# Proof of Evidence of The Leeds Railway Station (Southern Entrance) Order

**(LSSE.PTE/P/7.3)**

**Pedestrian Modelling**
**November 2012**

**John Robertson**
**Hyder Consulting**

# Contents

# 1 Introduction

## 1.1 Qualifications and Experience

1.1.1 My name is John Robertson. I have an Honours Degree in Civil and Transportation Engineering from Edinburgh Napier University, 1993. I am a Chartered Engineer (CEng) and also hold the professional qualification of Transport Planning Professional (TPP). I am a Member of the Chartered Institution of Highways and Transportation and a Fellow of the Chartered Institute of Logistics and Transport. I have 19 years experience in Transport Planning and Engineering working with Halcrow Group Limited for 14 years, and 5 years with Hyder Consulting UK Limited, holding the position of Associate Director.

1.1.2 I specialise in transport planning and pedestrian modelling, and my experience includes undertaking many similar studies throughout the UK, appraising design and potential future passenger congestion levels. My project experience includes St Pancras Olympic Queue Management Study, Channel Tunnel Rail Link Line 2 stations, Crossrail Whitechapel, Manchester Victoria, Bristol Temple Meads, Edinburgh Waverley, and I am current acting as technical advisor on Pedestrian Modelling matters to London Underground Limited for the Bank Station Capacity Upgrade Study.

## 1.2 Scope of Evidence

1.2.1 In my evidence I demonstrate how the existing and future passenger demand forecasts have been calculated, including the redistribution of passenger movements as a result of the new southern entrance, and how the proposed southern entrance station layout will accommodate these expected future passenger volumes and movement patterns under a variety of operational scenarios.

## 1.3 Response to Statement of Matters

1.3.1 My evidence relates specifically to the following matter under Items (2) in the Secretary of State's Statement of Matters:

'2 The justification for the particular proposals in the draft TWA Order, including the anticipated transportation, regeneration, environmental and socio-economic benefits of the scheme.'

# 2 Passenger Demand Forecasts

## 2.1 LSSE Proposals

2.1.1 The Leeds Station Southern Entrance (LSSE) will comprise a new concourse deck at overbridge level, and provide a new ticket gateline, ticket office and ticket machines. A new upper concourse is connected to a new lower concourse via stairs, escalators and a lift, which links to both banks of the River Aire.

## 2.2 Methodology

2.2.1 My evidence relates primarily to the Pedestrian Modelling Assessment undertaken by Hyder Consulting in report dated 20 March 2012, appended to my Proof of Evidence (PoE).

2.2.2 The analysis covers a variety of operational scenarios including normal operation, sensitivity analysis and emergency evacuation.

2.2.3 The agreed methodology for the assessment was to undertake pedestrian modelling based on 'best available' historic survey data.

## 2.3 'Existing' 2008 Passenger Demand Analysis

2.3.1 My PoE sets out the method and calculations for the following:

- 2008 passenger volumes;
- In/out proportions; and
- 5-minute data profiles.

2.3.2 The subsequent 2008 flows were calculated as set out in my PoE.

## 2.4 2029 Passenger Demand Analysis

2.4.1 My PoE provides further details on future passenger growth assumptions and the likely percentage of passengers using LSSE.

2.4.2 The following demand was calculated and has been used in the capacity assessment.

**Table 2.1 – 2029 LSSE Forecast Demand**

| Period | Entry | Exit | Total |
|---|---|---|---|
| AM Peak Period (3 hours) | 2,669 | 6,594 | 9,263 |
| PM Peak Period (3 hours) | 5,798 | 3,426 | 9,225 |

(*) Source – Pedestrian Modelling Assessment, Hyder 2012.

## 2.5 Demand Forecasting Summary

2.5.1 2008 pedestrian volumes are based on survey information considered to be 'best available', and passenger growth is in accordance with Route Utilisation Strategy 'High' growth scenario. The Leeds Transport Model was used to derive likely percentages of LSSE users based on their origin/destinations. I therefore consider the methodology presented to be a systematic, transparent and robust methodology to calculate existing (2008) passenger demand, based on 'best available' information, future passenger volumes for 2029, and the potential attractiveness of the new southern entrance.

# 3 Pedestrian Modelling and Analysis

## 3.1 Overview

3.1.1 The modelling exercise reported in the Pedestrian Modelling Assessment was undertaken using LEGION Studio software, allowing users to simulate individual pedestrian movements within a defined space.

3.1.2 Model outputs provide passenger densities based on Fruin Levels of Service (LoS), using the letters A (free flow) through F (forced or breakdown flow).

3.1.3 Thresholds from Network Rail design guidelines have been used to assess each area of the station.

## 3.2 2029 Normal Operation

3.2.1 Modelling results show all areas of the station to operate satisfactorily over the peak 15 minute period, with a LoS C, with the exception of the eastern bridge link. This extends to LoS D for a single 5 minute period. Although this slightly exceeds recommended threshold criteria it is considered acceptable given the duration.

3.2.2 It is my recommendation that a mitigation strategy be further developed, to be readily implemented should the need arise in those very limited circumstances, together with other recommended design considerations as follows:

- CCTV at Mezzanine level, monitored during peak times so staff can control passenger flow if required;
- Provide a number of escalator emergency stop buttons;
- Consideration during detailed design to increase the size of the run-off areas on the Mezzanine level;
- Consideration to open the stairwell in order to link in with the Mezzanine escalators; and
- If required the implementation of a one-way system in the passageways in the peak direction at Ground level.

3.27 Overall, subject to the above, the proposals would operate entirely satisfactorily at 2029.

## 3.3 Sensitivity Analysis

3.3.1 Sensitivity analysis identified the requirement for some form of management intervention, during at least part of the AM peak period, for a 20% increase to 2029 passenger forecasts.

3.3.2 It is my view that an appropriate mitigation strategy be developed in the event that it is necessary to manage passenger movements during busy peak periods. Chapter 3 of the Passenger Modelling Assessment identifies potential mitigation measures that I consider to be valid for further consideration. Such measures would be readily capable of being implemented and thereby mitigating any short term issues which might arise.

## 3.4 Emergency Evacuation

3.4.1 A further consideration is the impact of the LSSE during an emergency evacuation. The Passenger Modelling Assessment concludes that circa 2,000 passengers could be evacuated via LSSE to assist in the existing evacuation strategy for the station.

3.4.2 I agree that LSSE could provide additional capacity during any station evacuation scenario, and that LSSE should be included in an updated station evacuation strategy.

## 3.5 'High Demand' Scenario

3.5.1 During 'high demand' scenarios, e.g. Leeds United home match, there could be a need for management intervention. Options could include pre-match alighting passengers being 'held' on approach to the ticket gateline at overbridge level. Other alternatives include one-way operation or LSSE out-only during certain periods. Post-match passengers could be managed at ground level.

3.5.2 I would agree that there may be a requirement to manage passengers during very busy times, and the suggested methods should be discussed further with station operations staff.

# 4 Conclusions

4.1.1 My evidence sets out the appraisal of LSSE in terms of the increased capacity it will provide and potential demand by passengers.

4.1.2 The evidence explains the methodology to calculate future passenger volumes and movement patterns and concludes that the method adopted is transparent and robust. I have also noted that the assessment was based on best available information, and it is my view the data used is the most fit-for-purpose at that time. It is on this data that the subsequent analysis has been founded.

4.1.3 The capacity assessment has been undertaken using LEGION Studio, and utilising industry standard modelling analysis techniques. The results of the analysis support the design, noting that there may be occasions (single period of 5 minutes) where one element of the design experiences LoS D against a recommended capacity threshold of LoS C. It is my conclusion that the design would be fit-for-purpose based on the assumptions developed for the tests undertaken.

4.1.4 Sensitivity tests have highlighted the potential need to introduce passenger management strategies during certain periods, particularly at the approach to the gateline at the overbridge level, and the approach to the entrances at ground level. The strategies noted within this document would help alleviate potential congestion and my view is they would be appropriate and should be developed further with stations operation and management staff.

4.1.5 In summary, my evidence supports the proposed LSSE design in terms of the capacity it would provide and the demand expected. The results are based on best available data at the time of assessment, and it is recommended that this data be updated whenever possible, to keep abreast of actual changes in passenger flow volumes and movement patterns at Leeds Station, and feed any new information into the design process as required.