Melbourne Airport

Taxiway Delay Analysis
SIMMOD Case Study

September 12, 2006

MELBOURNE AIRPORT

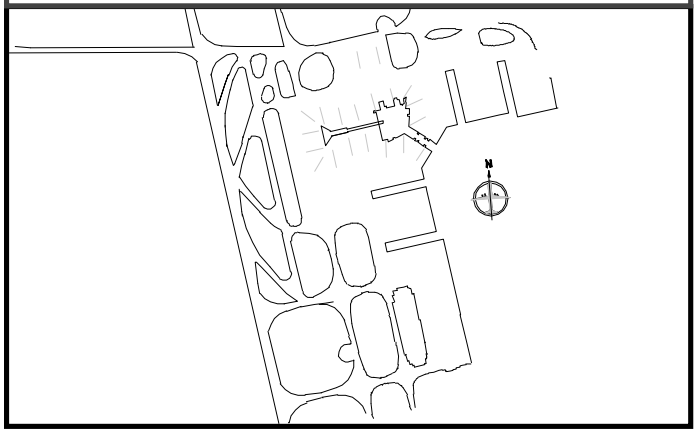
Landrum&Brown Worldwide Services
Aviation Planning at the Leading Edge

Taxiway Delay Analysis

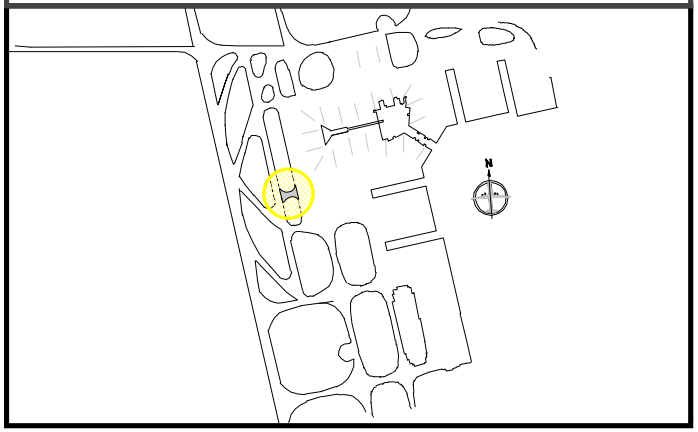
- Evaluate eight alternative airfield layouts
  - Two international concourse extension concepts
    - B4a and A3-1
  - Four alternate taxiway configurations for each concept to evaluate benefits of an extended Taxiway D and/or additional crossover taxiway serving Pier E
- Performance metrics:
  - Total daily travel time and operations count on terminal area taxiways and taxilanes serving Pier D
  - Total daily delay on strategic taxiway and taxilane segments near Pier D

Concept Alternatives

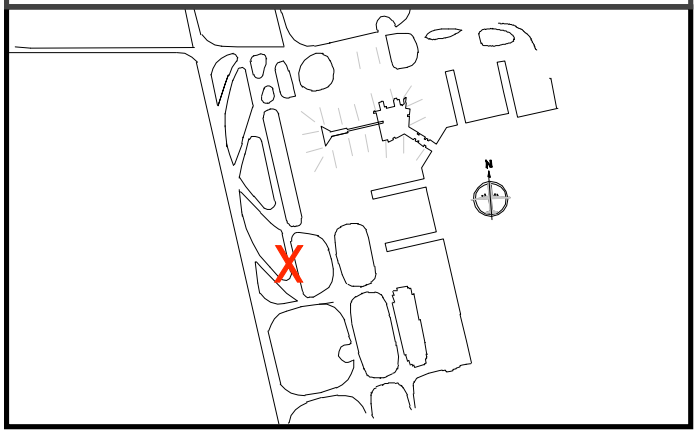
Alternative B4A
with Taxiway D extension



Alternative B4A with crossover
and Taxiway D extension



Alternative B4A
without Taxiway D extension



Alternative B4A with crossover
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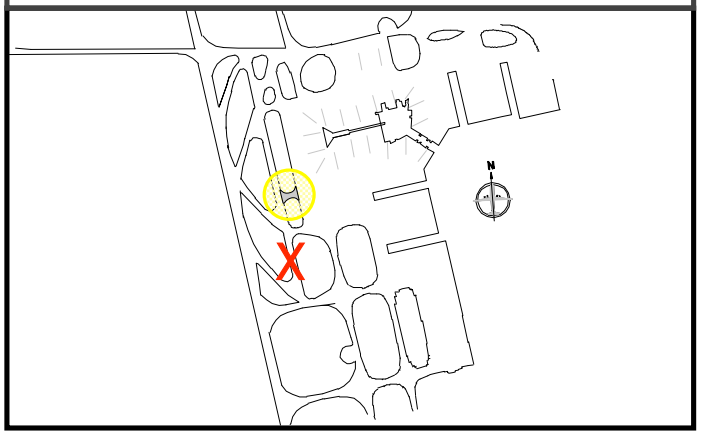
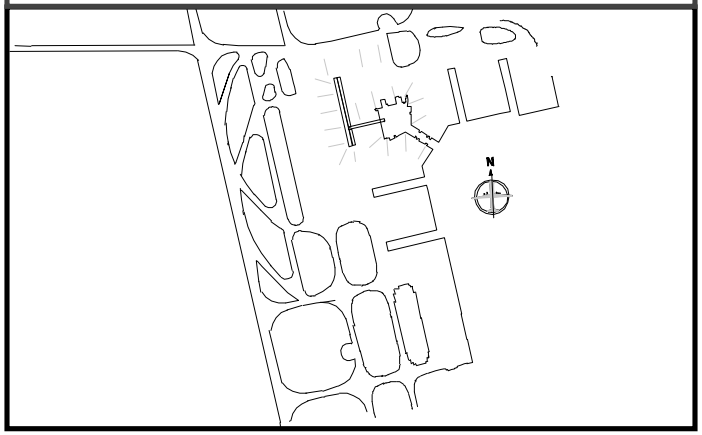
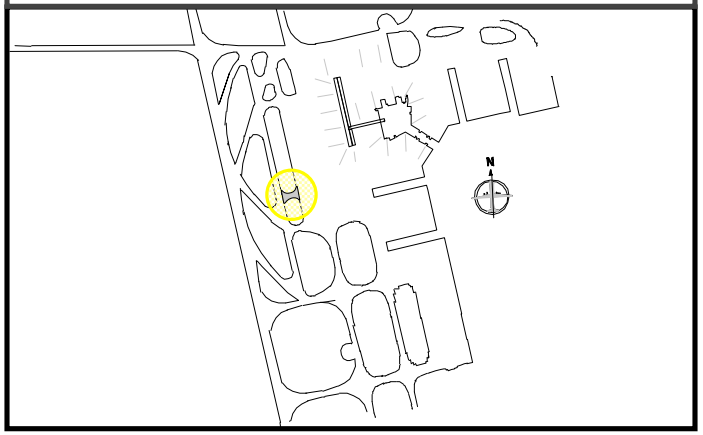


Concept Alternatives

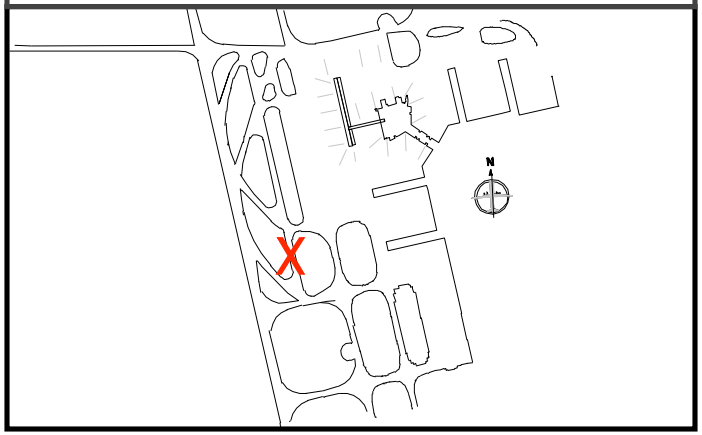
Alternative A3-1
with Taxiway D extension



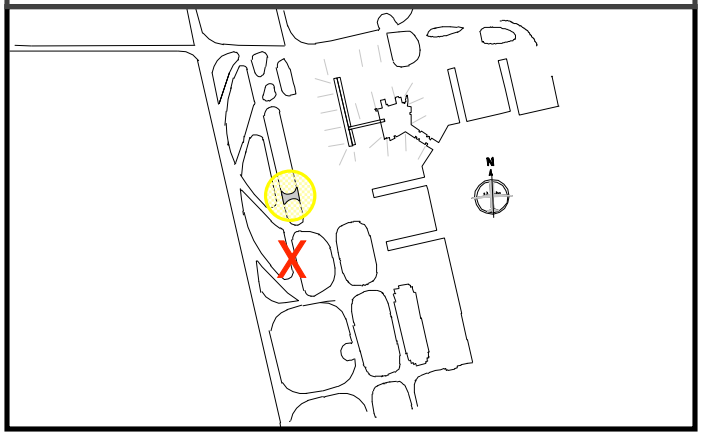
Alternative A3-1 with crossover
and Taxiway D extension



Alternative A3-1
without Taxiway D extension



Alternative A3-1 with crossover
without Taxiway D extension



Modeling Assumptions

1. Taxiway Flow
2. Air Traffic Control Assumptions
3. 2015 Flight Schedule and Gate Usage
4. Runway Use Assumptions
5. Taxiway Speed Assignments
6. Concept 3A Modeling Approach

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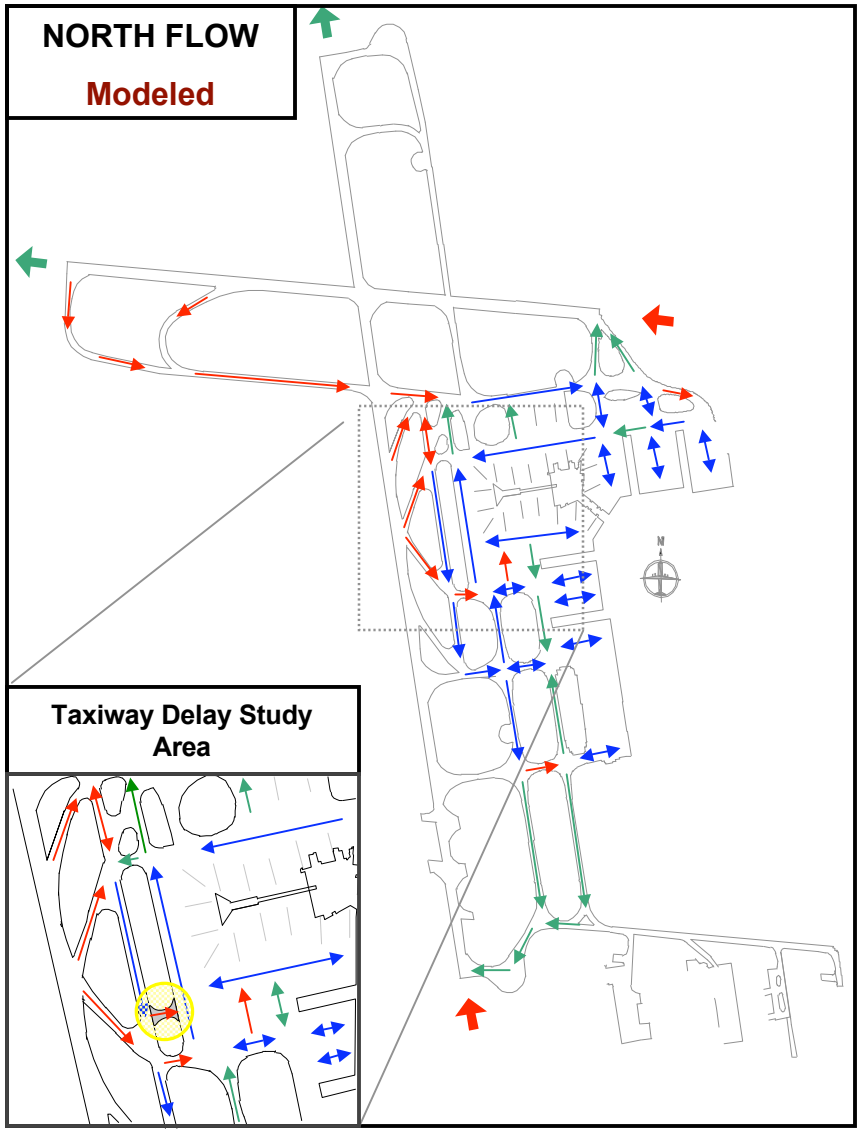
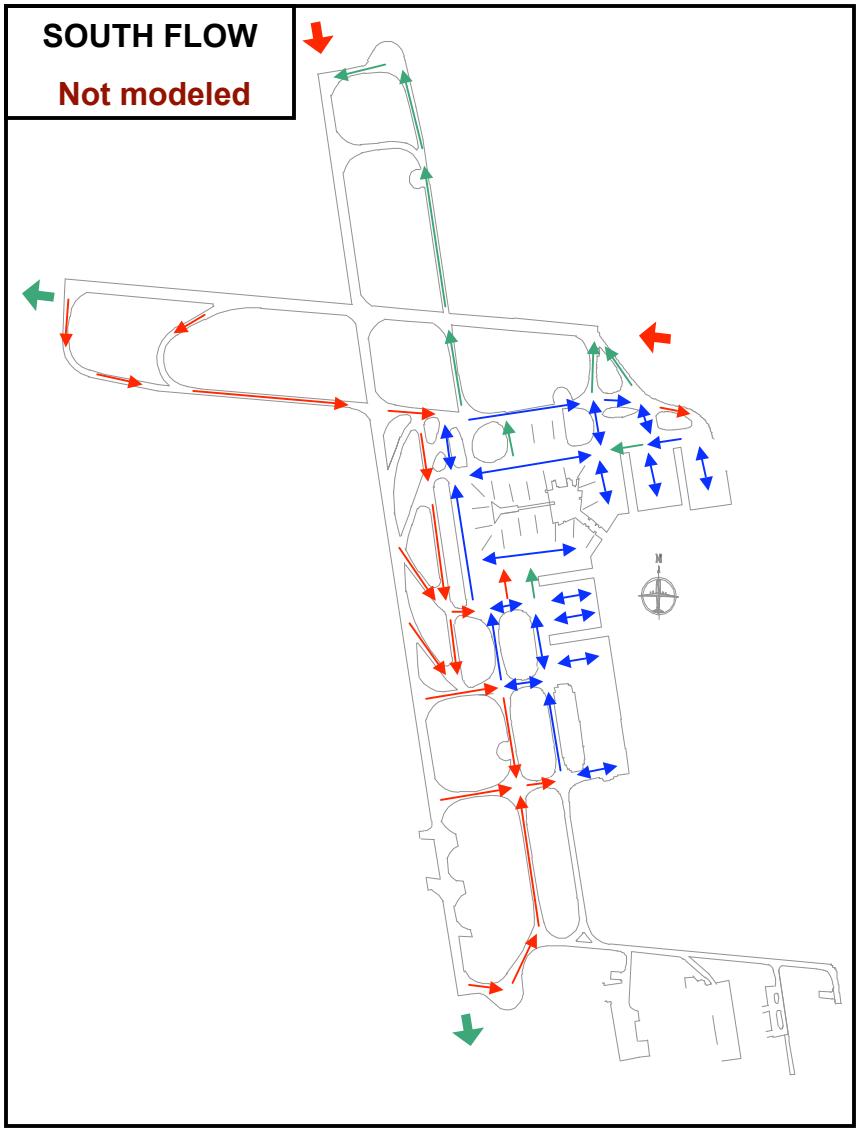
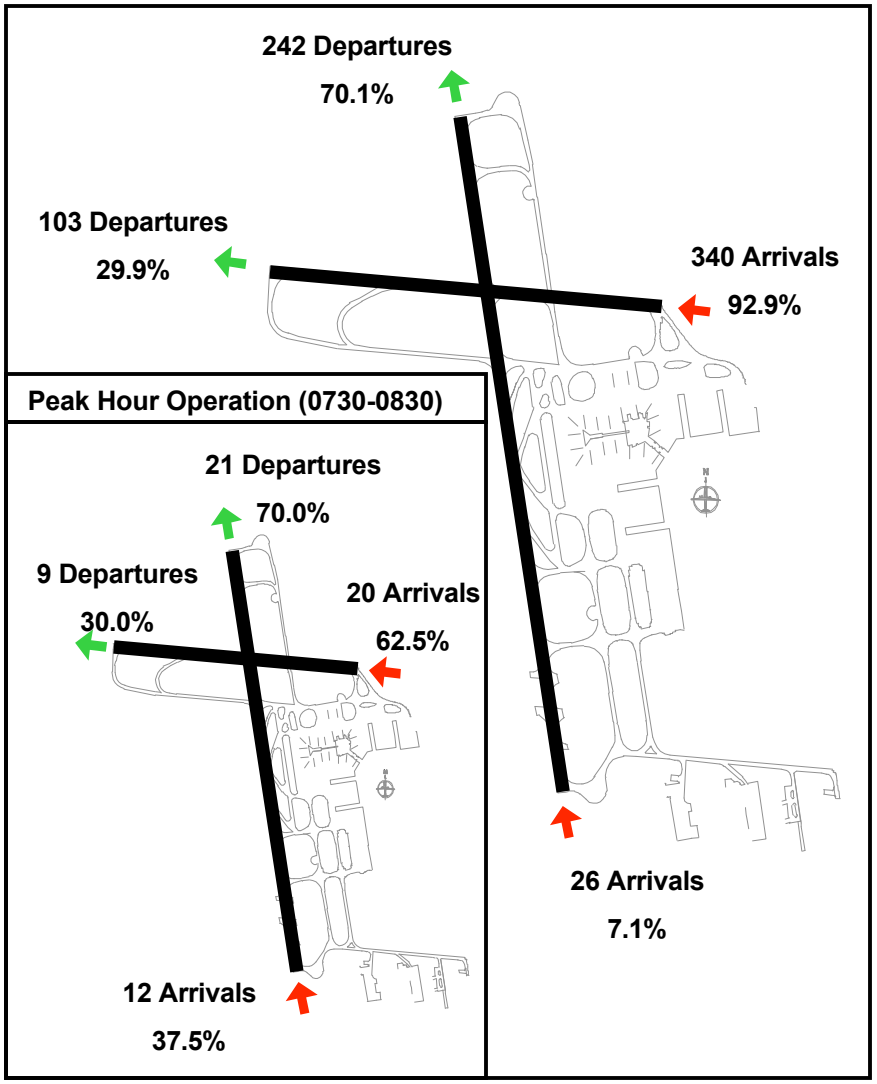
Taxi Flow


NORTH FLOW
Modeled
Taxiway Delay Study Area

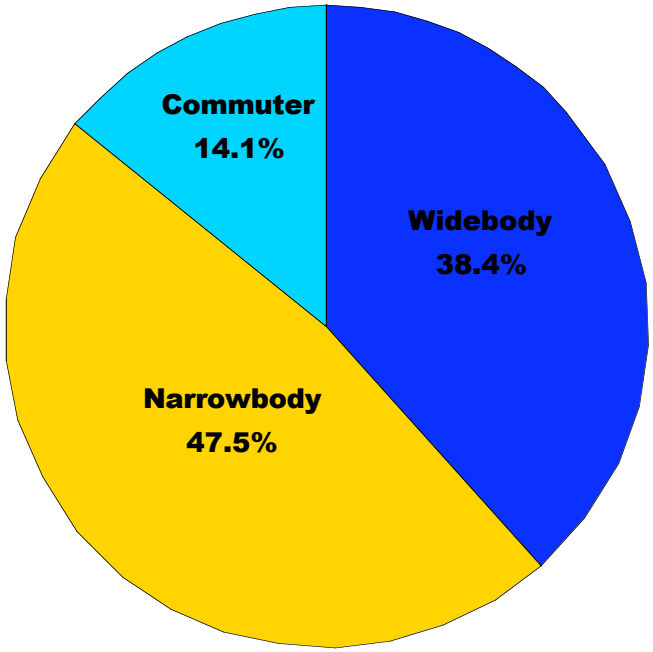

SOUTH FLOW
Not modeled

Air Traffic Control Assumptions

- 2015 forecast demand
- Gated flight schedule
- North flow airfield operation
- Visual flight rules
- Typical taxi routes

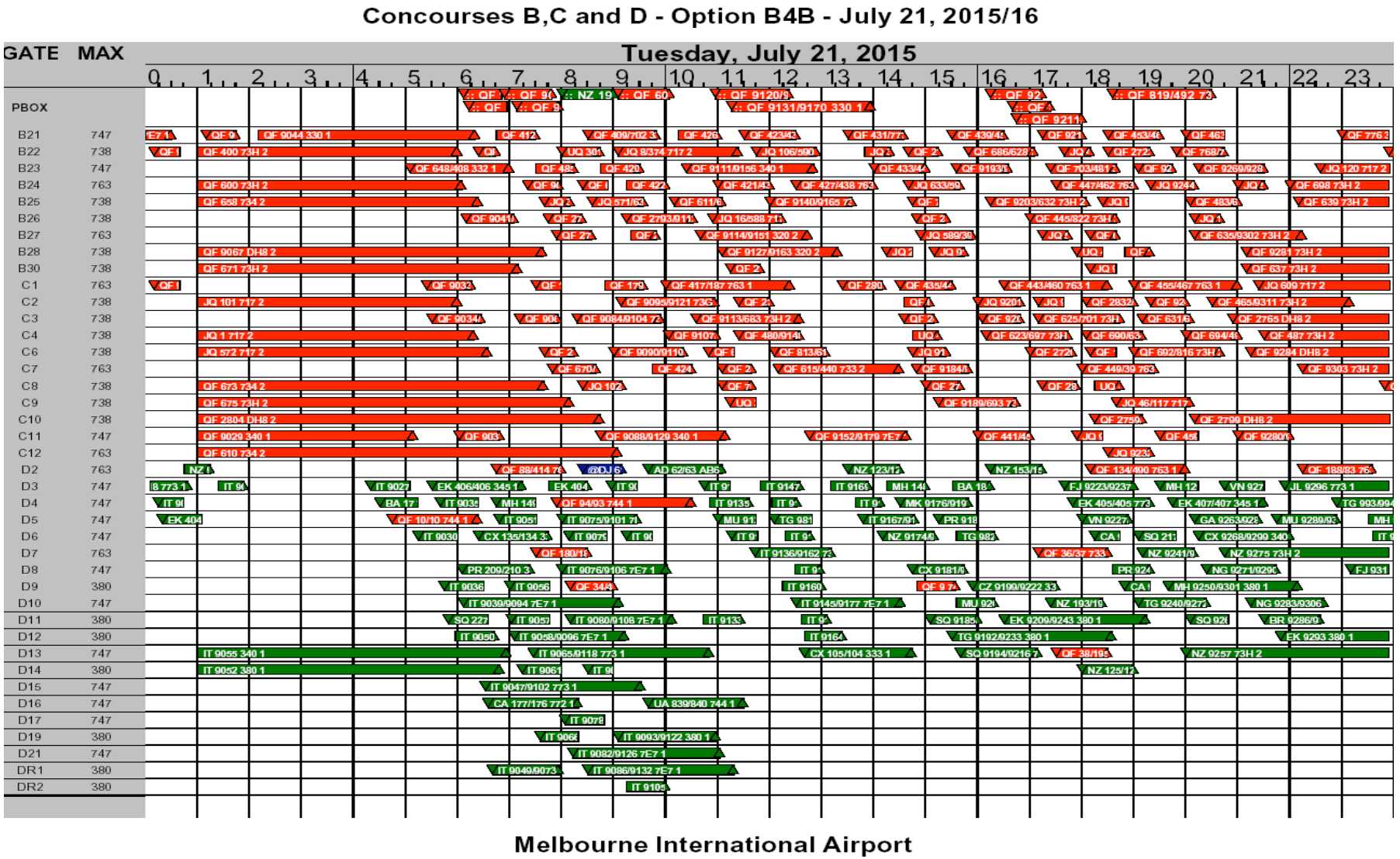


Future Flight Schedule Summary

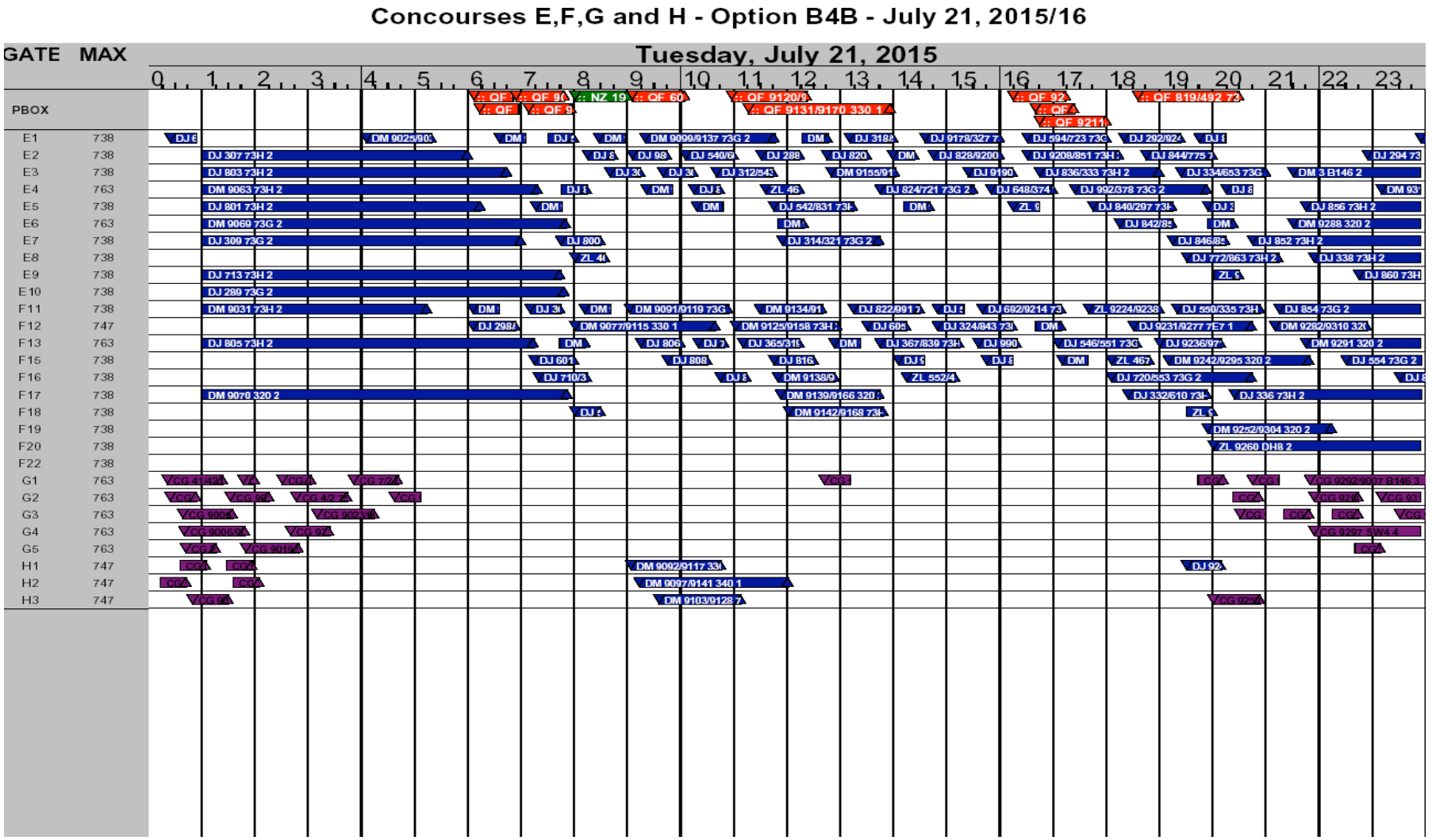


	Equipment	Operations	Percentage
Wide	A300	2	0.3%
	A330	43	6.0%
	A340	30	4.2%
	A380	21	3.0%
	B747	15	2.1%
	B757	20	2.8%
	B767	36	5.1%
	B777	26	3.7%
	B7E7	80	11.3%
	Total	273	38.4%
Narrow	A320	61	8.6%
	B717	42	5.9%
	B737	235	33.1%
	Total	338	47.5%
Commuter	BAE300	9	1.3%
	DH8	58	8.2%
	SW3/4	26	3.7%
	Other	7	1.0%
	Total	100	14.1%
Total		711	100.0%

Gate Usage (1)


Concourses B,C and D - Option B4B - July 21, 2015/16
GATE MAX
Tuesday, July 21, 2015
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
PBOX
B21 747
B22 738
B23 747
B24 763
B25 738
B26 738
B27 763
B28 738
B30 738
C1 763
C2 738
C3 738
C4 738
C6 738
C7 763
C8 738
C9 738
C10 738
C11 747
C12 763
D2 763
D3 747
D4 747
D5 747
D6 747
D7 763
D8 747
D9 380
D10 747
D11 380
D12 380
D13 747
D14 380
D15 747
D16 747
D17 747
D19 380
D21 747
DR1 380
DR2 380
Melbourne International Airport

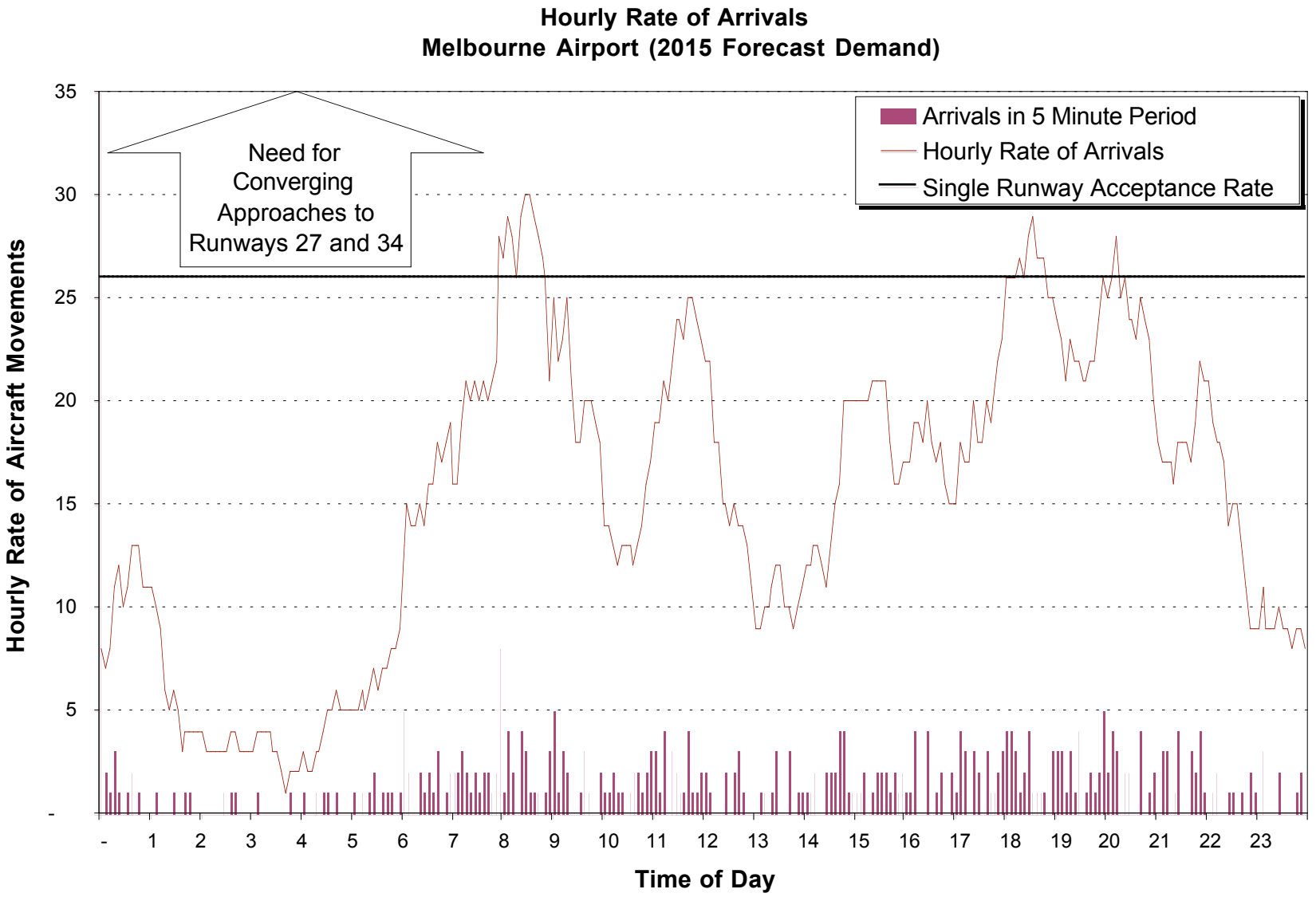
Gate Usage (2)


Concourses E,F,G and H - Option B4B - July 21, 2015/16
GATE MAX
Tuesday, July 21, 2015
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
PBOX
E1 738
E2 738
E3 738
E4 763
E5 738
E6 763
E7 738
E8 738
E9 738
E10 738
F11 738
F12 747
F13 763
F15 738
F16 738
F17 738
F18 738
F19 738
F20 738
F22 738
G1 763
G2 763
G3 763
G4 763
G5 763
H1 747
H2 747
H3 747
Melbourne International Airport

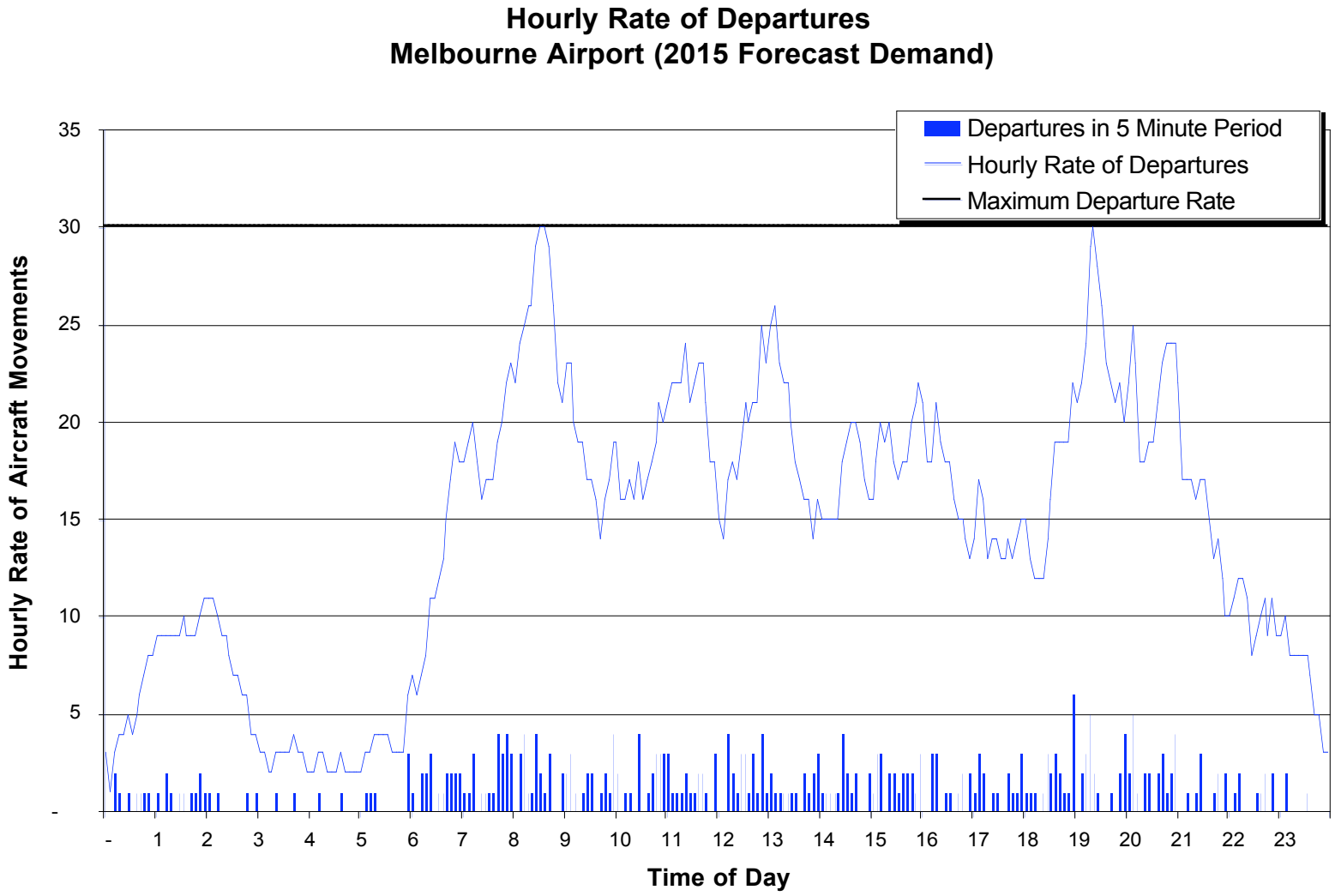
Runway Use Assumptions

- Study only evaluates north flow
- Demand analyzed to determine need for dual approaches to Runways 27 and 34 by time of day
- Dual departures on Runways 27 and 34
  - All heavy jets depart on Runway 34
  - Other departure demand split between Runways 27 and 34

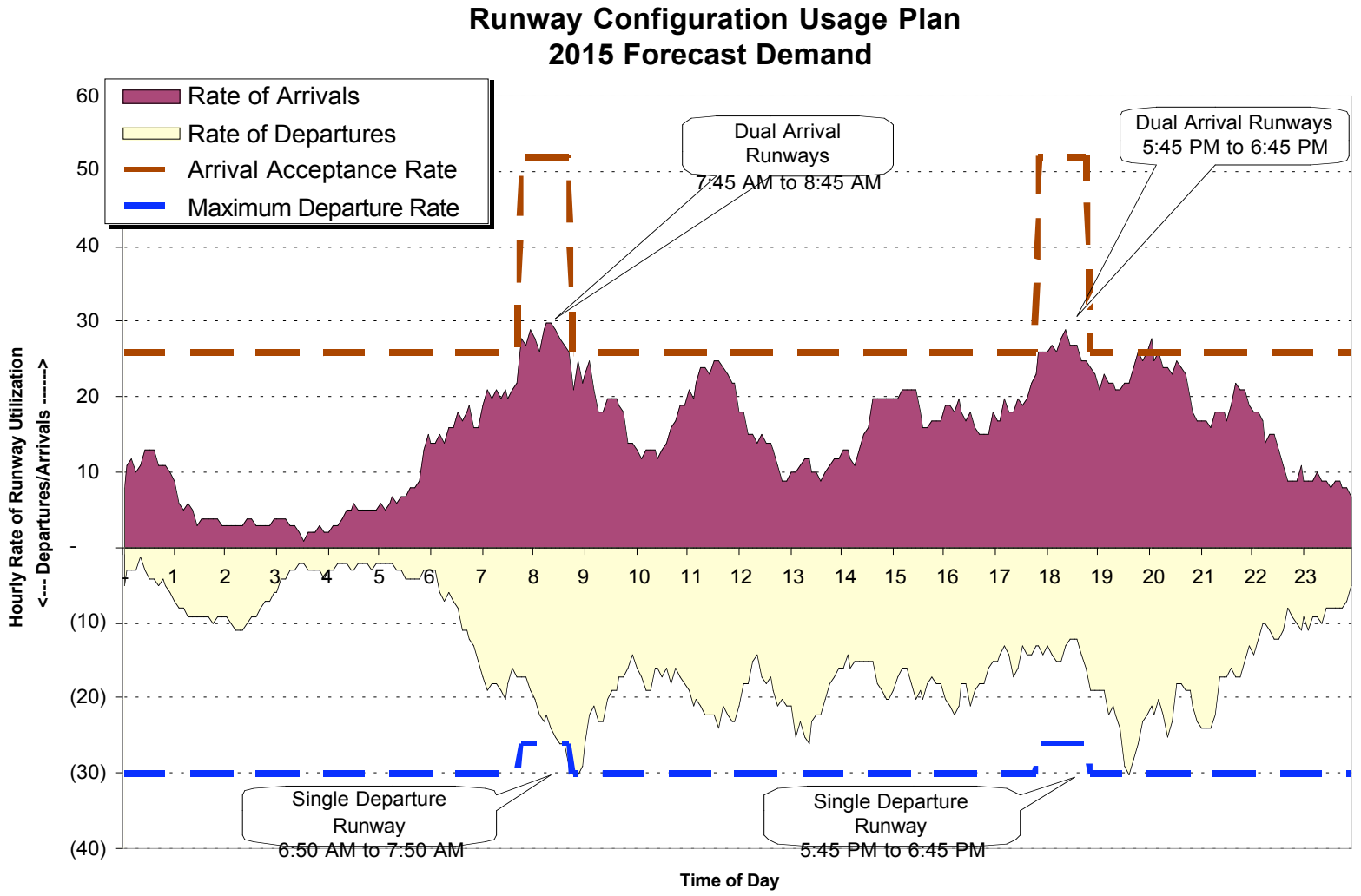
Analysis of Arrival Runway Demand
VFR _ North Flow



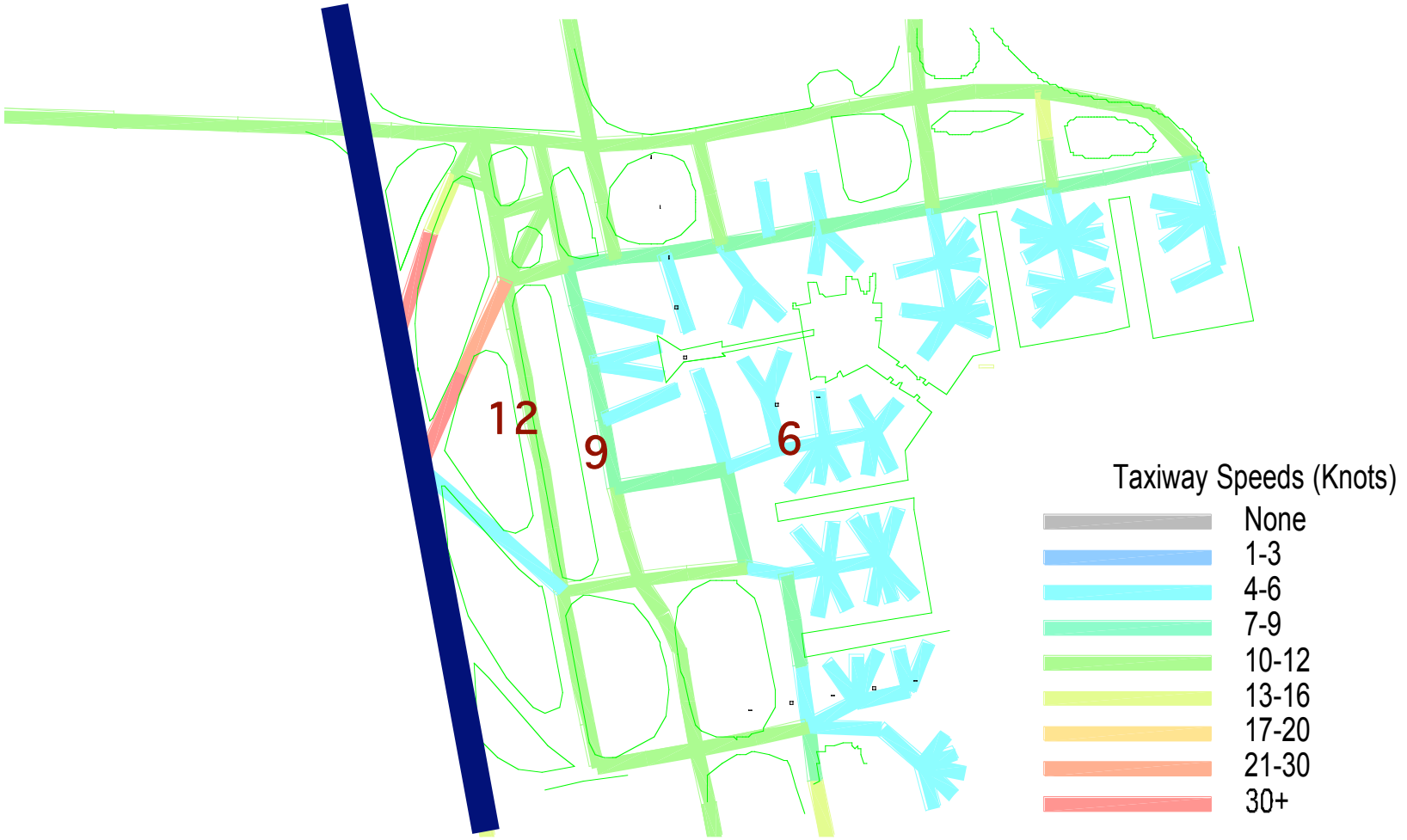
Analysis of Departure Runway Demand
VFR _ North Flow



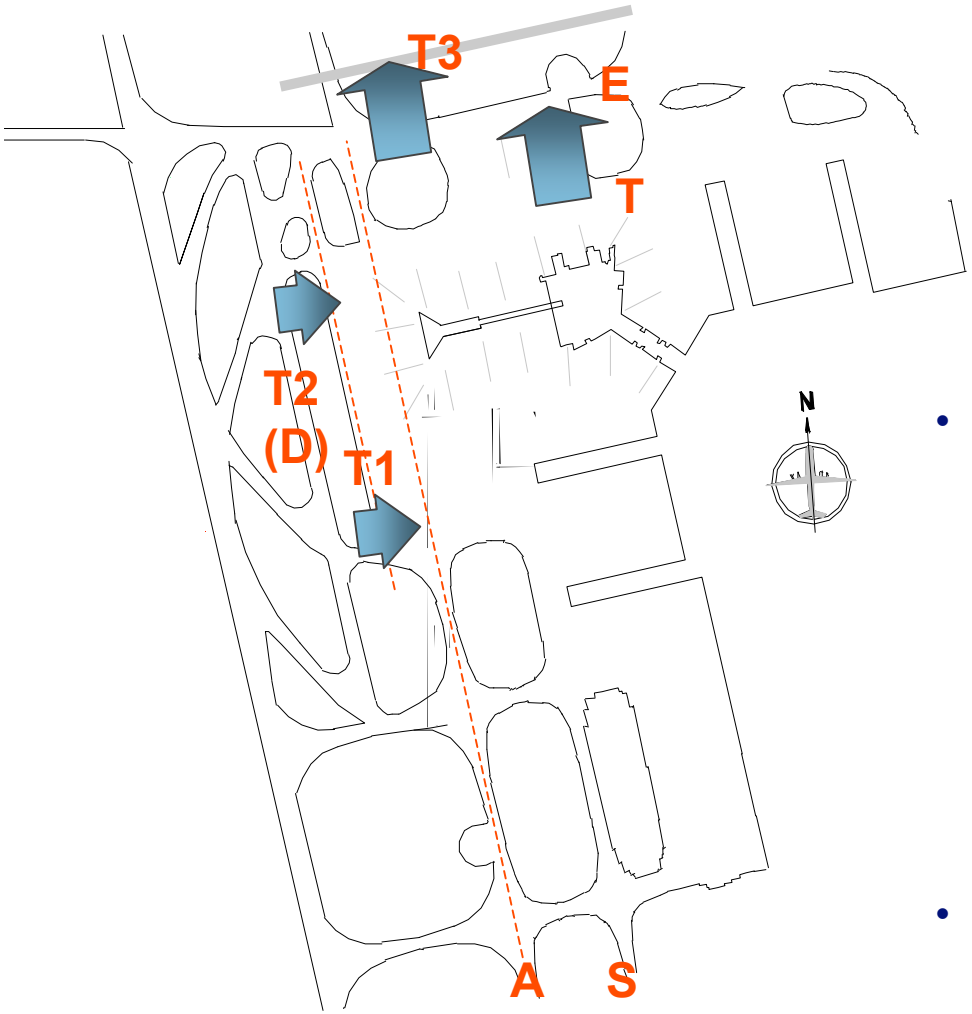
Evaluation of Arrival and Departure Capacity Needs



Taxiway Speed Assignments



Concept 3A Modeling Approach



- 3A airfield network derived from B4A airfield network with the following changes:
  - Gates D12 and D17 reconfigured to pushback to Taxiway A
  - Taxiway A operations modeled on Concept B4-A Taxiway T1
  - T1 operations modeled on Concept B4-A Taxiway T2 (D)
- Preliminary analysis indicated single taxiway North of terminal complex not able to support 375 daily operations, existing dual taxiway configuration is required
  - Concept 3A will require an additional parallel taxiway (T3) north of Taxiway E, extending from TWY A to TWY P
  - Dual taxiway configuration modeled on existing taxiways
- Nine gates change location between concepts, minimal difference in unimpeded taxi times

Taxiway Flow Analysis Results

1. B4a – With Extended Relocated Taxiway D and With Additional Crossover
2. B4a – With Extended Relocated Taxiway D and Without Additional Crossover
3. B4a – Without Extended Relocated Taxiway D and With Additional Crossover
4. B4a – Without Extended Relocated Taxiway D and Without Additional Crossover
5. A3 – With Extended Relocated Taxiway D and With Additional Crossover
6. A3 – With Extended Relocated Taxiway D and Without Additional Crossover
7. A3 – Without Extended Relocated Taxiway D and With Additional Crossover
8. A3 – Without Extended Relocated Taxiway D and Without Additional Crossover
9. Analysis of two-way movement requirements
10. Need for simultaneous two-way movements

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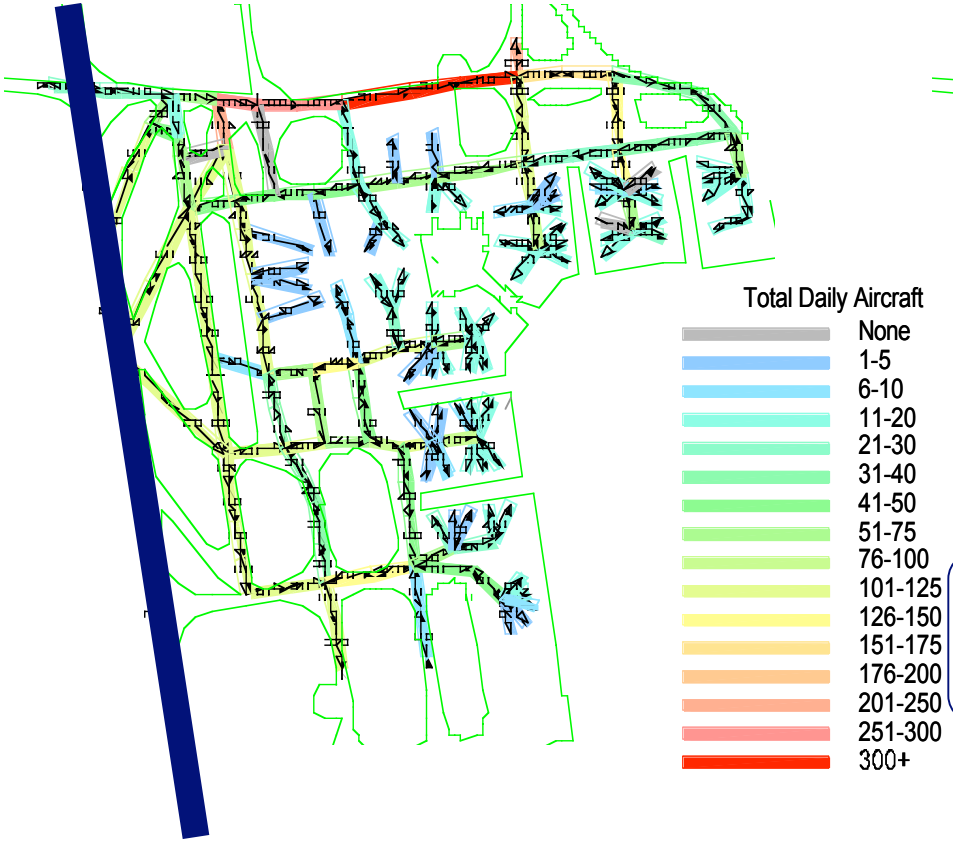
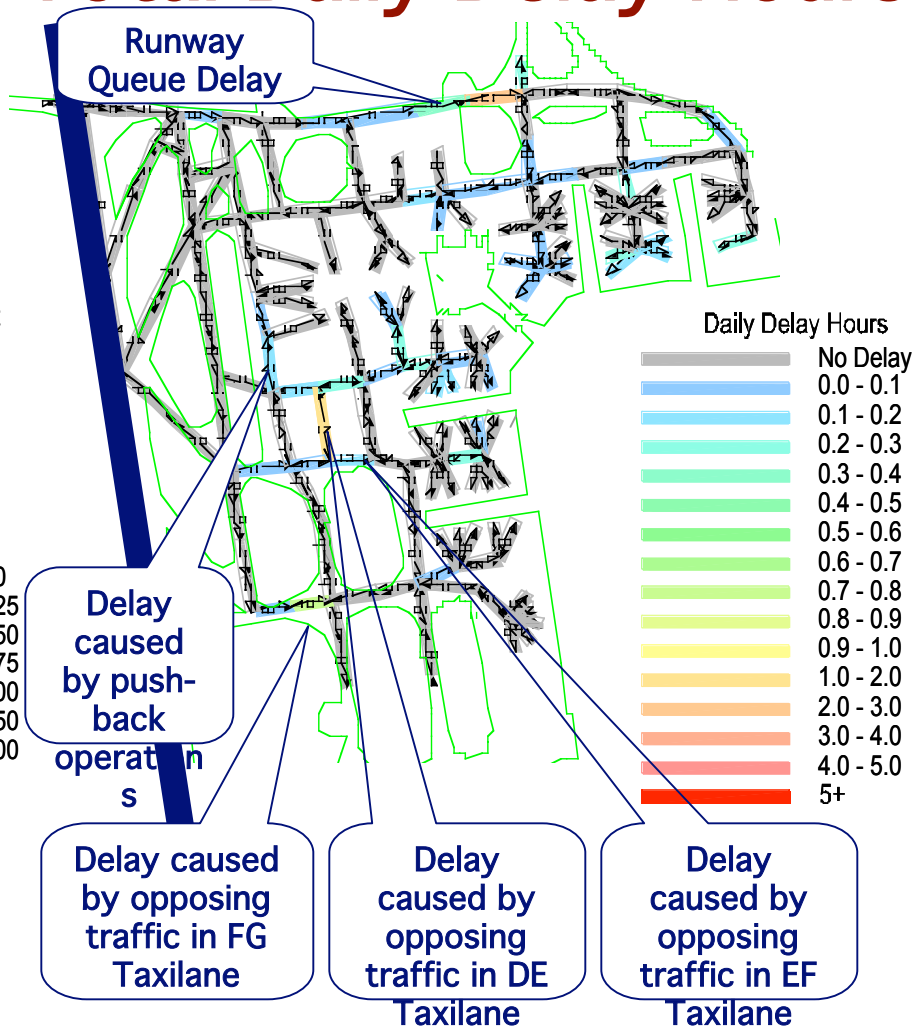
Daily Taxiway Usage and Delay (Concept B4A)

With Extended Relocated Taxiway D and With Additional Crossover

Total Daily Aircraft

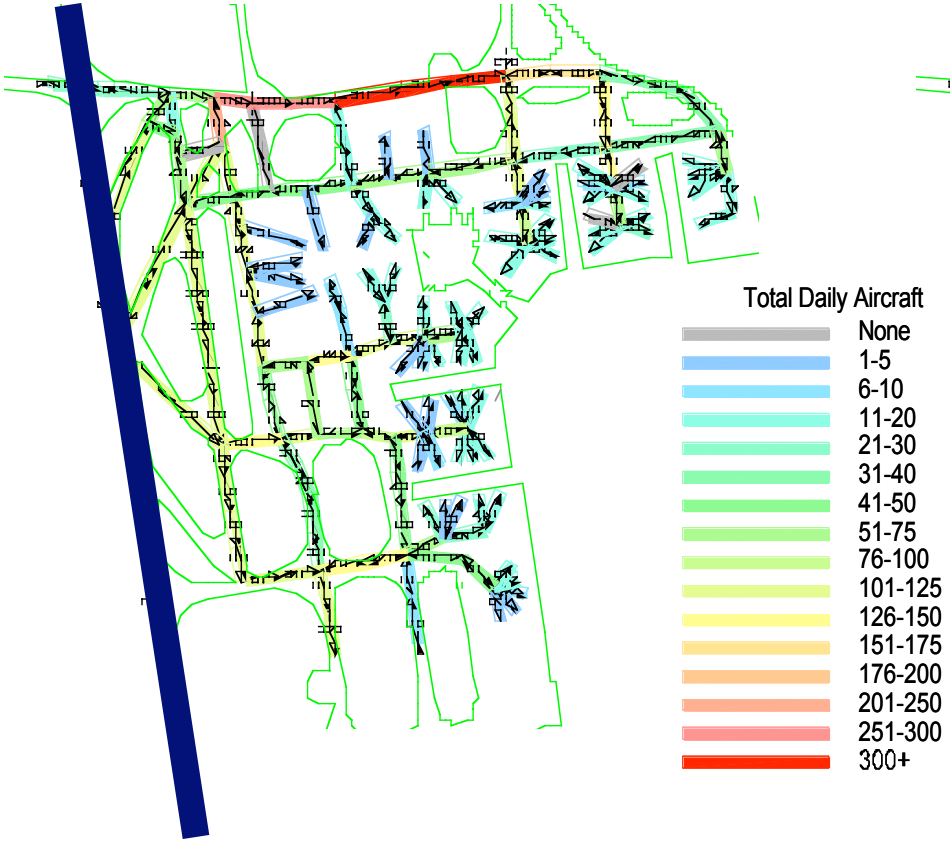


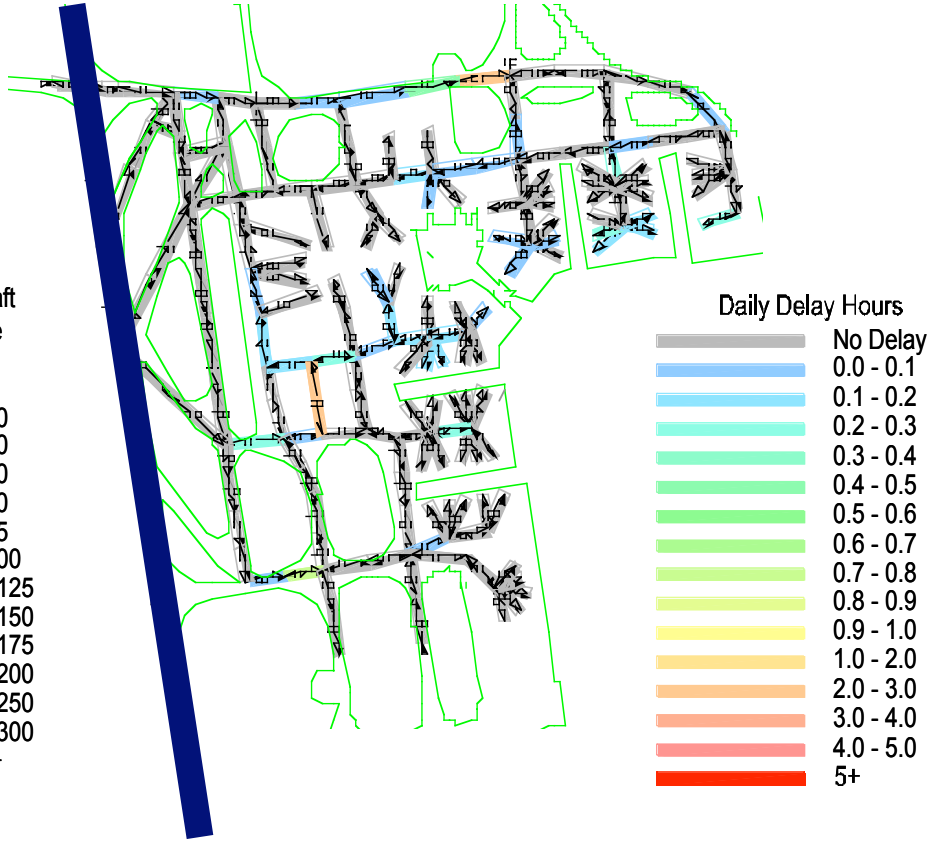
Total Daily Delay Hours



Daily Taxiway Usage and Delay (Concept B4A)

With Extended Relocated Taxiway D and Without Additional Crossover

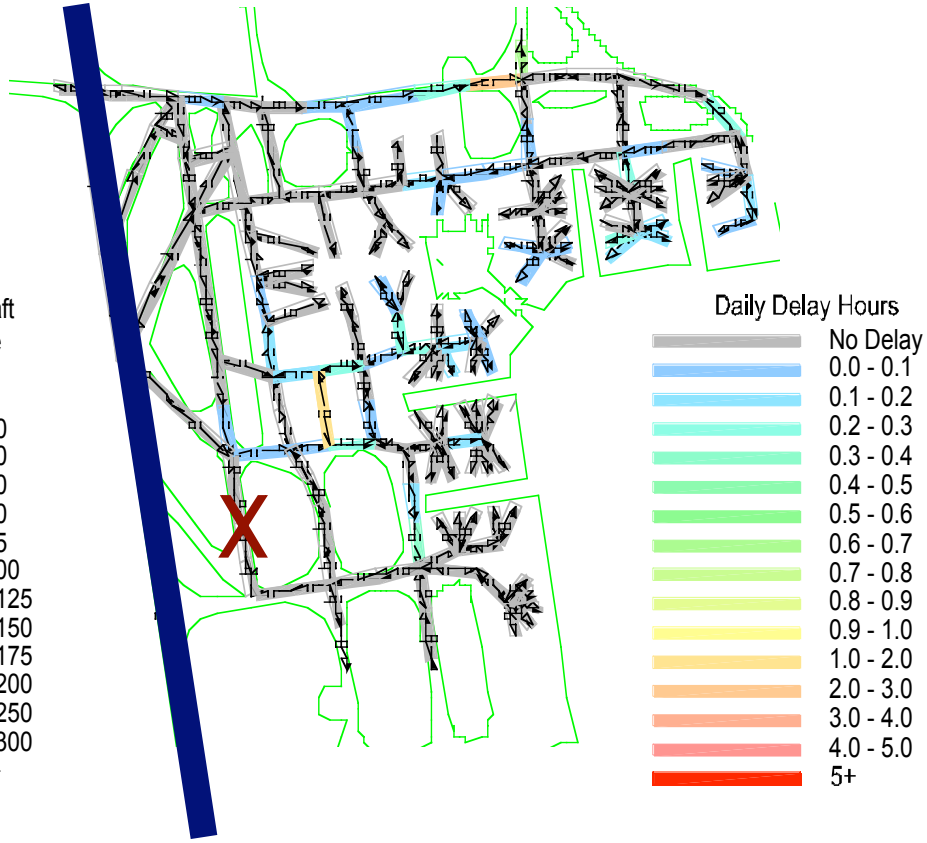




Total Daily Aircraft

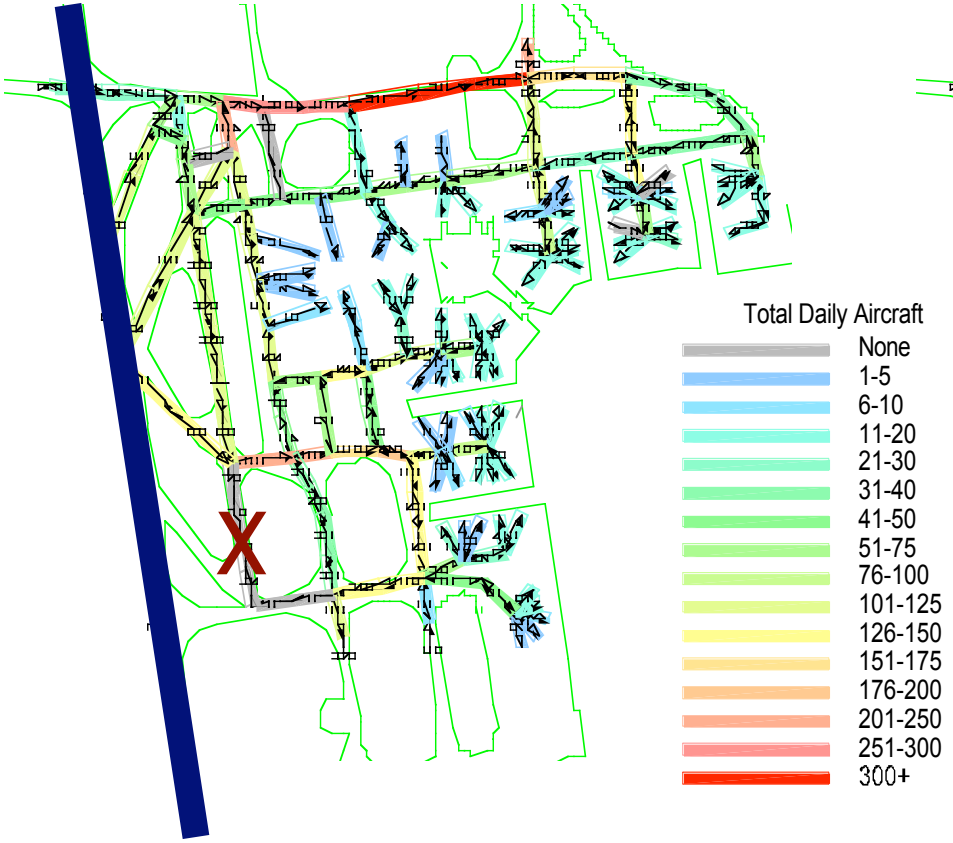
Total Daily Delay Hours

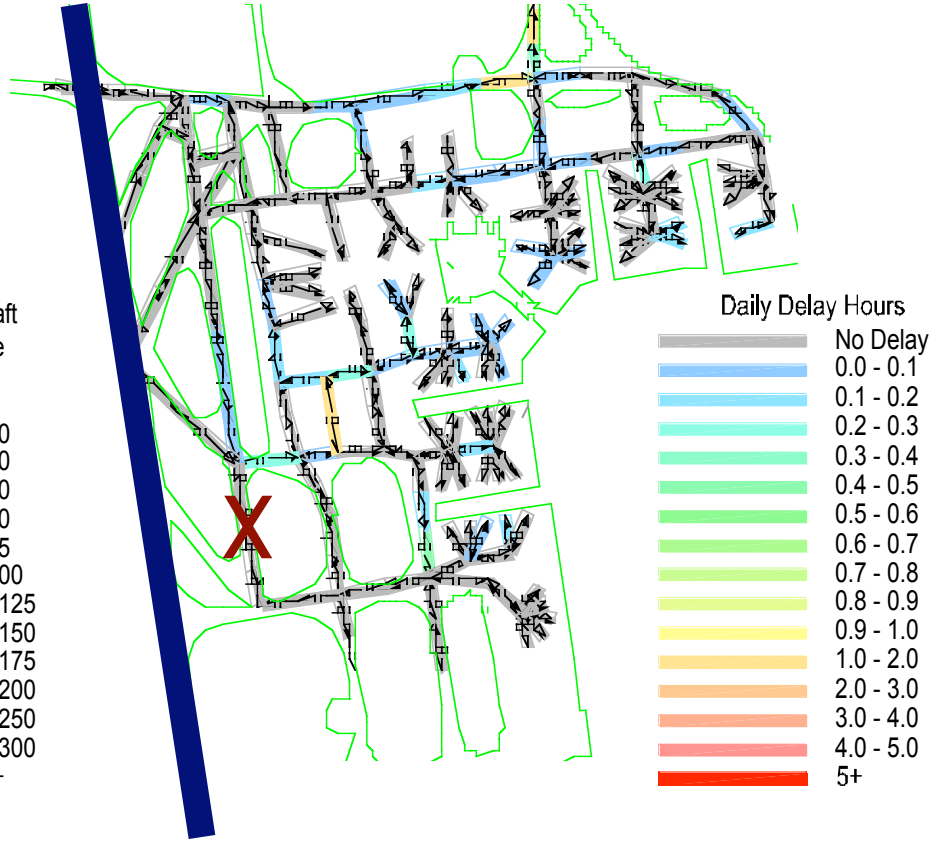
Daily Taxiway Usage and Delay (Concept B4A)
without Extended Relocated Taxiway D and with Additional Taxiway Crossover



Total Daily Aircraft **Total Daily Delay Hours**

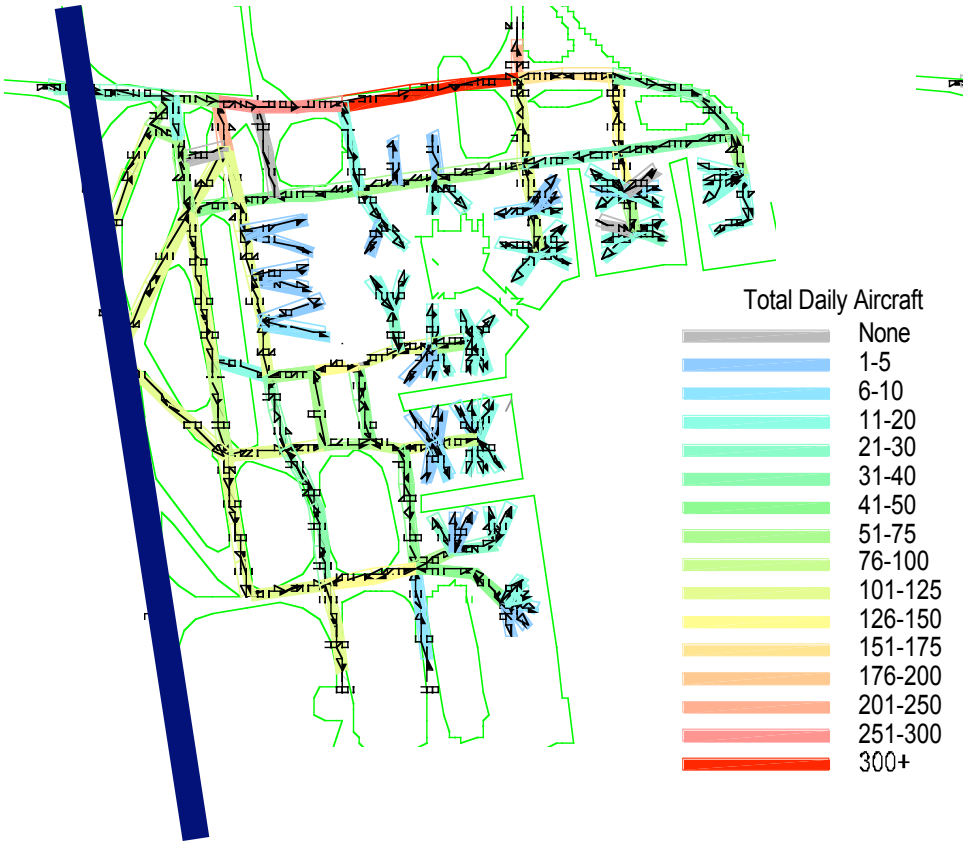
Daily Taxiway Usage and Delay (Concept B4A)
without Extended Relocated Taxiway D and without Additional Taxiway Crossover

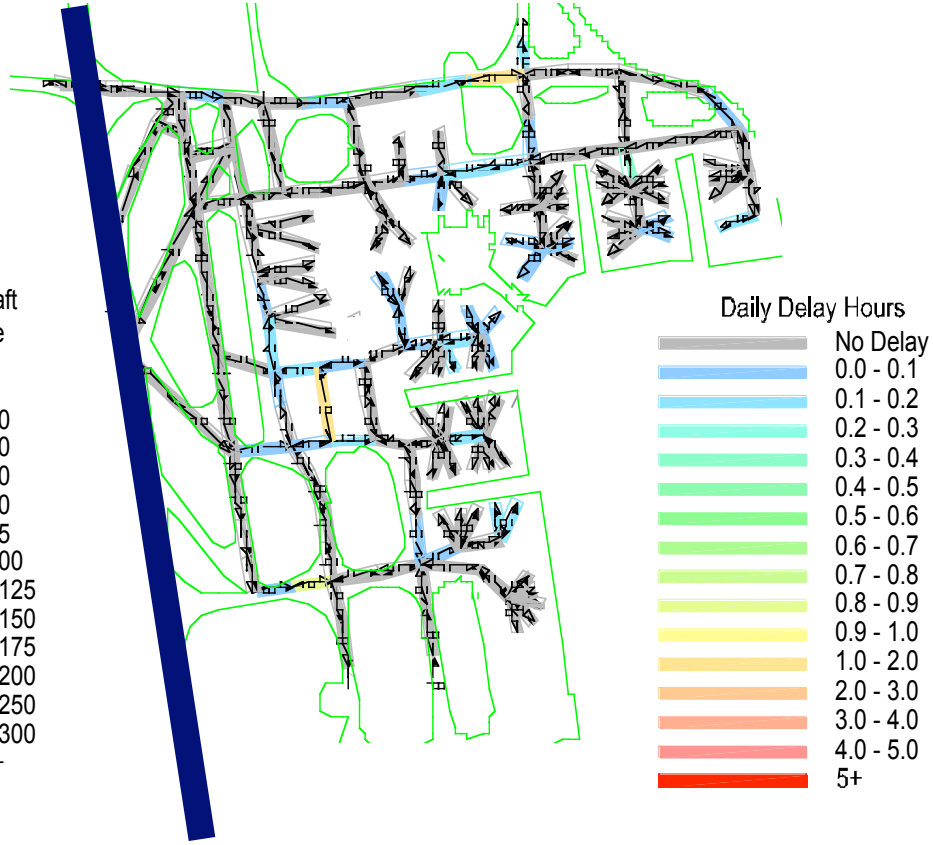




Total Daily Aircraft **Total Daily Delay Hours**

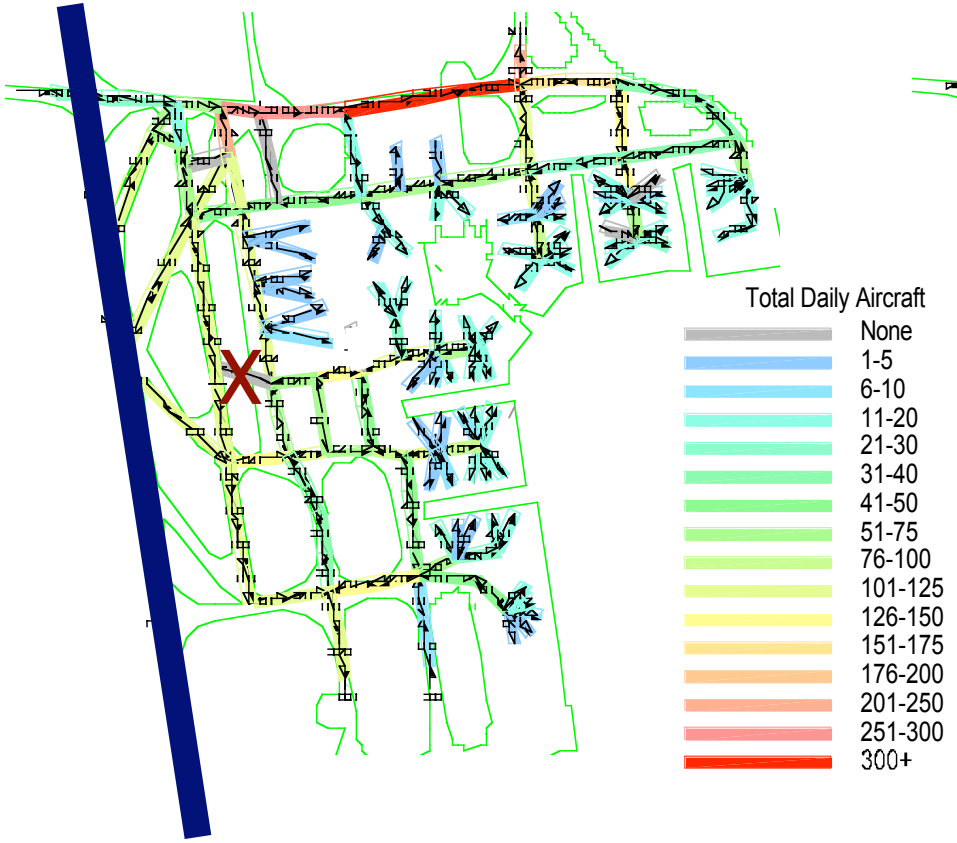
Daily Taxiway Usage and Delay (Concept A3)
With Extended Taxiway D and With Additional Crossover

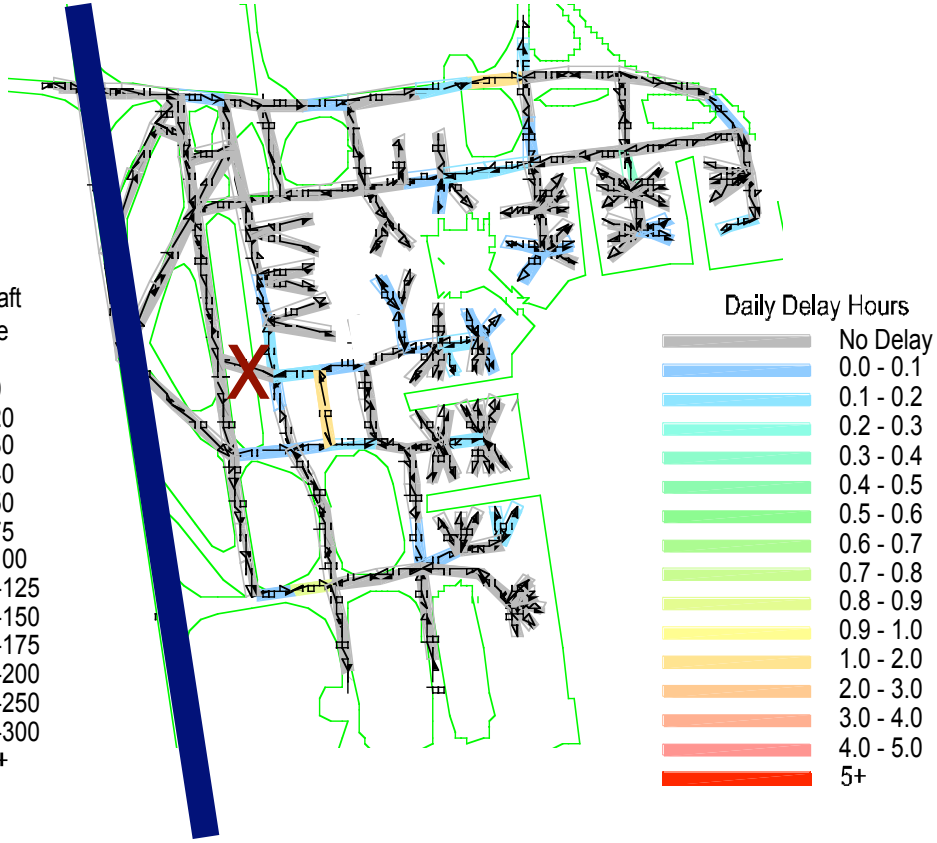




Total Daily Aircraft **Total Daily Delay Hours**

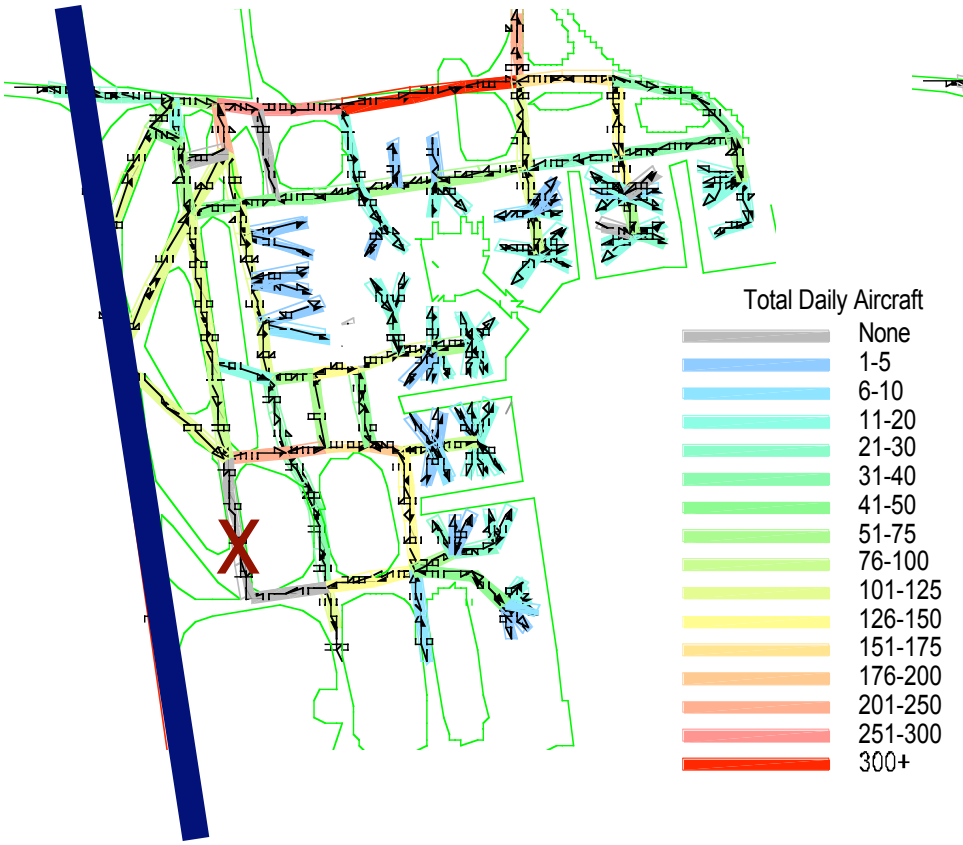
Daily Taxiway Usage and Delay (Concept A3)
With Extended Taxiway D and Without Additional Crossover

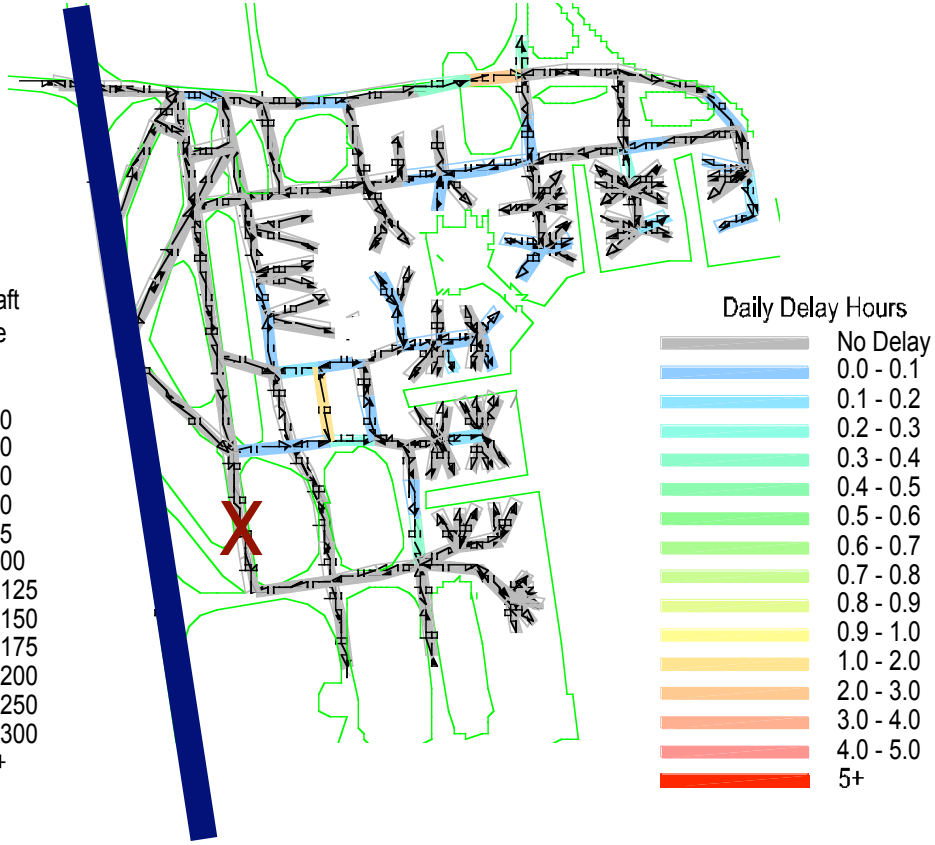




Total Daily Aircraft **Total Daily Delay Hours**

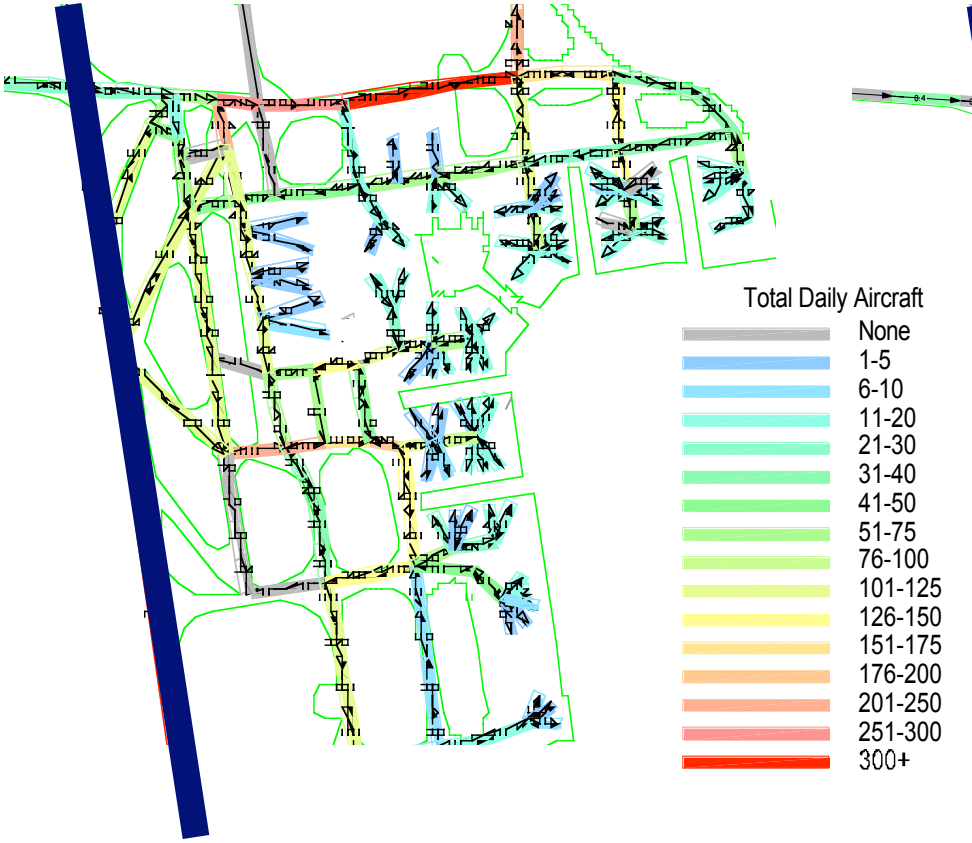
Daily Taxiway Usage and Delay (Concept A3)
Without Extended Taxiway D and With Additional Crossover

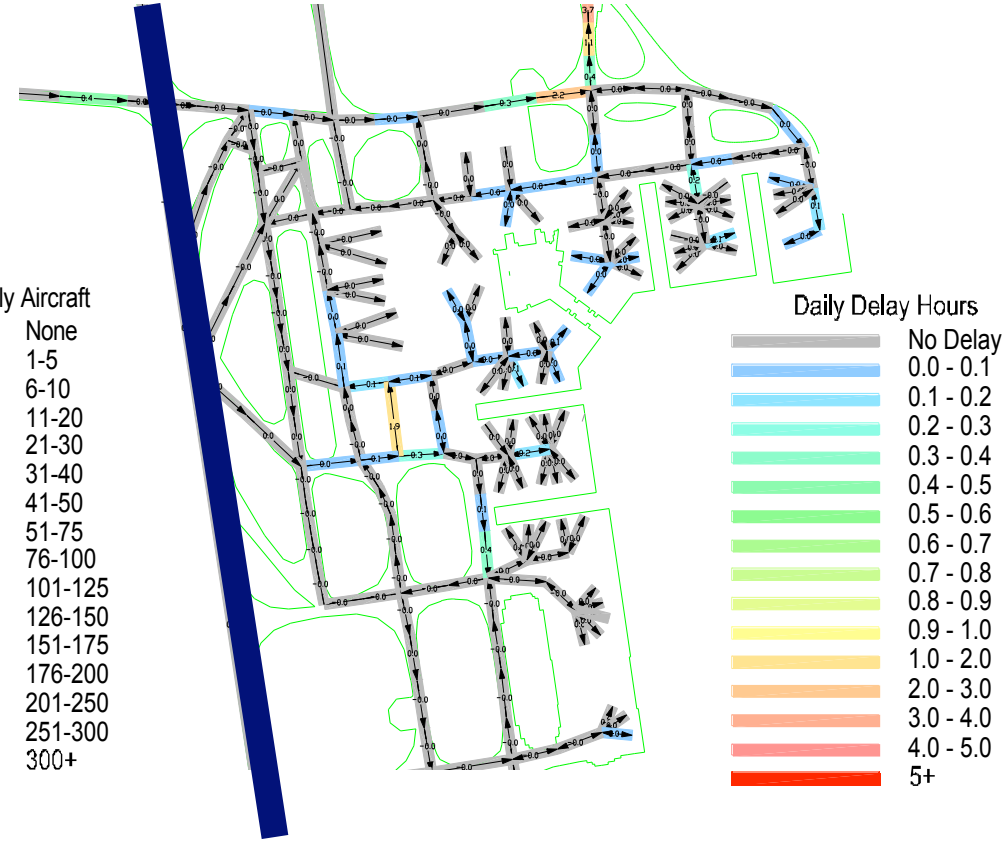




Total Daily Aircraft **Total Daily Delay Hours**

Daily Taxiway Usage and Delay (Concept A3)
Without Extended Taxiway D and Without Additional Crossover





Total Daily Aircraft **Total Daily Delay Hours**

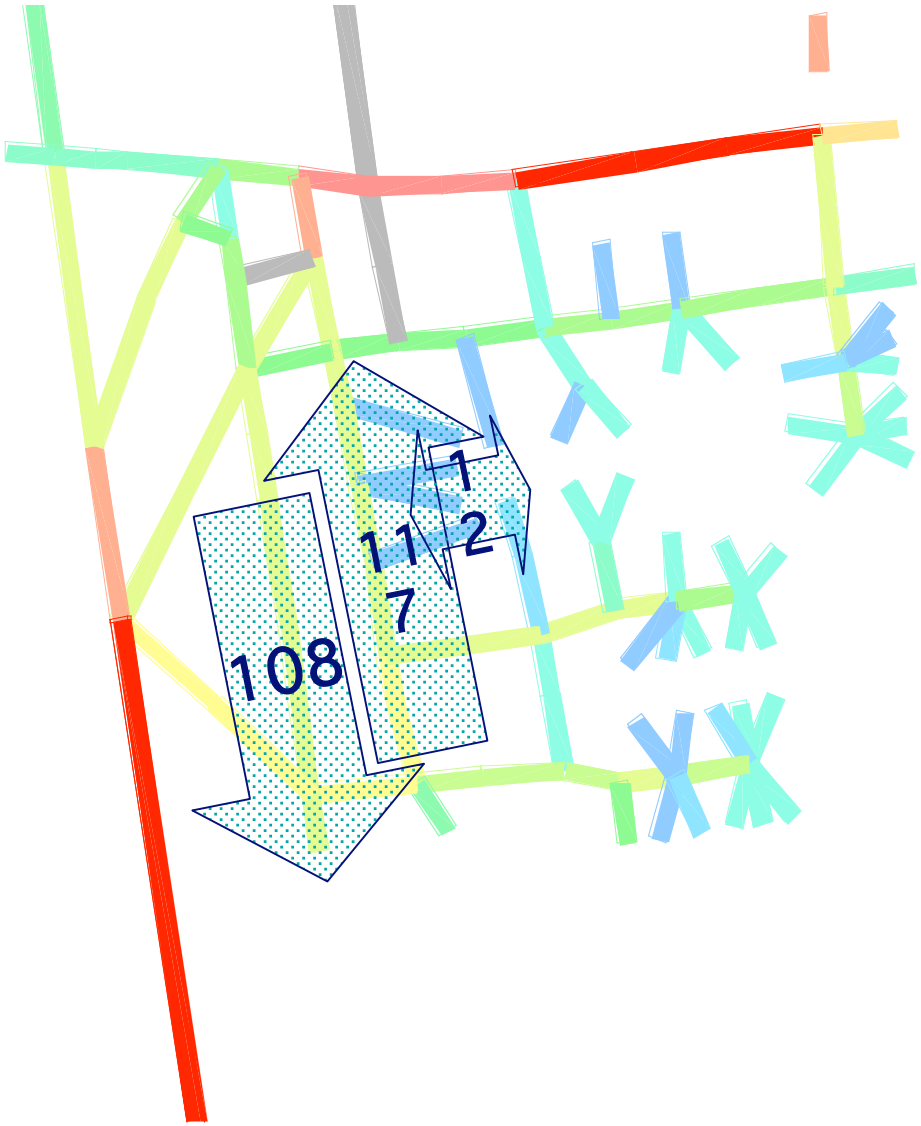
Travel Time Comparison

- Extending replacement Taxiway D south reduces daily travel times by 1.80 to 1.83 hours
- Concept B reduces the number of gates served by the taxi-lane between Piers D and E and thus reduces travel times
- Additional crossover taxiway reduces daily travel times by another 0.17 to 0.48 hours
- Highest delay (4.28 hours) in Concept B4A with Taxiway D extension, lowest delay (3.15 hours) in Concept A3 without Taxiway D extension

Daily Travel Time Hours on Terminal Area Taxiways

Taxiway Configuration	Concept B4A	Concept A3	Benefit of Concept A3
Without Taxiway D Extension	46.13	45.21	0.91
With Taxiway D Extension	44.33	43.38	0.95
Benefit of Taxiway D Extension	1.80	1.83	
With Additional Crossover	43.85	43.18	0.66
Benefit of Additional Crossover	0.48	0.19	
With Additional Crossover and Without Taxiway D Extension	45.96	45.03	0.93
Benefit of Additional Crossover	0.17	0.18	

Need for simultaneous two-way movements



- Traffic flow approximately equal in both directions
- Movements occur simultaneously
- Sufficient peak hour volume to require two taxiways
- The twelve movements per day from Pier D do not significantly hinder movement along apron edge taxilane
- Need two independent taxiway flows
- One taxiway can accommodate the push-backs while serving through movements