

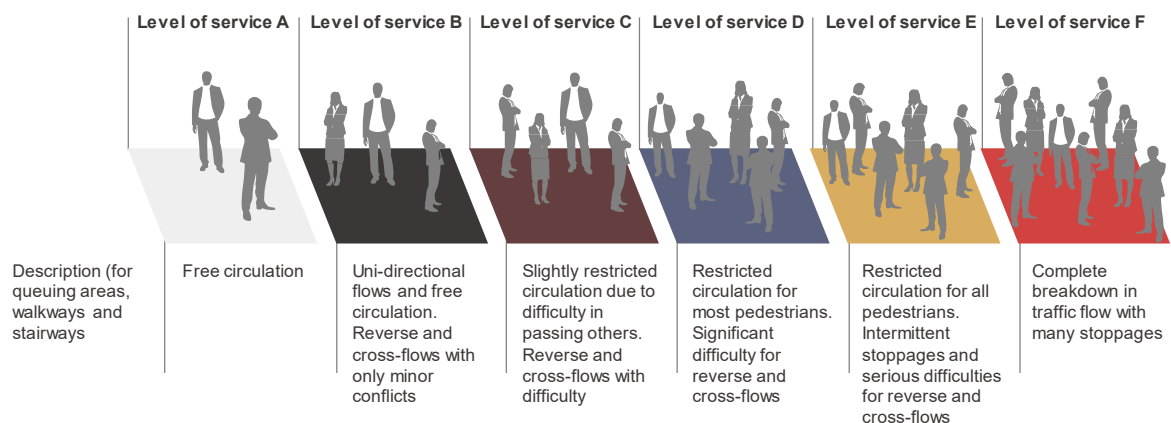
# Appendix four – Crowding pedestrian modelling

Both Sydney Trains and TfNSW collect data and conduct modelling on station crowding when planning for significant infrastructure or network capacity projects. The models consider information from a range of sources including:

- population and patronage information generated by the Strategic Travel Model (STM)
- qualitative assessments of crowding and customer behaviour provided by station staff
- dwell time data
- OPAL data including boarding and terminations
- interchanges (based on a TfNSW algorithm which predicts where customers are likely to interchange based on origin and destination)
- data on numbers of passengers requiring boarding assistance.

TfNSW and Sydney Trains use global industry standard Fruin Levels of Service to assess estimated crowding density. Exhibit 11 shows Fruin Levels of Service and the quality of passenger's space.

**Exhibit 11: Fruin Levels of Service and the quality of passengers' space**



Source: Transport for NSW.

For short periods of time or in emergency situations it is considered reasonable for people to experience Level of Service E or F. There is a trade-off between maximising the use of space and passenger comfort.

## Results of pedestrian modelling at Town Hall and Redfern stations

Approaching 2024, pedestrian modelling commissioned by Sydney Trains and TfNSW shows that Town Hall and Redfern stations will come under increasing pressure during normal operations. TfNSW and Sydney Trains do not expect to deliver network capacity upgrades (which will relieve pressure on these stations) until 2022.

Pedestrian modelling for Town Hall station shows that without intervention from Sydney Trains, the station may not perform satisfactorily in the 2024 PM peak interval (the busiest 15-minute period during the PM peak). The model shows excessive levels of congestion and a complete breakdown of passenger flow at OPAL gate lines at the entry to the station causing gridlock. Exhibit 12 shows a density heat map for Town Hall Station concourse in 2017 PM and projected for 2024 PM.

With some interventions, the model shows improvements in passenger flow however multiple platforms will operate at Fruin 'Level of Service D-E'. This level of congestion indicates uncomfortable crowding and restricted movement.

**Exhibit 12: Town Hall 2017 v 2024 PM (5.15–5.30pm) station concourse density heat map**

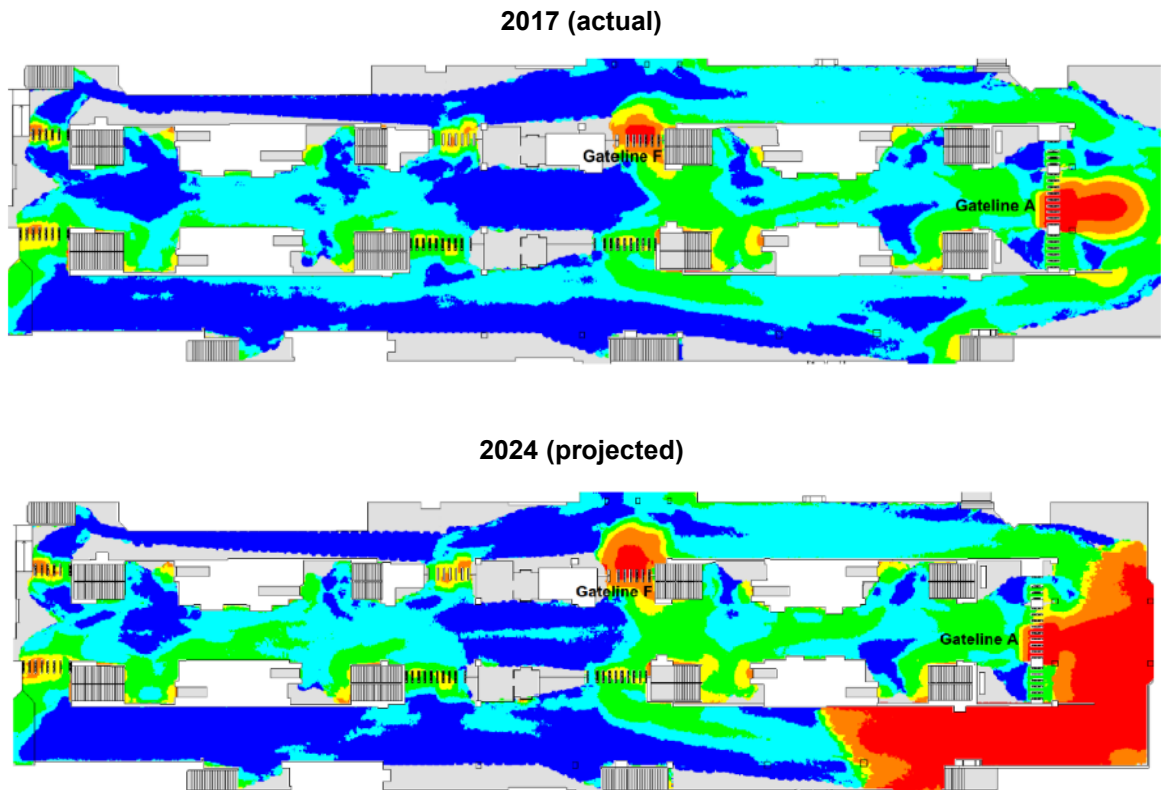


Figure 9: Density Heat Map Scale

*Fruin LoS Criteria for Walkways*

A	B	C	D	E	F	
∞	3.25	2.32	1.39	0.93	0.46	m <sup>2</sup> per passenger

Source: Transport for NSW 2017. Unaudited.

Pedestrian modelling for Redfern station shows that in the 2024 AM peak interval, the platform clearance time at platform four is longer than the train headway. This means that there is not enough time for alighting customers to leave the platform before the next train arrives, this leads to a risk of train delays. Some areas of platform four will operate at Fruin 'Level of Service E-F', indicating uncomfortable crowding and restricted movement.

If service delays occur at Town Hall and Redfern stations in 2024, with no intervention by Sydney Trains, it is likely to result in highly uncomfortable conditions and severely restricted movement, and a high risk of unsafe levels of congestion and gridlock.