

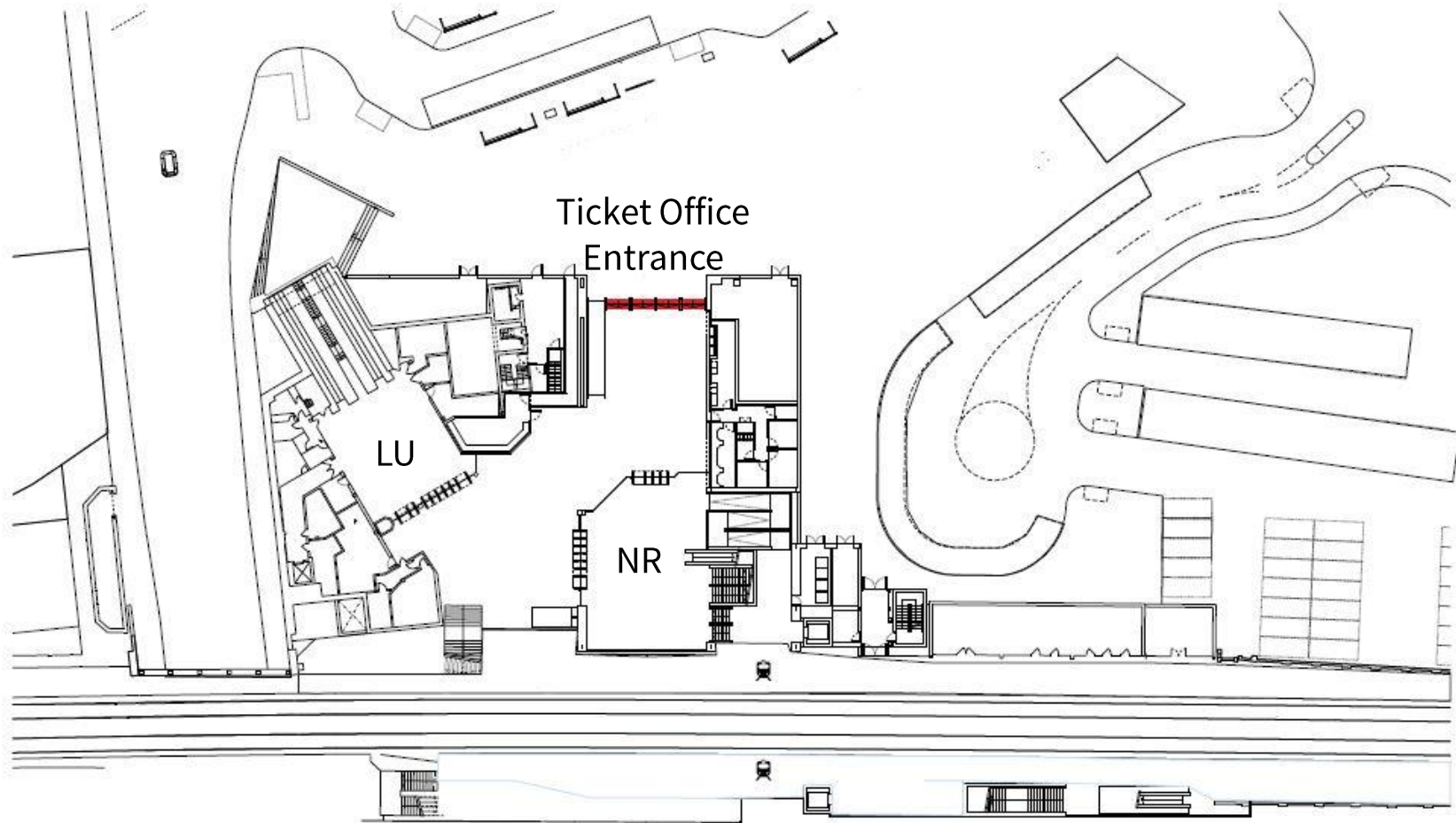
THFC New Stadium Tottenham Hale Interchange Analysis

Assessment of Station Capacity

- This document contains the outcome of an assessment of capacity of Tottenham Hale Station in the light of anticipated demand associated with an expanded Tottenham Hotspur Stadium.
- Two Match day scenarios are considered:
 - Midweek: 20:00 kick off, 21:50 final whistle
 - Weekend: 15:00 kick off, 16:50 final whistle
- Spectator demand forecasts have been generated by Tim Spencer & Co, using information from existing spectator surveys and analysis of THFC's database of Season Ticket Holders and those on the Waiting List.
- Assumptions used to generate the forecasts of Spectator demand at Transport Nodes are listed in a 'Data Book'.
- A spreadsheet model of demand and capacity has been constructed to assess the performance of different parts of the infrastructure
- The following pages summarise the performance throughout the pre- and post-match period for both the Midweek and Weekend scenarios
- Background loading on services and at the Station is included in the assessment. 22% growth has been applied to observed background figures to represent conditions in 2021.
- Station capacities are calculated according to SPSPG 'Special Events' guidance, this includes those elements which are Network Rail. NR and LU guidance for Special Events are largely consistent, with a slight difference for escalator capacities.

Station layout and entry points

- Station re-configuration is currently underway. The plan below shows the layout as assumed in 2021.
- At the time of assessment, the THFC Shuttle Bus pick-up/drop-off location was unconfirmed.

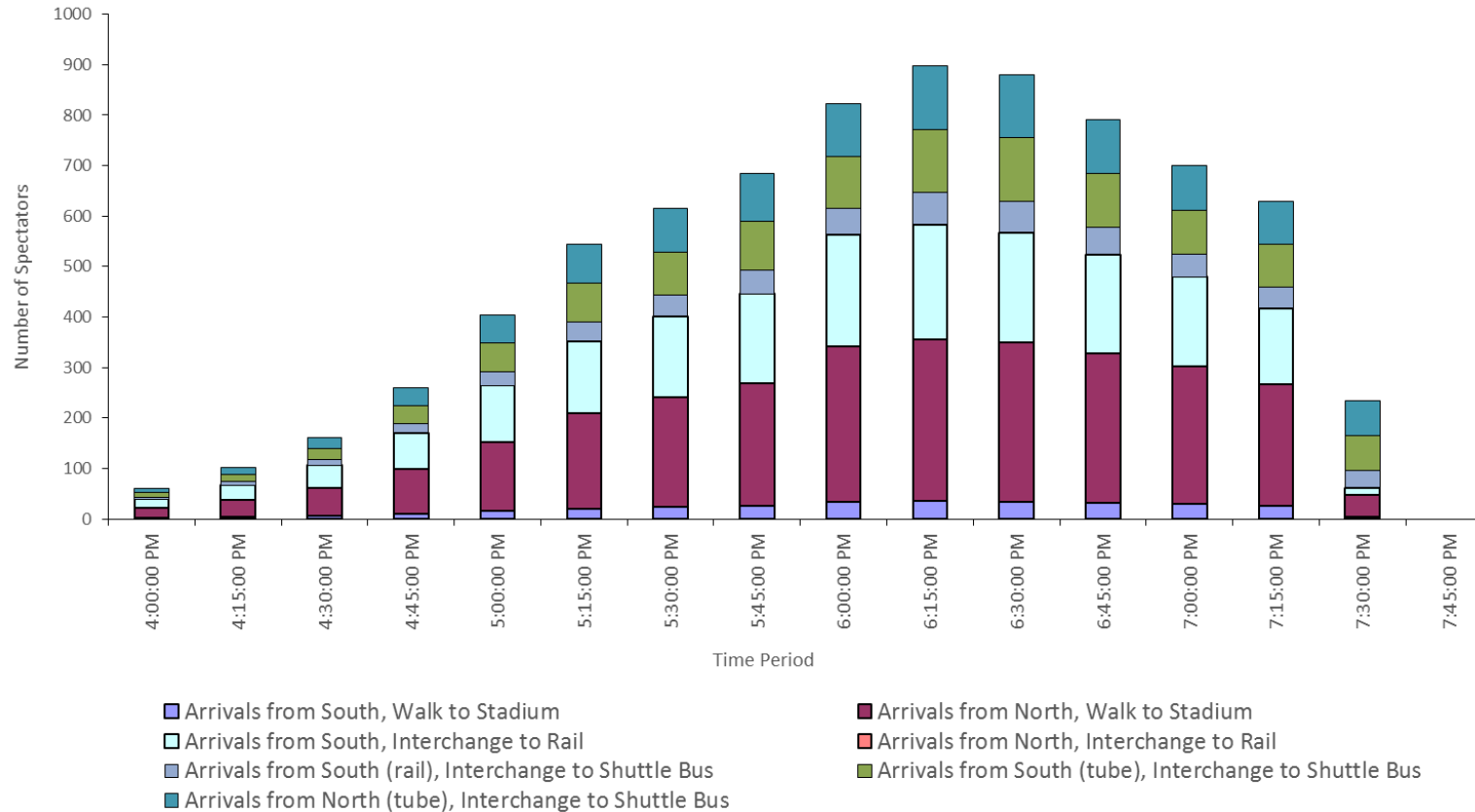




Midweek Matchday Scenario

Pre-match period: Arrival profile

Spectator Arrivals at Tottenham Hale during the Pre-Match Period



- 7,788 spectators in total (~13% of Spectators)
 - 3,086 exit the Station and Walk to the Stadium
 - 2,741 interchange onto a THFC Shuttle Bus
 - 1,961 interchange onto National Rail services to Northumberland Park

Pre-match period: access to the escalators/stairs from LU

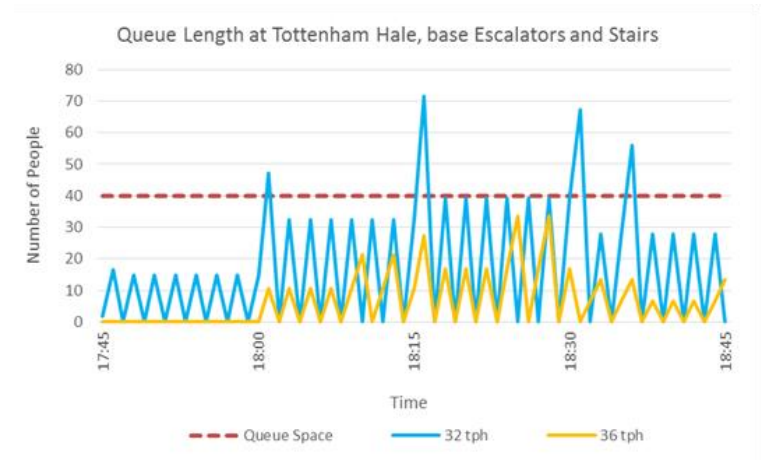
- During the pre-match period, the most significant constraint is access to the vertical circulation from the LU platforms.
- Observations during the current year indicate that some delays are experienced at this location, with queues taking up to one minute to clear at the busiest times.
- The Victoria Line service frequency will be increased, by 2021 it should be at 36tph in both directions during the midweek pre-match period. The train frequency increase at Tottenham Hale is a key element in preventing queue formation at the bottom of the escalator.
- It is estimated that the space at the base of the stairs/escalators can accommodate a queue of 40 people before it extends back to the platform exits.
- Table 1 shows the maximum queue length in this location with use of the stairs in addition to the existing escalator for different train frequencies.
- Table 2 shows the maximum queue length in this location without use of the stairs in addition to the existing escalator for different train frequencies.
- Chart 1 shows the queue patterns in this location for the peak hour with a frequency of 32 and 36 tph and a full use of the stairs.
- This analysis suggests that some queuing can be expected for at least 45 minutes. If the stairs are not used this would be for two hours.
- To avoid queues forming back on to platforms, use of stairs would need to be encouraged, and as highlighted, the high service frequency should be maintained.

Maximum Queue Length with Stairs

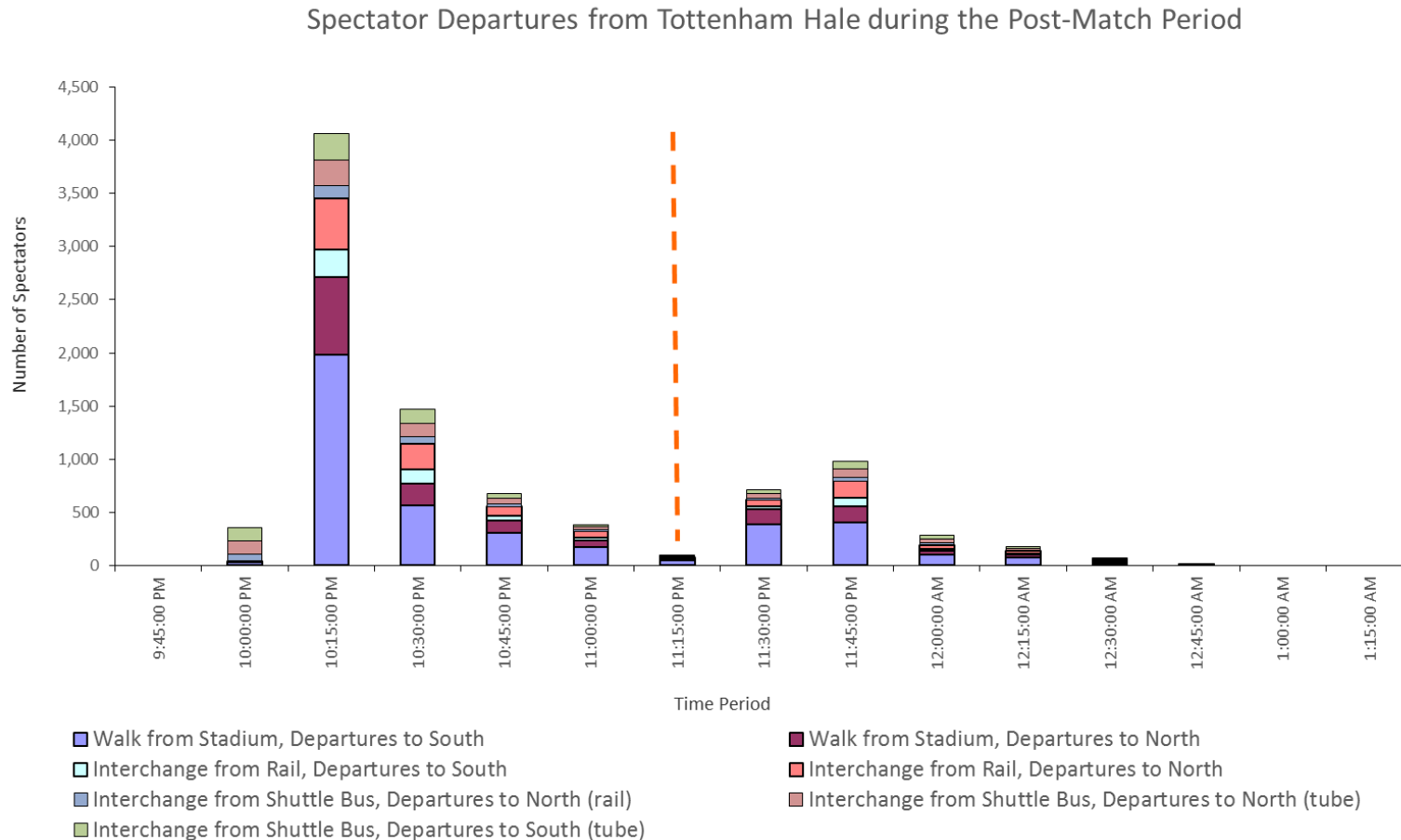
With use of the stairs	
28 tph	68
32 tph	72
36 tph	33

Maximum Queue Length without Stairs

Without use of the stairs	
28 tph	111
32 tph	153
36 tph	119



Post-match period - Arrival Profiles over time

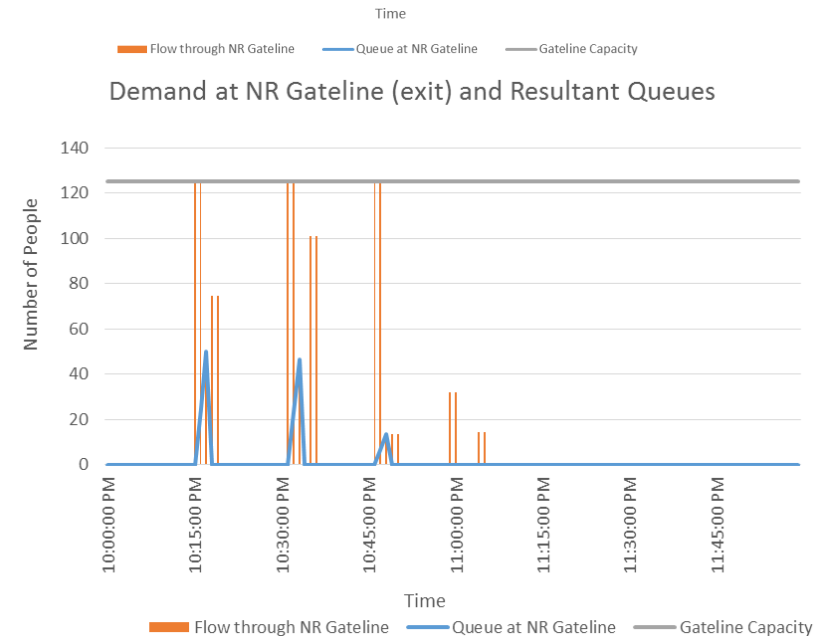
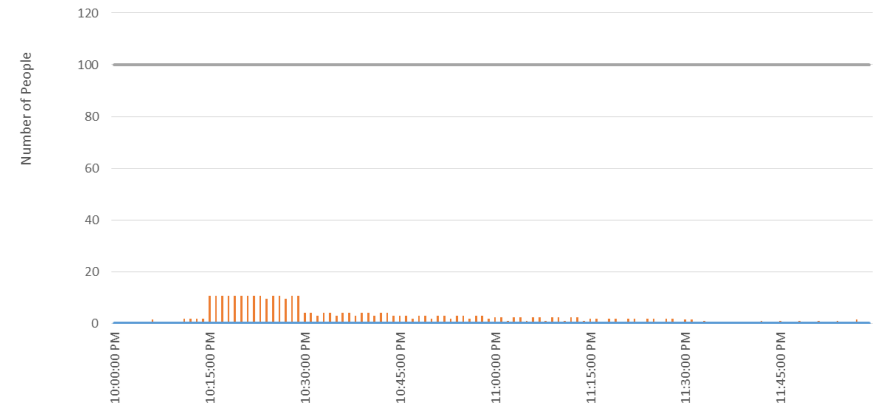


- 9,270 spectators in total (~15% of all spectators)
- 5,585 arrive on foot from the Stadium
- 1,795 interchange from NR train services from Northumberland Park
- 1,890 interchange from a THFC Shuttle bus service

Post-match period – use of National Rail Gateline

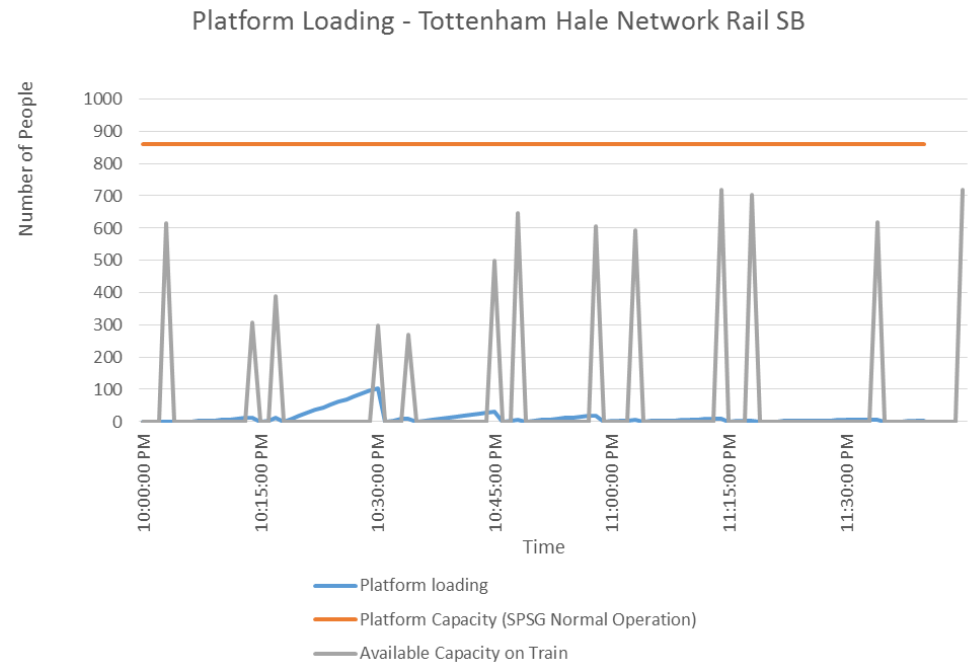
- It is assumed that entry into the National Rail station would be via **4 automated ticket gates**.
- This is sufficient capacity to accommodate all anticipated entry flows, assuming a maximum Shuttle Bus frequency of one every two minutes.
- Peak flows will occur between 22:15 and 22:30
- It is assumed that exit from the National Rail station would be via **5 automated ticket gates**.
- In the post-match period, this would predominantly be used by spectators boarding National Rail services at Northumberland Park and interchanging onto the Victoria Line at Tottenham Hale.
- As such, flows are associated with the arrival of specific services.
- The gateline capacity enables all alighters to clear within three minutes of the train arrival. Whilst there may be some short lived queuing at the gates, there is more than sufficient space within the re-configured concourse for these people to be accommodated without negatively affecting station operations or passenger safety.

Demand at NR Gateline (entry) and Resultant Queues



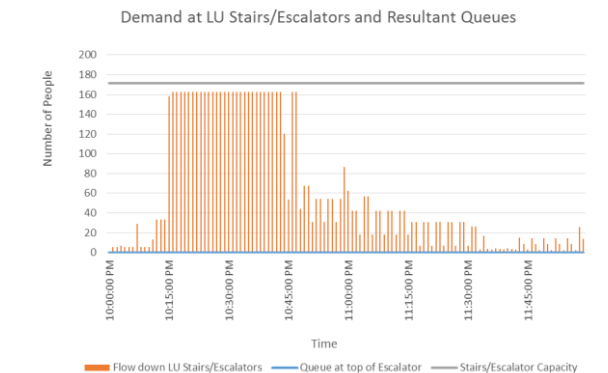
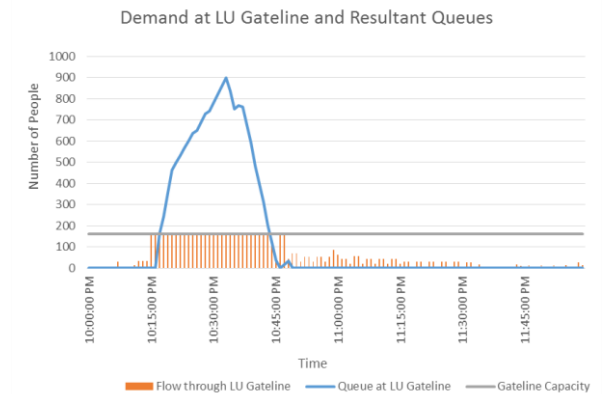
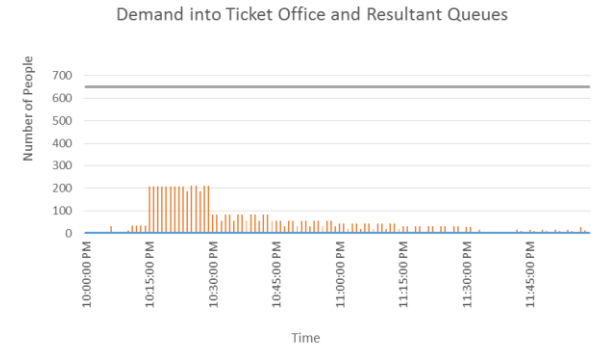
Post-match period: NR SB platform

- Some passengers alighting from the Shuttle Bus will require to board the National Rail services to Northumberland Park.
- The analysis shows that all of these spectators will be able to board the next available train after their arrival.
 - Although the trains will leave Northumberland Park ‘at capacity’, the number of people alighting at Tottenham Hale (to interchange to LU) exceeds those wishing to board
- The number of people waiting on the Platform to board will peak at approximately 100 – there is no capacity issue anticipated.



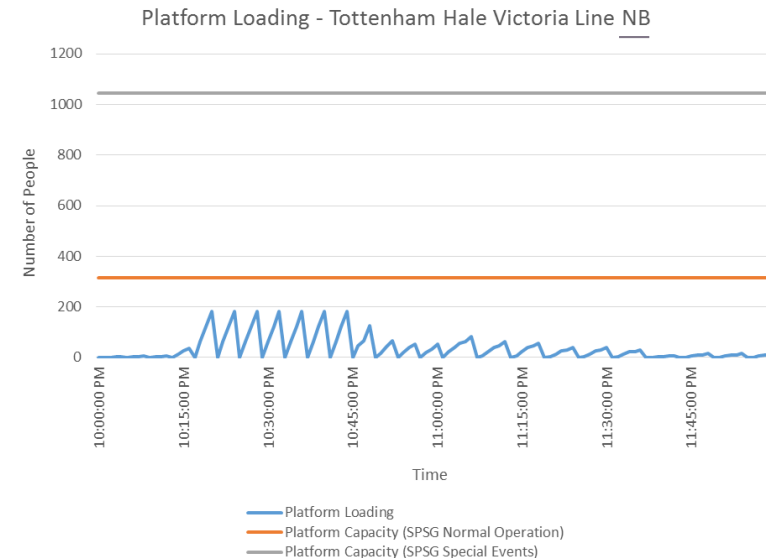
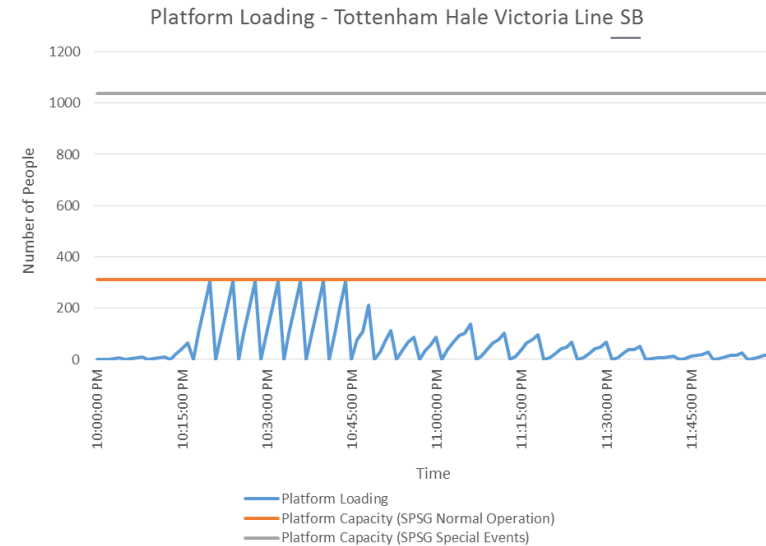
Post-match period: Ticket Office and access to LU

- The entrance to the Ticket Office provides sufficient capacity to accommodate all flows entering the station.
- If this was to be a series of individual doors, this offers the flexibility to introduce management at this location should it be preferable to manage any queues outside the station, particularly as they merge with interchangers from National Rail.
- It is assumed that entry into the London Underground part of the station would be via **6 automated ticket gates + 1 Wide Aisle Gate**.
- This is matched to the vertical circulation capacity within the station, and therefore prevents any queue formation at the head of the stairs/escalator or in the gateline run-off area. This does suggest that use of the stair capacity is required in addition to the escalator and therefore may need to be encouraged.
- Some queuing is anticipated at the gateline
 - Queue duration of **29 mins**
 - Maximum queue size of circa **900 people**
 - Maximum delay for any individual of **less than 6 minutes**
 - The majority of passengers either experience no delay, or a delay of less than one minute



Post-match period: LU Platforms

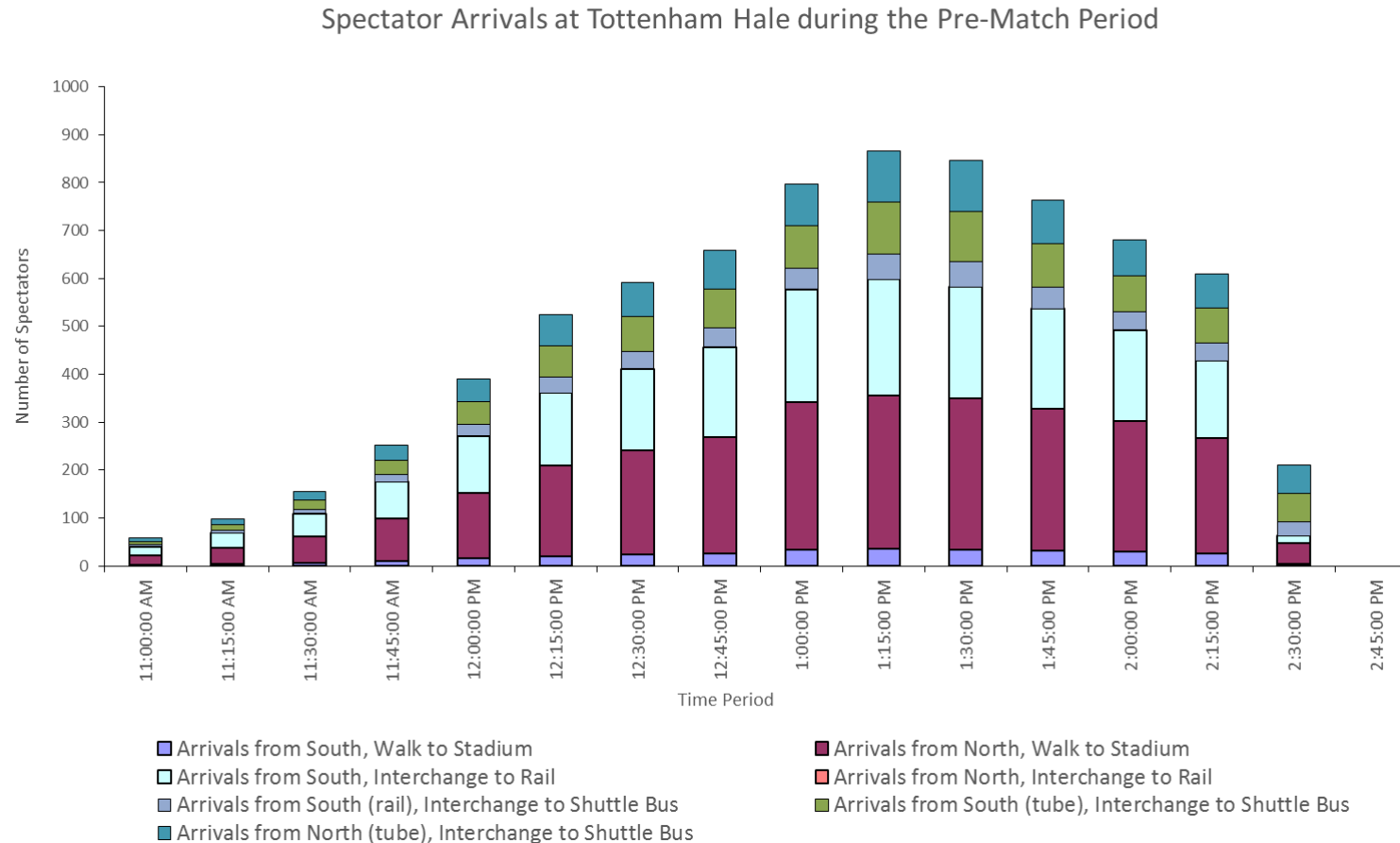
- Under SPSG Special Events guidance, each LU Platform has capacity for approximately 1,000 people.
- As indicated in the adjacent charts, the peak anticipated occupancy is approximately 360 passengers for Southbound services and 200 passengers for Northbound.
- As the southbound loading is only marginally higher than planning standards for Normal Operations, this suggests that conditions on the Platform during the post-match should operate safely without management intervention.
- In both directions, all passengers would be expected to board the first train after they arrived on the Platform.





Weekend Matchday Scenario

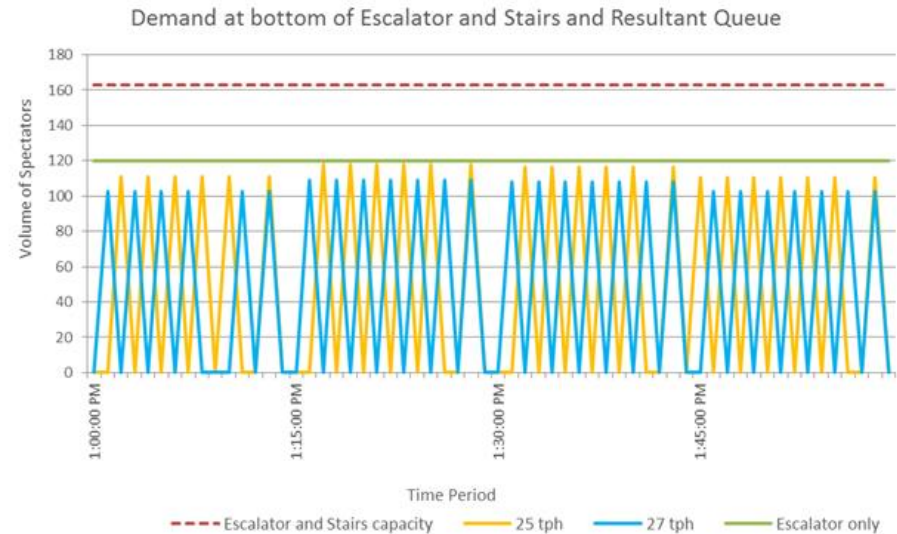
Pre-match period: Arrival profile



- 7,503 spectators in total (~12% of Spectators)
 - 3,086 exit the Station and Walk to the Stadium
 - 2,327 interchange onto a THFC Shuttle Bus
 - 2,090 interchange onto National Rail services to Northumberland Park

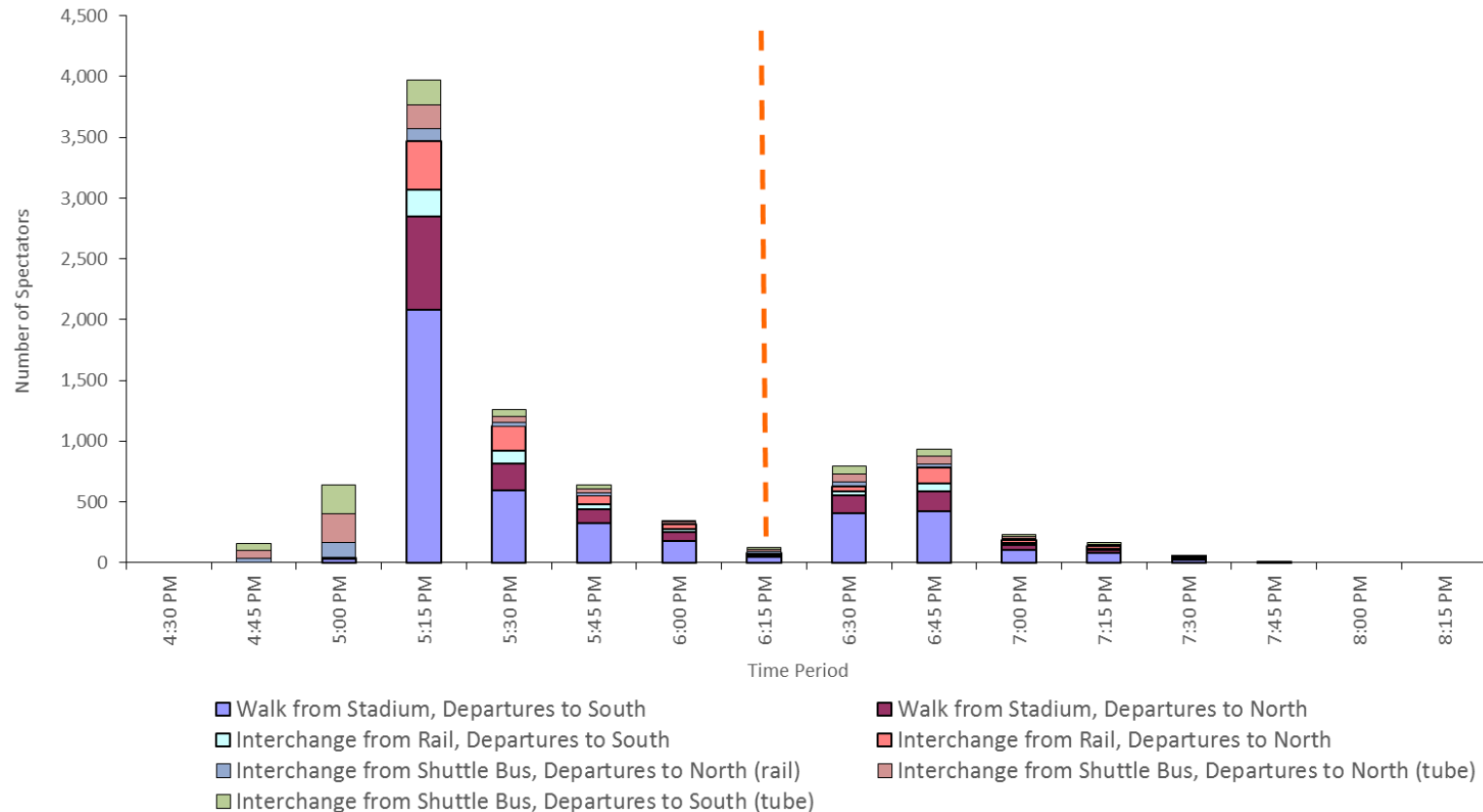
Pre-match period: Vertical Circulation from the Victoria Line

- The peak arrival period occurs between 13:15 and 13:30
- During the weekend pre-match period, it is anticipated that Victoria Line services will be running at 27tph in both directions.
- Given the forecast levels of background and spectator alighters at this time, the assessment indicates that there should be no queuing at the base of the stairs/escalators.
- This outcome is also true should no alighters choose to use the stairs.
- Sensitivity tests indicate that delays at the base of the escalator/stairs remains below the threshold at which would see queuing back to the Platform accesses for frequencies as low as 21tph.



Post-match period - Arrival Profiles over time

Spectator Departures from Tottenham Hale during the Post-Match Period

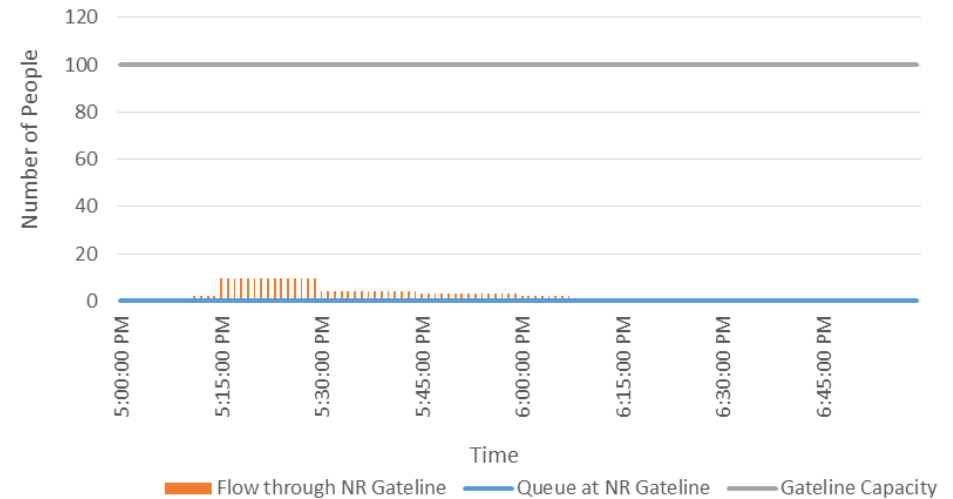


- 8,845 spectators in total (~15% of all spectators)
- 5,875 arrive on foot from the Stadium
- 1,496 interchange from NR train services from Northumberland Park
- 1,944 interchange from a THFC Shuttle bus service

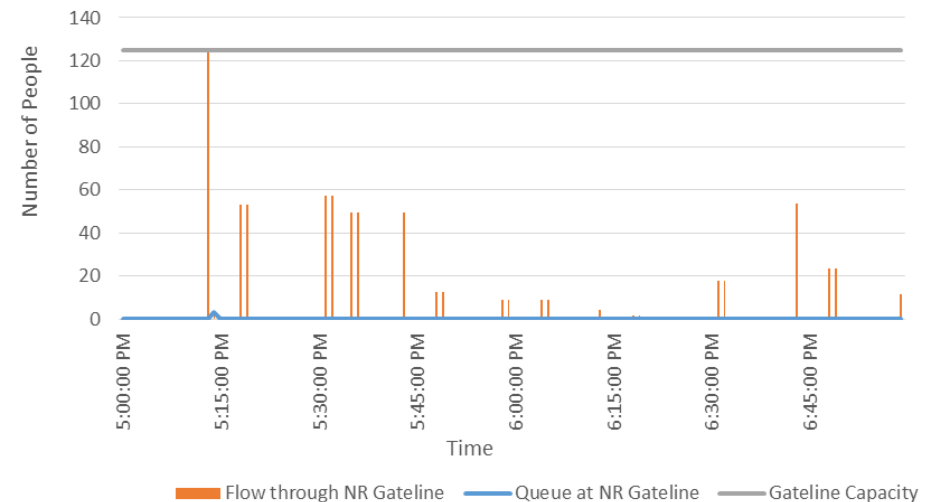
Post-match period: use of National Rail Gateline

- **Assuming 4 entry gates and 5 exit gates**
- No delays are anticipated at the gateline in either direction
- Peak entry flows are forecast between 17:15 and 17:30
- All alighters from National Rail services are able to clear through the gateline within two minutes of the train arrival

Demand at NR Gateline (entry) and Resultant Queues

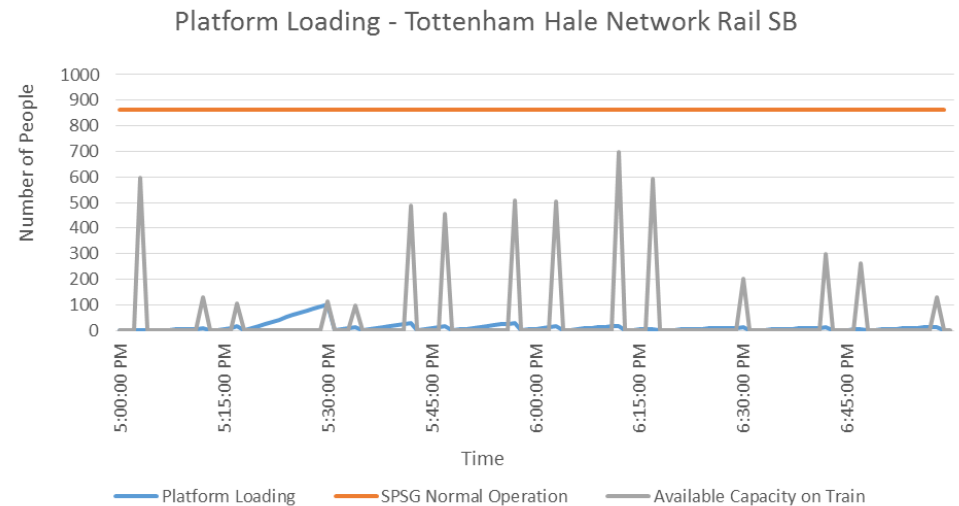


Demand at NR Gateline (exit) and Resultant Queues



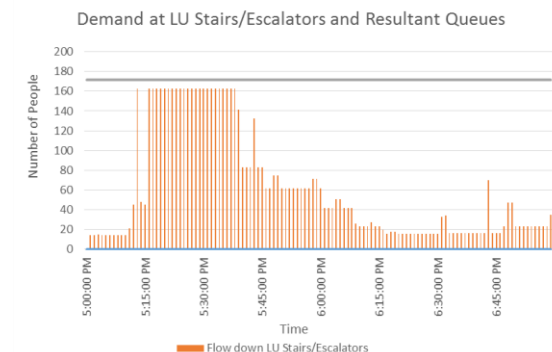
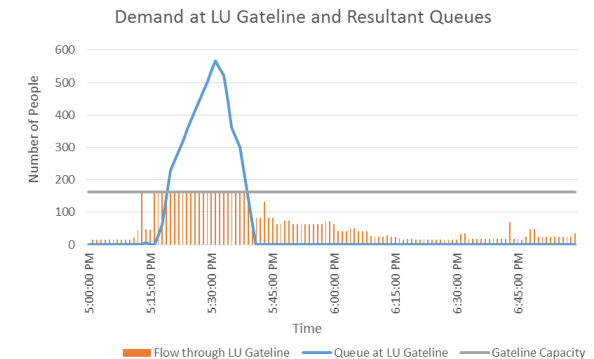
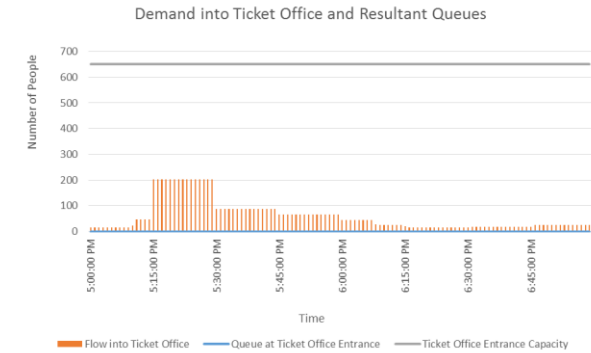
Post-match period: NR SB platform

- Some passengers alighting from the Shuttle Bus will require to board the National Rail services to Northumberland Park.
- The analysis shows that all of these spectators will be able to board the next available train after their arrival.
 - Although the trains will leave Northumberland Park ‘at capacity’, the number of people alighting at Tottenham Hale (to interchange to LU) exceeds those wishing to board
- The number of people waiting on the Platform to board will peak at approximately 100 – there is no capacity issue anticipated.



Post-match period: Ticket Office and access to LU

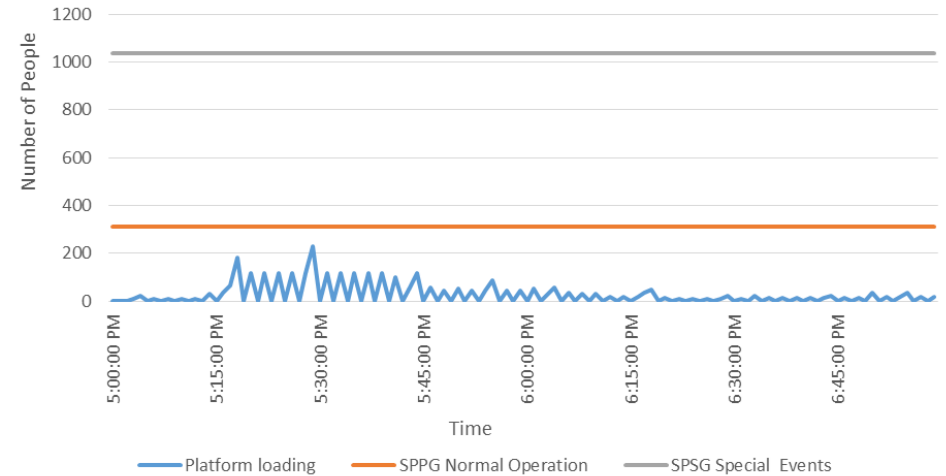
- The entrance to the Ticket Office provides sufficient capacity to accommodate all flows entering the station.
- It is assumed that entry into the London Underground part of the station would be via **6 automated ticket gates + 1 Wide Aisle Gate**.
- This is matched to the vertical circulation capacity within the station, and therefore prevents any queue formation at the head of the stairs/escalator or in the gateline run-off area. This does suggest that use of the stair capacity is required in addition to the escalator and therefore may need to be encouraged.
- Some queuing is anticipated at the gateline
 - Queue duration of **24 mins**
 - Maximum queue size of circa **566 people**
 - Maximum delay for any individual of **less than 4 minutes**
 - The majority of passengers do not experience any delay



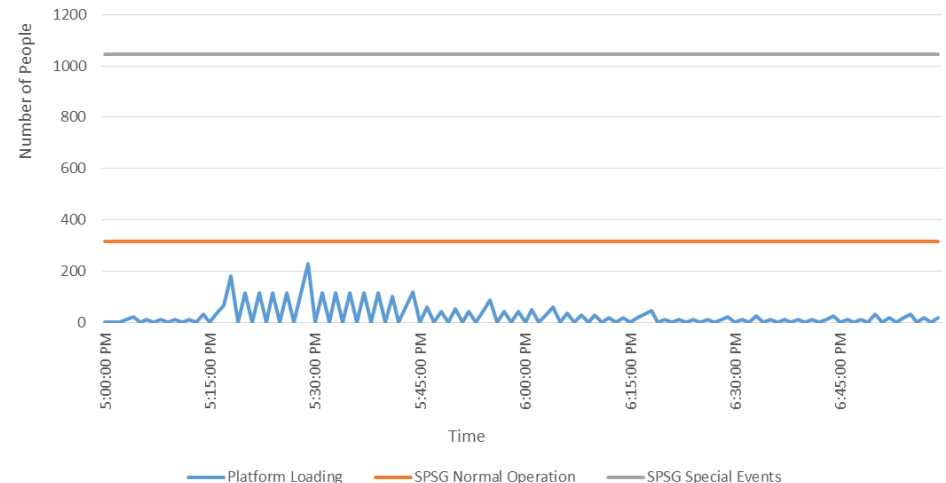
Post-match period: LU Platforms

- Under SPSG Special Events guidance, each LU Platform has capacity for approximately 1,000 people.
- As indicated in the adjacent charts, the peak anticipated occupancy is approximately 200 passengers for Southbound services and 200 passengers for Northbound.
- For both platforms, densities experienced are below the planning standards for Normal Operations, suggesting that conditions on the Platform during the post-match should operate safely without management intervention.
- In both directions, all passengers would be expected to board the first train after they arrived on the Platform.

Platform Loading - Tottenham Hale Victoria Line SB



Platform Loading - Tottenham Hale Victoria Line NB



Conclusions

- Midweek

- Tottenham Hale Station in its future configuration has the capacity to accommodate the forecast Spectator demand in addition to ‘regular’ use of the station. This includes an uplift in demand of >20% to 2021.
- During the pre-match period, the critical capacity constraint is the vertical circulation between the Victoria Line platform level and the ticket office, with the limited area at the base of the escalator/stairs before the queues form back as far as the platform. Calculations suggest that to avoid extensive queuing in this area it is important that high train frequencies are maintained (to spread demand across more trains) and that use of the stairs is encouraged.
- In the post-match period, there is some queuing anticipated as a result of the surge of demand associated with clearance of the stadium. Again, the vertical circulation is the key constraining factor, however it is anticipated that from a management perspective, it would be better to introduce a constraint at either the gateline or in the Ticket Office, depending upon space and operational preference. The peak queue would be 900 people, and it is not anticipated that any individual would be delayed for more than six minutes.

- Weekend

- The weekend scenario is accommodated more comfortably than the midweek matchday. This is principally due to the lower volumes of non-spectator demand using the station at this time. However, this is also an expectation that spectator volumes using Tottenham Hale station would also be lower at a weekend.



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