airfield

3 New Towed Jet Sweepers

3 New 30M ASP De-icers

2 New Stratos Gritters

2 New ASP 990 Glycol Recovery Trucks

Vehicle & Equipment Improvements – Apron

2 x Compact Jet Sweeper

Combi Spreader Sprayer

Street King 660 with Glycol suction box

Cleango 500

Vehicle & Equipment Improvements – Attachments

2 x Traxos Gritter

32 x V-blades & 6 Towed Sweeper Sprayers

12 x New VKS 2.6m Brushes

New Snow Cutter Attachment

Dublin Airport & Aebi Schmidt

Winter resilience partnership

aebi schmidt group

Vehicle Specification, Ordering & Delivery

Since 2018 we have fine-tuned our vehicle specifications ensuring that each new addition to our fleet has the most up to date and technological advanced features providing better user engagement and ensuing operational sustainability is achieved.

Vehicles are delivered in the most sustainable manner possible and following continuous improvement engagement, new processes have been introduced to ensure minimal operational impact upon arrival at Dublin Airport

Aftersales and Service Support

Continuous aftersales support is provided by our partners at Aebi Schmidt UK in the form of,

- Pre-season vehicle & equipment checks
- Mid-season inspections
- 24-hour breakdown support
- Mechanical & maintenance repairs
- Warranty and goodwill support

Training and continuous improvement

Each year we identify areas of improvement and in conjunction with Aebi Schmidt UK deliver new or refresher training for safe and efficient operation of equipment and vehicles used at Dublin Airport.

Training delivered in 2024

- Compact Jet Sweeper
- ASP De-icer
- Tow-Jet Sweeper
- Towed Sweeper Sprayer
- Airport Assistant
- Stratos Gritter

Stock Control and Operational Support

To further bolster operational readiness Aebi Schmidt UK manage our stock control at Dublin Airport and keep tools and consumables onsite to expediate repairs and provide additional resilience to their 24-hour breakdown support

Innovation

Sustainability & Continuous Improvement

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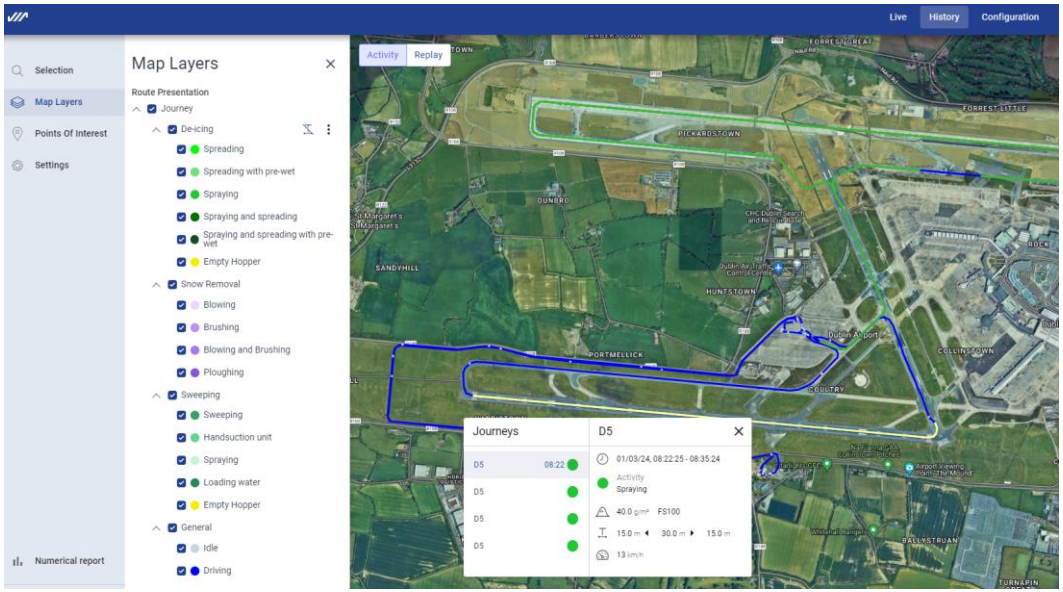
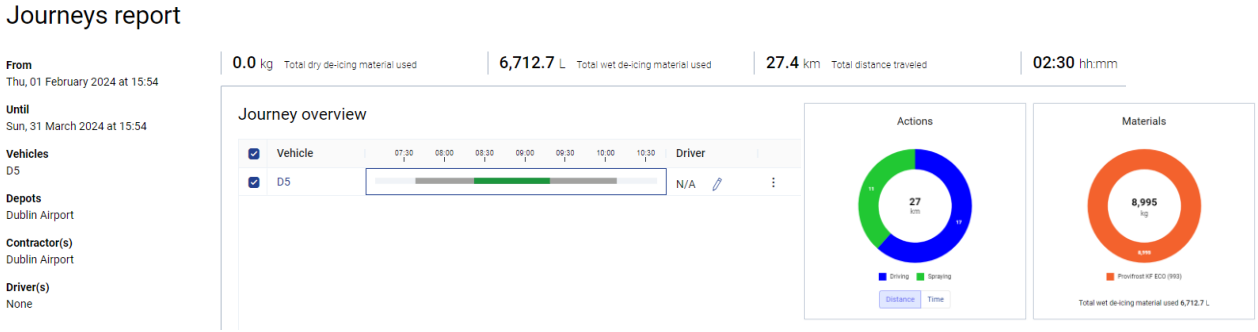
IntelliOPS

IntelliOPS is Aebi Schmidt bespoke vehicle tracking and telematics system

Key Features include

- Vehicle Tracking
- Reporting on chemical usage
- True width spray data
- Route playback
- Vehicle Utilisation
- Dispersion & quantity patterns

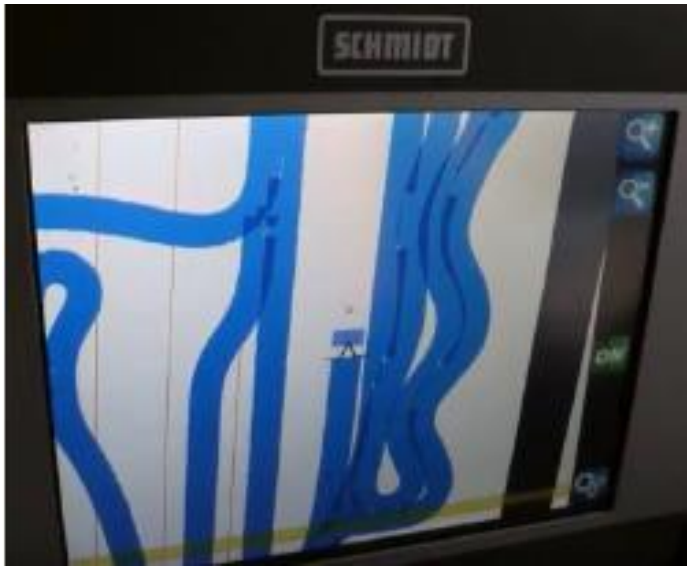




Plans to install into Airport command & control prior to winter 24

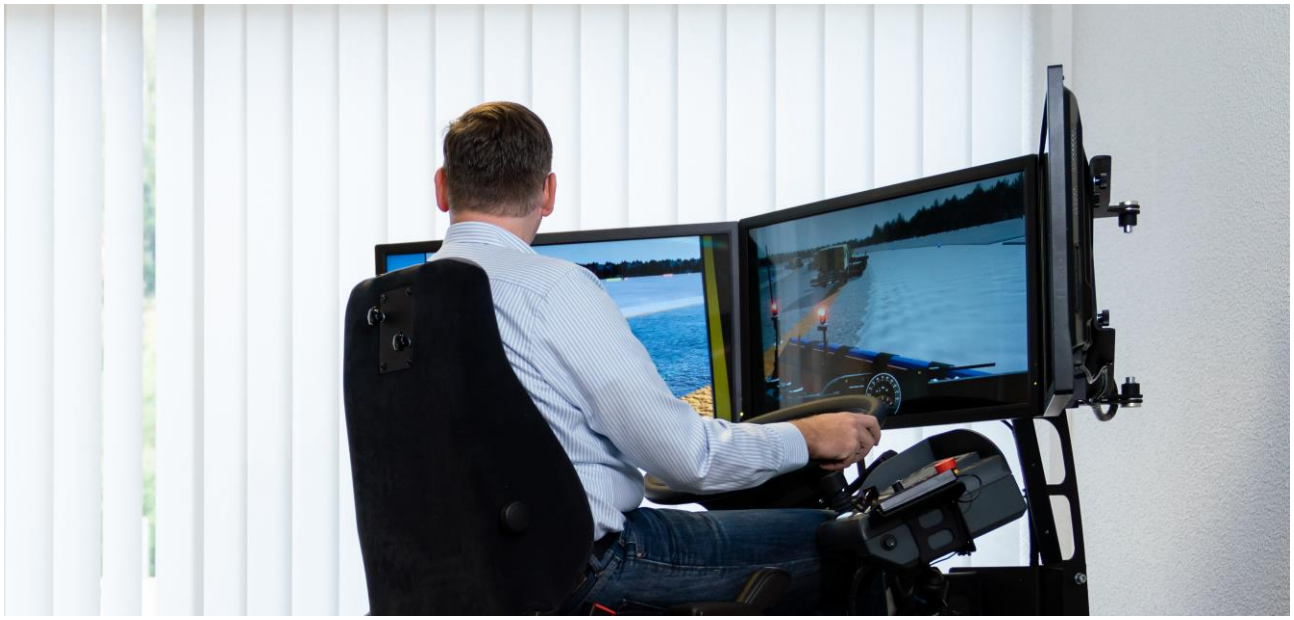
Airport Assistant (former Airport Logic)

- The system displays where the machine has sprayed and prevents double application if the same area is treated
- Increased safety through better visualisation of sprayed area
- De-icing media savings in the region of 10-15% for basic Airport Assistant functionality



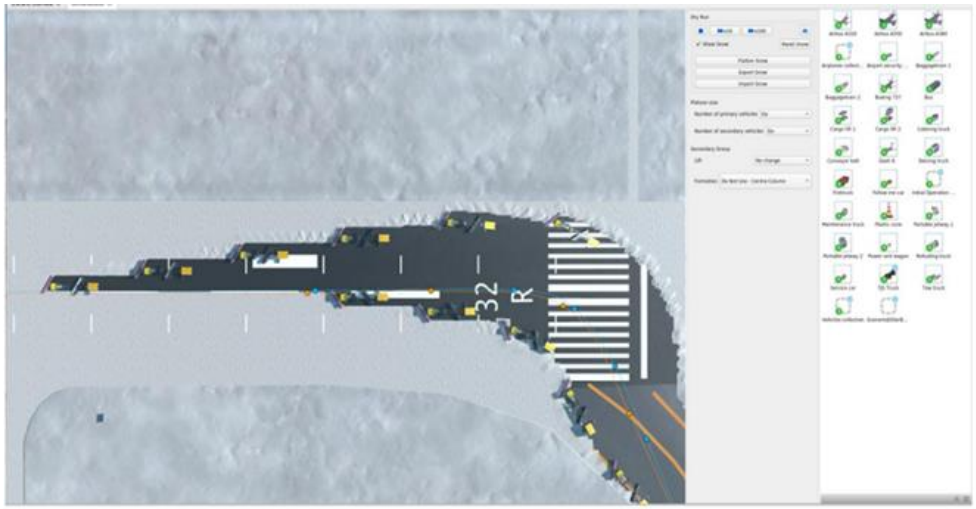
Installed in all DAP's spraying and gritting vehicles

Towed Jet Sweeper Simulator



- Reduce OPEX on both fuel and vehicle maintenance
- Reduce carbon emissions
- Reduce ATC clutter during training / practice
- Reduce airfield interference during simulation / training
- Increase operator proficiency

Winter Operations Planner



- Real life airport mapping
- Utilised in conjunction with simulator for real life snow clearing training
- Enables future planning and route clearing efficiencies
- New operator airfield familiarisation

Dublin Airport Winter Fleet 23/24

aebi schmidt
group

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Thank you for your time and interest!