Planning and Design of the YHU Central De-icing Facility

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Overview

Montréal-Trudeau International Airport (YUL)

Montréal Metropolitan Airport (YHU)

Montréal Metropolitan Airport (YHU)

STAKEHOLDERS

MONTREAL METROPOLITAN AIRPORT

YHU Terminal

Our mission statement

To revolutionize the airport model, turning it into a source of collective pride and inspiring the world to see air transport differently.

Important aerospace cluster

→ First civilian airport in Canada (in 1927)

→ 515 hectares of land

→ Airport authority ownership

→ Main runway: 2.4 km – cat. 4

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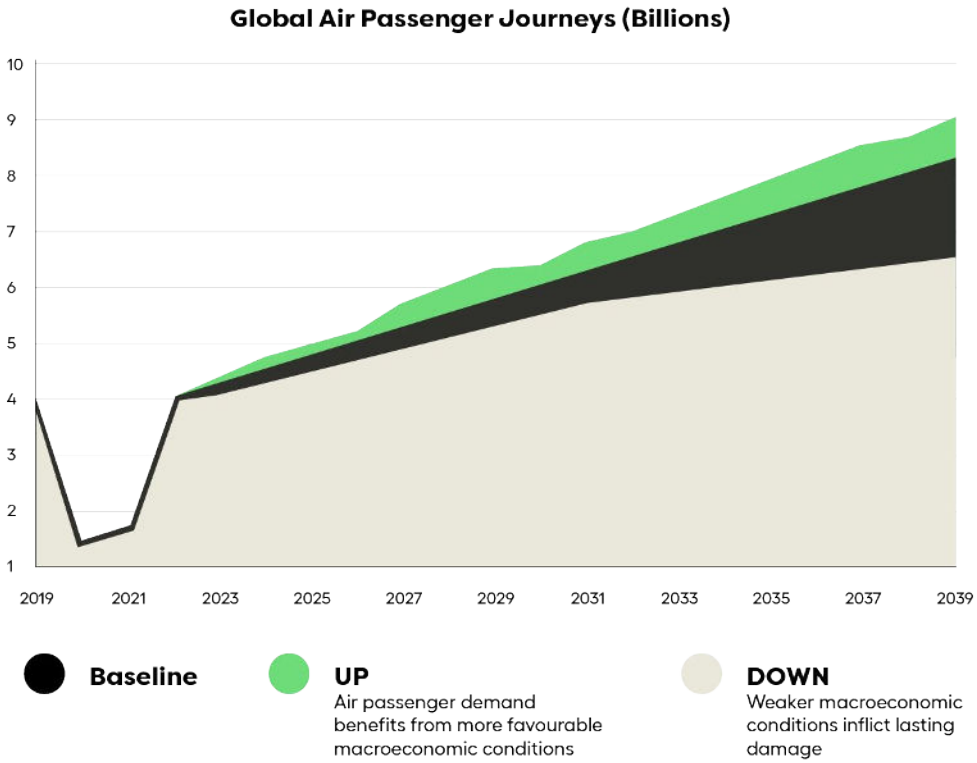
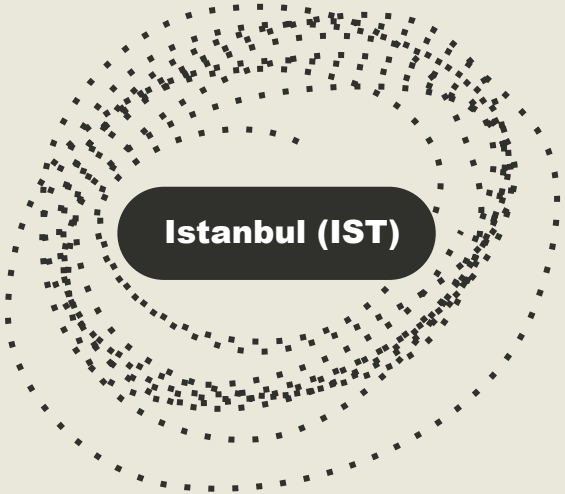
World passenger traffic to be multiplied by 2 before 2040



Sources: IATA Sustainability and Economics, Tourism Economics (September 2023 release)

Traffic growth: two models

One mega-airport



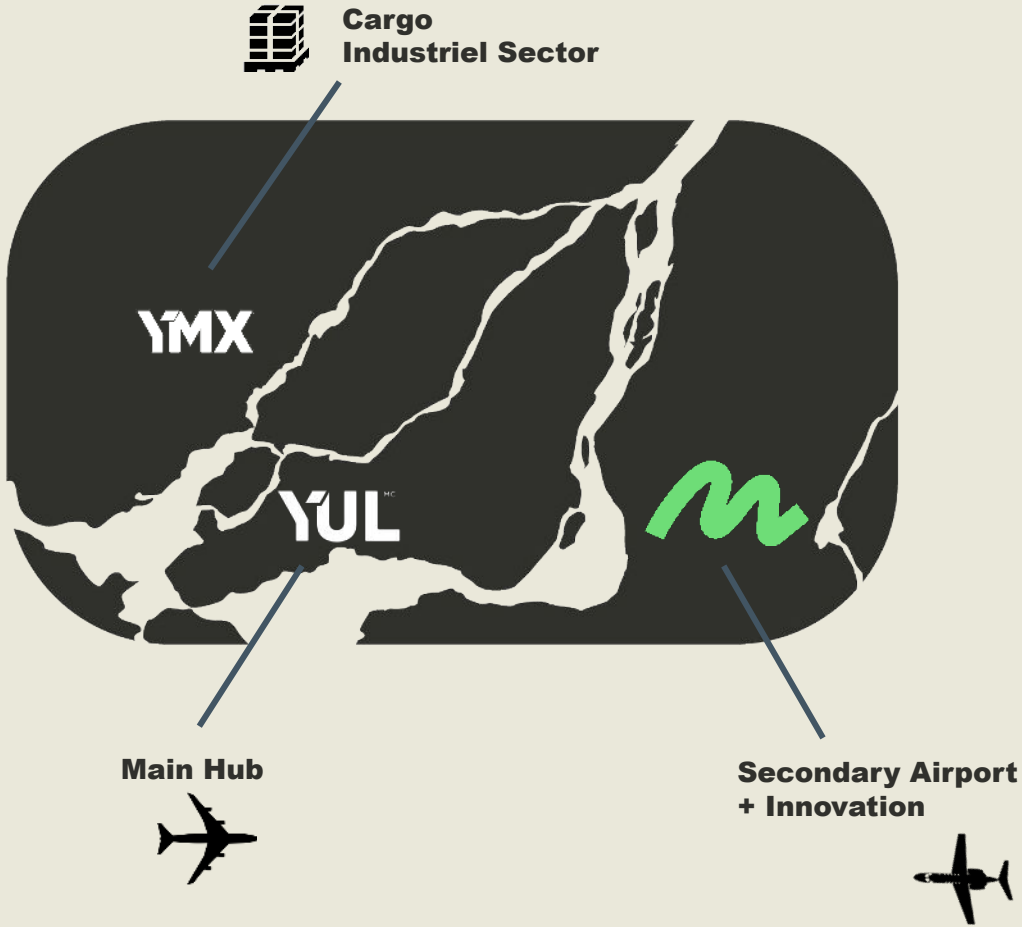
vs

Airport system

MET MONTREAL METROPOLITAN AIRPORT

Major cities are served by an airport system

Each airport with its specific niche



MET MONTREAL METROPOLITAN AIRPORT

MET Aéroport métropolitain de Montréal

Montréal Metropolitan Airport (YHU)

STAKEHOLDERS

MET MONTREAL METROPOLITAN AIRPORT

YHU Terminal

About YHU Infrastructure Partners

- Partnership between Porter Aviation Holdings and Macquarie Asset Management
- Develop and operate a new passenger terminal at MET

New Terminal

- Expected operation: Early 2026
- Capacity: grow to service 4 Million passengers

HATCH

Design a De-icing Facility

Client needs:

- Minimize upfront capital
- Efficient winter operation
- Protect the environment
- Accommodate future expansion

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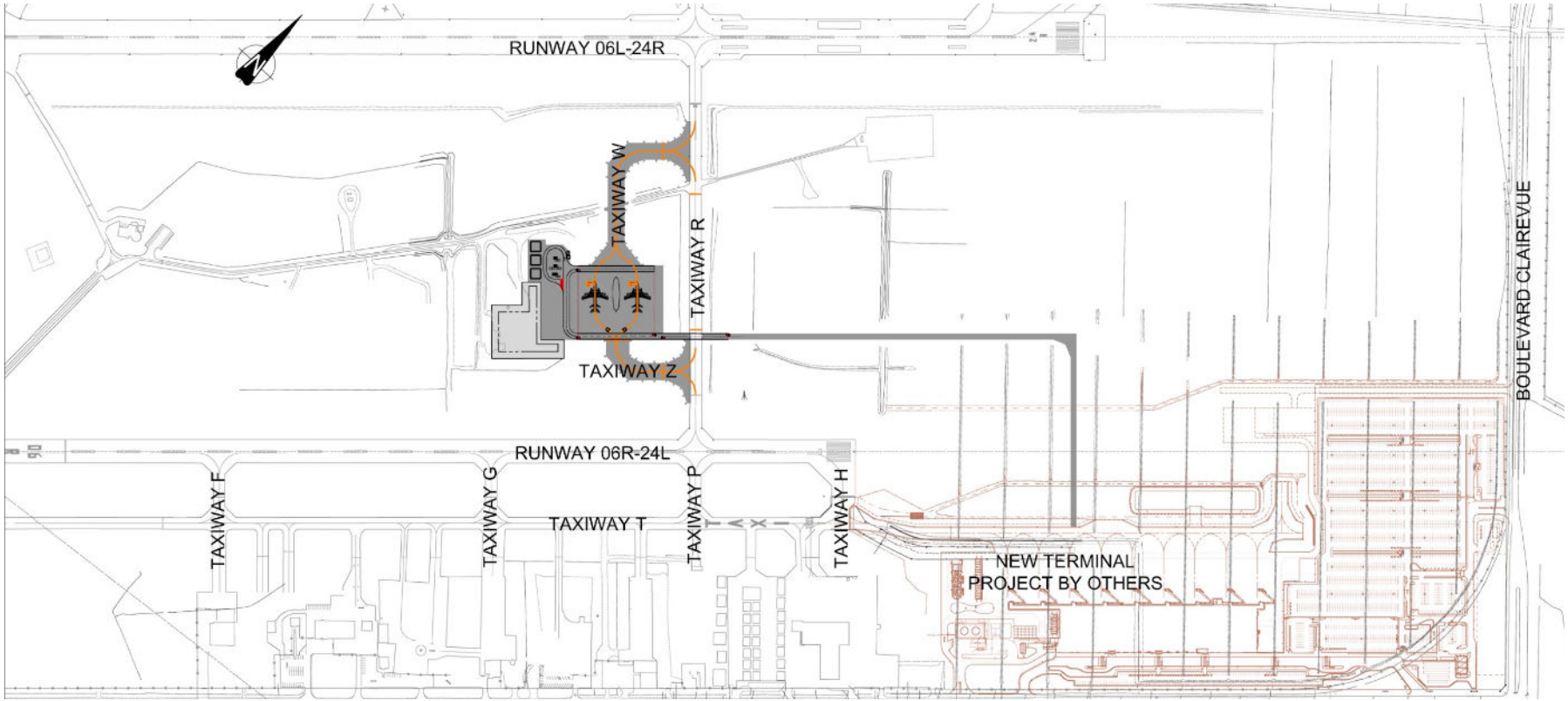
Central De-icing Facility (CDF) Location



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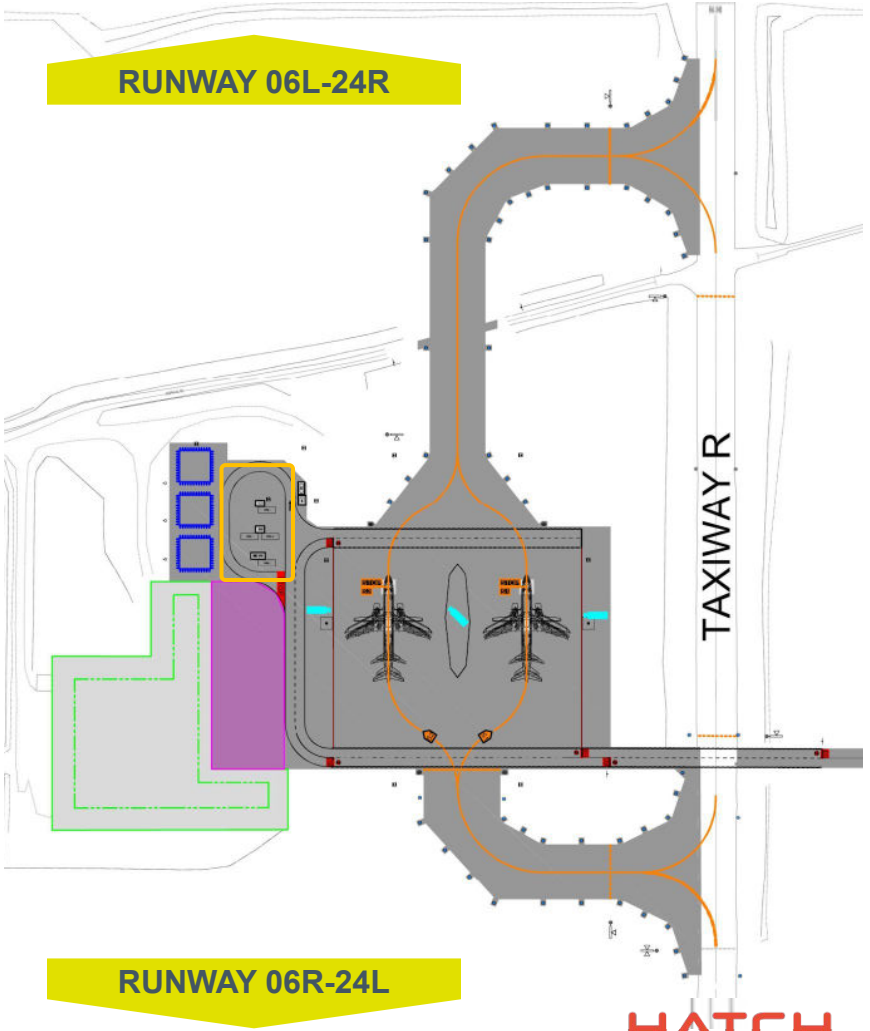
CDF Geometry

- ✔ Ensures efficient winter operation
- ✔ Environmental protection
- ✔ Safety for vehicle operations

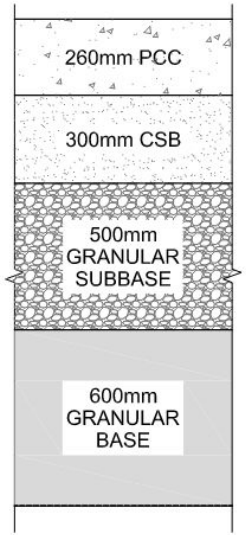
- De-icing vehicles
- Protective berm
- Pink snow storage area
- De-icing fluid pre-mixers
- Spent fluid holding tanks



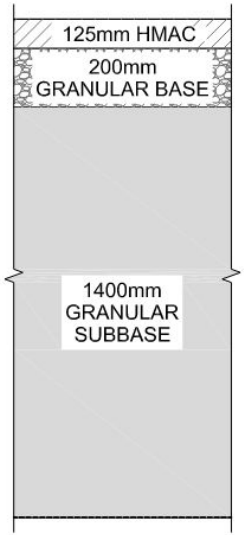
Pavement Structures

Complete **Frost** Limited

Rigi
Apron



Flexibl
Taxiway



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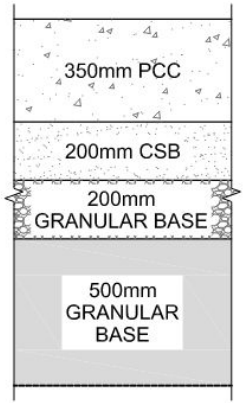

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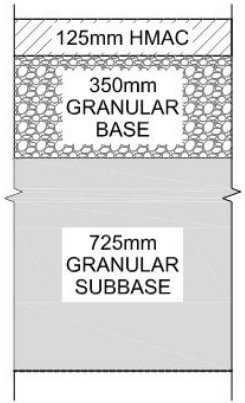

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Pavement Structures

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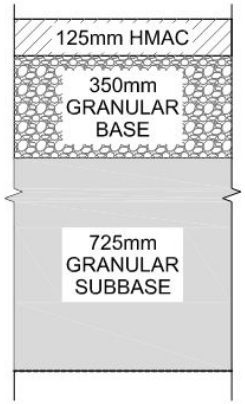
Apron & Taxiway



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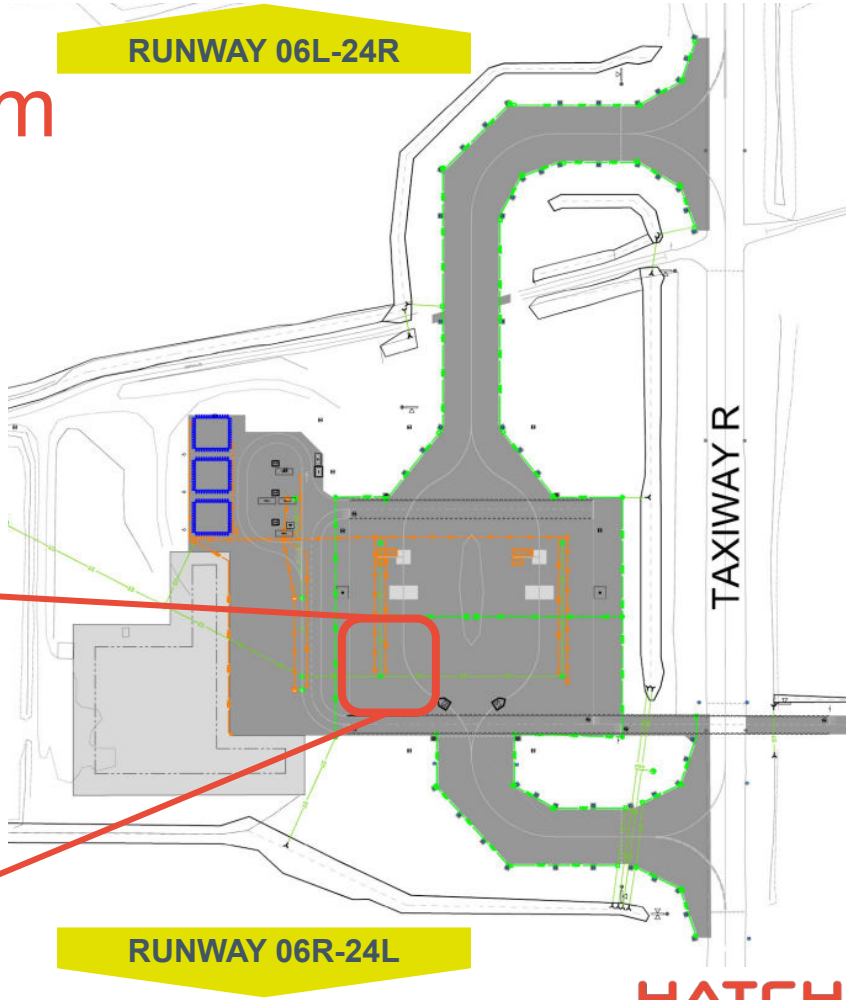
Dual Drainage System

- ✔ Enable single bay operations
- ✔ Isolate pads for Glycol Recovery Vehicles (GRV)
- ✔ Divert clean run off into nearby ditches
- ✔ Reduce volume of glycol impacted runoff collected

Clean Surface water drainage
Glycol fluid drainage



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Design a De-icing Facility

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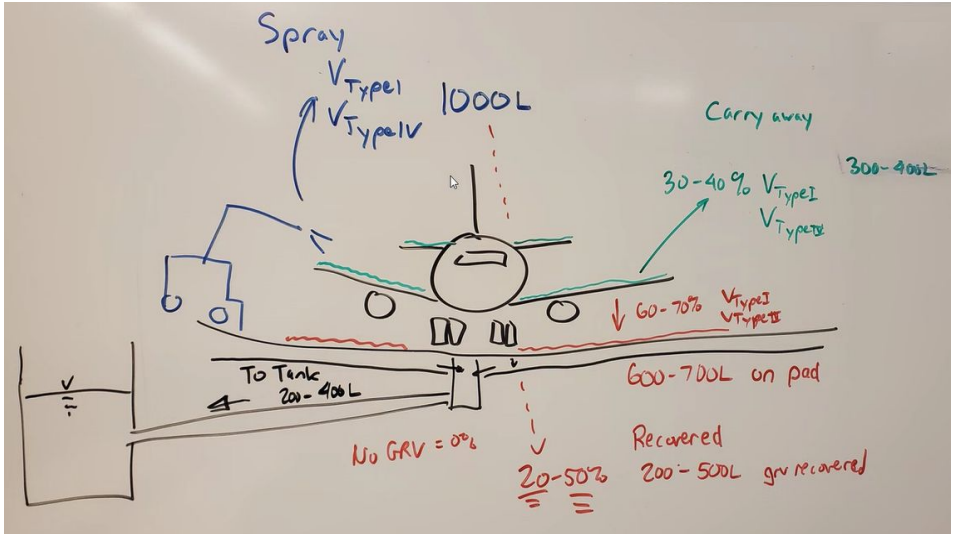
- ✔ Protect the environment
- ☐ Accommodate future expansion

Model Development

How to model de-icing operations and glycol reduction strategies?



Understand the problem → Check Assumptions → Model Inputs → Model Output → Results

HATCH

Model Development

Understand the problem > Check Assumptions > Model Inputs > Model Output > Results

Known

- Departure Schedule and aircraft mix
- Equipment Capabilities
- Operating Approach

Unknown

- Design Day
- Design Season

Additional Variables

- Weather
- Departure Mix
- Spray Volumes by:
  - Aircraft Code
  - Weather
  - Contamination
- CDF Configuration
- Reduction Strategies

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De-icing Concept Model

Understand the problem | Check Assumptions | Model Inputs | Model Output | Results

- Aircraft condition based on weather up to 2 hours prior to departure
- Early AM departures are considered Remain Overnight (RON)
- Base volumes can be adjusted:
  - Glycol concentration of Type I adjusted by blending for daily minimum temperature
  - Up to 50% reduction in Type I spray volume by using hot forced air
  - Aircraft carry away between 30% and 40%
  - GRV recovery efficiency of up to 53%

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De-icing Concept Model

Understand the problem | Check Assumptions | **Model Inputs** | Model Output | Results

- Considered three seasons (Oct 1 to May 31) to account for variability deicing requirements and amount of precipitation
- Hourly data on temperature, wind speed, and weather observations used to assess condition of aircraft based on the departure schedule
- Daily data provides the total rain, snow, and overall precipitation to predict runoff

Season	Average Max Temp.	Average Min Temp.	Average Temp.	Rain (mm)	Snow (cm)	Total Precipitation (mm)
Average *(closest to 30-year normal)*	19.6	-15.7	0.9	494.9	240	723.1
Wet *(highest total precipitation)*	19.3	-10.5	1.9	731.4	183.5	898.7
Cold *(lowest average temperature)*	18.6	-17.6	-1.4	400.3	204.7	597.1

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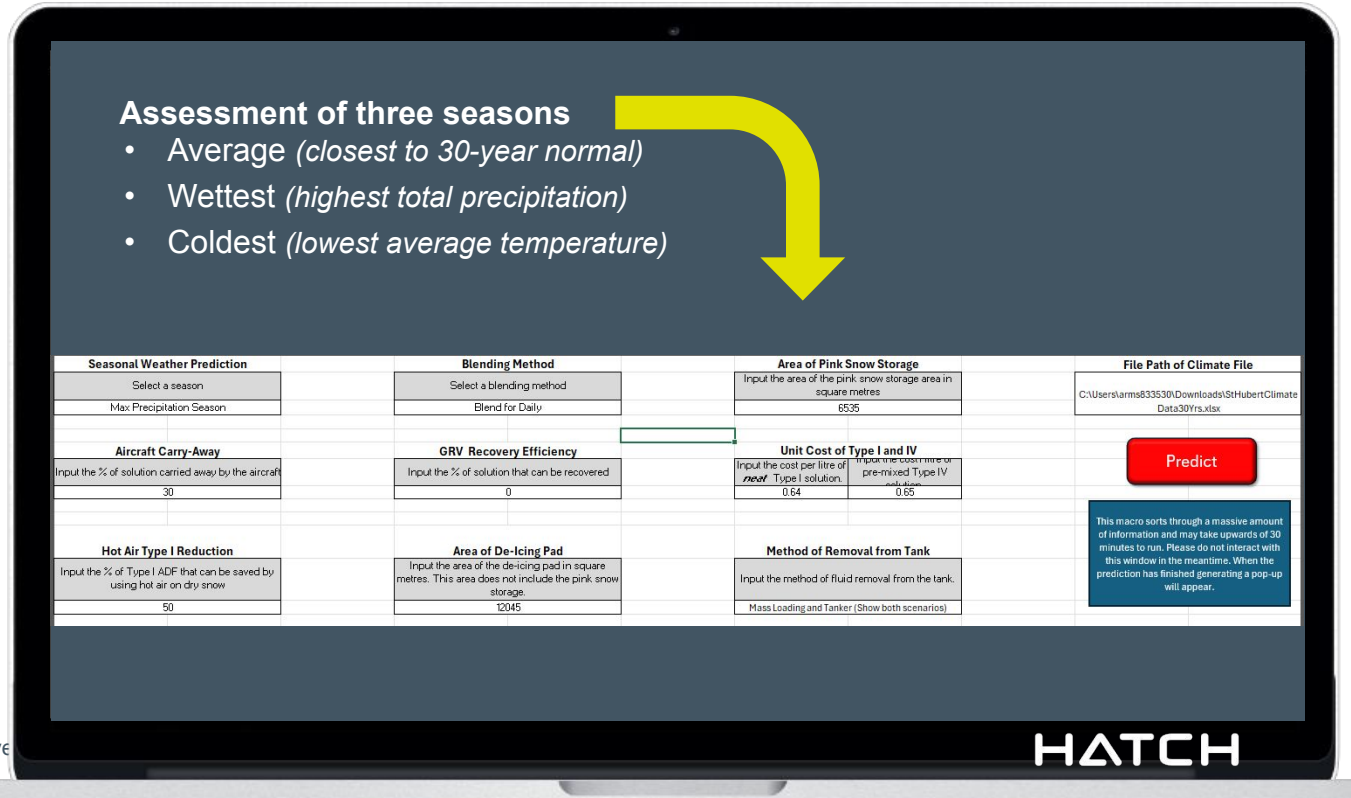
De-icing Concept Model

Understand the problem | Check Assumptions | Model Inputs | Model Output | Results

Account for variables

- ✔ Blending for temperature
- ✔ Use of forced air to reduce glycol use
- ✔ Use of GRVs for recovery
- ✔ Fraction carried away by departing aircraft
- ✔ Departure schedule



Modelling Output

Understand the problem | Check Assumptions | Model Inputs | Model Output | Results

- ✔ Annual and Daily summary
- ✔ Estimated costs for glycol supply
- ✔ Estimated storage volume required

Prediction Results

Month	Average Max Temperature (°C)	Average Min Temperature (°C)	Average Mean Temperature (°C)	Total Rain (mm)	Total Snow (cm)	Total Precipitation (mm)
October	13.8	5.7	9.8	165.3	0	165.3
November	7.1	-2.0	2.5	80	16.4	97.4
December	-2.4	-9.8	-6.1	27.7	72.4	94.3
January	-0.8	-8.3	-4.6	103	47.4	149.4
February	-3.2	-10.5	-6.9	46	29	69.6
March	3.6	-4.9	-0.6	30.4	14.8	40.2
April	13.3	0.6	7.0	103.5	3.5	107
May	19.3	9.0	14.2	175.5	0	175.5
Seasonal Totals				731.40	183.50	898.70

Note:
The liquid draining to the tank (Runoff, L) includes both runoff from the de-icing pad as well as runoff and meltwater from the pink snow storage area. This means that the total amount of neat glycol draining to the tank also includes both runoff from the de-icing pad as well as any glycol released from the pink snow storage area runoff and meltwater.

Peak De-Icing Day

Date	Max Temperature	Min Temperature	Mean Temperature	Total Rain (mm)	Total Snow (cm)	Total Precipitation
03-Dec	-3	-6.7	-4.9	0.00	0.20	0.20

This value assumes only ADF is recovered by the GRVs, not precipitation.

Month	Total Number of Departures	Number of Departures De-Iced	Total Amt Type I Sprayed (L)	Total Amt Type IV Sprayed (L)	Total Amt Neat Type I Sprayed (L)	Total Amt Neat EG (Type I + IV) Draining To Tank (L)	Total Liquid Draining to Tank (Runoff, L)	Total Amt Neat Glycol Recovered by GRV	Cost of Neat Type I	Cost of Mixed Type IV
October	1364		0	0	0	0	0	0	$ -	$ -
November	1680		107835	22958	47802	37952	1172434	2908	$ 30,593.56	$ 14,922.63
December	2325		359304	71673	159329	86716	2167804	34486	$ 102,354.44	$ 45,587.18
January	2201		241914	48437	104295	73966	3092756	10074	$ 66,748.80	$ 31,483.99
February	1680		224520	35318	104664	55144	1455612	31079	$ 66,985.09	$ 22,956.98
March	2077		197482	36571	85497	32420	858381	38520	$ 54,718.01	$ 23,771.41
April	1290		9994	2228	3813	2750	965425	0	$ 2,440.08	$ 1,447.91
May	1395		0	0	0	0	0	0	$ -	$ -
Seasonal Totals	14,012		1,141,049	217,185	506,000	288,948	9,712,413	117,066	$ 323,839.98	$ 141,170.10

Peak De-Icing Day

Date	Total Number of Departures	Number of Departures De-Iced	Total Amt Type I Sprayed (L)	Total Amt Type IV Sprayed (L)	Total Amt Neat Type I Sprayed (L)	Total Amt Neat EG (Type I + IV) Draining To Tank (L)	Total Liquid Draining to Tank (Runoff, L)	Total Amt Neat Glycol Recovered by GRV	Cost of Type I	Cost of Type IV
03-Dec	75	75	30107	6904	13036	11264	29624	0.00	$ 8,343.23	$ 4,487.73

READ ME | Prediction Home Page | Departure Data | Daily Predictions | Tank Flow BOD Tanker | Tank Flc

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Results for YHU Central De-icing Facility

Understand the problem > Check Assumptions > Model Inputs > Model Output > Results

Season	Total Rain (mm)	Total Snow (cm)	Total Precip. (mm)	Aircraft De-iced (%)	Total Amount Blended Type I Sprayed (L)	Total Amount Blended Type IV Sprayed (L)	Total Amount Neat Glycol Recovered by GRV (L)	Total Liquid Draining to Tank (Runoff + Glycol) (L)
Average	494.9	240.0	723.1	2,679	823,425	124,127	251,060	9,925,296
Wettest	731.4	183.5	898.7	3,193	1,141,049	217,185	347,797	9,416,906
Coldest	400.3	204.7	597.1	2,916	933,960	151,064	280,011	9,192,254

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Model Evolution

Understand the problem > Check Assumptions > Model Inputs > Model Output > Results

- Use of Incomplete Season Climate Data
- Options for Diversion During the Season, including:
  - Single Pad Operations
  - Clean Snow Diversion

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Project Status

“I would like to take the opportunity to congratulate the entire team, and especially the Hatch team, for the outstanding quality of the plans and specifications. It is rare to see such comprehensive documents that precisely cover all the critical elements of a complex facility like this”

Elie Hindi

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Questions?