

## Terms of Reference

**The aim of this study is to identify and agree solutions to the impact of the events to be held at the MSG Sphere on the capacity of Stratford railway station.**

It is considered by MSG that their proposals should support and be integrated with the requirements for overall expansion of the station capacity and wish to work with Network Rail and Transport for London to develop and agree the overall station expansion principles.

MSG is employing the Mott MacDonald Stratford Station Engineering Commentary July 2019 (the MM Report) prepared for Network Rail, that reviews and summarises numerous recent reports prepared by various parties for Network Rail and Transport for London. It is not the intention of this study to again review these previous reports or the assessments that support their preferred recommendations, but instead to consider, adopt or expand upon their proposals and findings as defined in the MM Report.

In parallel this study considers the results of capacity assessments carried out for MSG by their transport planning specialists, Momentum. In undertaking their analysis Momentum has called upon the TfL Legion model. This model considers all anticipated flows to 2021, albeit with a number of assumed and manually added flow routing modifications to enable the software to calculate the effects of growth. Beyond 2021, the capacity of the software is exceeded if greater than 400ppm are added from the anticipated MSG flows. While of limited value in the precise definition of future conditions, the model results point the way to critical locations for change.

While the benefits of over-station development and the resolution of urban segregation discussed in the MM Report are appreciated, it is considered that the criticality and complexity of resolving the station capacity question should be primary, with urban or development solutions being identified as a consequence and at a later stage of project development and funding.

Notwithstanding, it is important to recognise the planned and potential development changes, including the MSG Sphere, that are beyond the curtilage of the station, such that the Origin & Destination of the growth can influence decisions about the location, purpose and responsibility for future change.

This study is a broad review but not a multi-disciplinary assessment, focusing on passenger capacity and considering complexity and consequent cost of implementation by comparison. Once the principles of a station wide solution to growth are agreed between parties, the further development of the most effective and pressing components can be progressed.

Within this wider understanding, MSG presently intend to follow this study by supporting the station adjustment proposals that most effectively accommodate the capacity requirements of their visitors. They intend to develop these elements to a degree of further detail, to a point where it is reasonably practical for them to do so within the protocols and procedures of Network Rail and Transport for London procurement and assurance.

### MMR Report Review Documents

- Stratford Station Access Study, Outline Business Case (WSP) – 2014
- Stratford Platforms Extension GRIP Stage 2 Feasibility Report (Volker Fitzpatrick) - 2015
- Stratford Single Station Strategy (TfL Rail and Underground) - 2016
- Stratford South – Eastern Ticket Hall (Arcadis) - 2017
- Stratford Interchange (TfL, Allford Hall Monaghan Morris, SEW, Mott MacDonald) - 2018
- Stratford Platform 1 Event Day Entrance (Pell Frischmann) - 2018
- Stratford Station Overcrowding, Review of Crowd Management Arrangements (Arthur D Little) - 2018
- Stratford Station Capacity Project, Outcome Definition Report (Weston Williamson & Partners) - 2018
- London Overground Capacity (Jacobs) – 2018
- Stratford Station Legion Modelling: Outcome Definition Testing (Ch2M) – 2018
- Stratford Over Track Development Structural Engineering Feasibility Design Report (Mott MacDonald) - 2019

## Next Steps

The majority of the design interventions reviewed are rational and well considered but they do not fully address the significant challenges that Stratford Station is facing. It may be possible that a combination of the options could temporarily relieve some of the capacity and access issues in the station, but the underlying issues would still be present. This is likely to be further compounded by increased passenger demand and the creation of new developments around the station, such as MSG Sphere. Rather than individual interventions that target distinct areas of the station, it is recommended that a more holistic approach to Stratford Station is undertaken.

### 10.1 Future approach

Stratford station has several issues within the station itself and outside its boundaries with its connection to the greater community. A holistic approach should be adopted, which works from the inside out because the core problem within Stratford Station is capacity and congestion. The primary objective of any proposal going forward is to improve station capacity and operational safety. Therefore, without improving rail and platform capacity, additional access points into the station and increasing circulation routes will potentially exacerbate congestion within the station and negatively impact rail performance and passenger safety.

After reviewing the proposals submitted to Network Rail, it is clear that implementation of all the best proposals will not resolve the issues Stratford Station faces. However, while long term and larger scale interventions are being developed and assessed there is scope and benefit in implementing 'lighter touch' interventions mentioned in the final options review. These shorter-term options could help alleviate some of the immediate capacity issues.

In order to provide a holistic solution for the station, a greater array of interventions need to be examined. Responses should be based on understanding the station capacity requirements and the constraints for future development. The following section will outline the steps that should be taken going forward to generate a holistic response to ensure Stratford Station maximises its potential now and in the future.

### 10.2 Process for maximising Stratford Station's potential

The methodology for maximising Stratford Station's potential, is based on the following stages;

1. Understanding - Ascertaining the station requirements and constraints
2. Appraising – Reviewing the requirements against the constraints
3. Responding – Applying mitigation measures to address any issues
4. Integrating – Planning the phasing of changes and integrating with the context.

Following this process will ensure a thorough response is generated that addresses the underlying requirements of the station and its context. This process will have two strands. Firstly, an exercise of reviewing the station requirements and producing responses that meet them. Running concurrently to this process, a parallel exercise will need to be undertaken focusing on the station's integration to its urban context. This will ensure development benefits can be maximised alongside the station's core function as a transport hub. The below diagram sets out the process for both streams and how they interact.

Review the Mott MacDonald July 2019 Engineering Commentary report and employ as an NR/TfL proposals reference.

Review Momentum passenger congestion profile assumptions and conclusions.

Summarise anticipated conditions : Platforms, Passageways/Stairs, Entrance Concourses, adjacent Urban Realm/Interchange at 5 year periods.

1. Normal anticipated growth
2. London Stadium effect
3. MSG effect

Consider implications of MTR proposed station management proposals.

Identify a station-wide framework of potential locations/opportunities for long-term relief (management/physical) by reference to potential benefits, consequences and associated risks.

Propose and justify risk apportionment – identify appropriate owner(s) by location/opportunity.

Identify and justify ‘MSG effect’ potential mitigation solutions within the above framework – prioritise by comparative cost, risk and effectiveness.

Compile the results and outcomes into a single, concise document for circulation to the stakeholders as a record of the assumptions, proposals and decisions.

## Stratford Station Engineering Commentary

July 2019

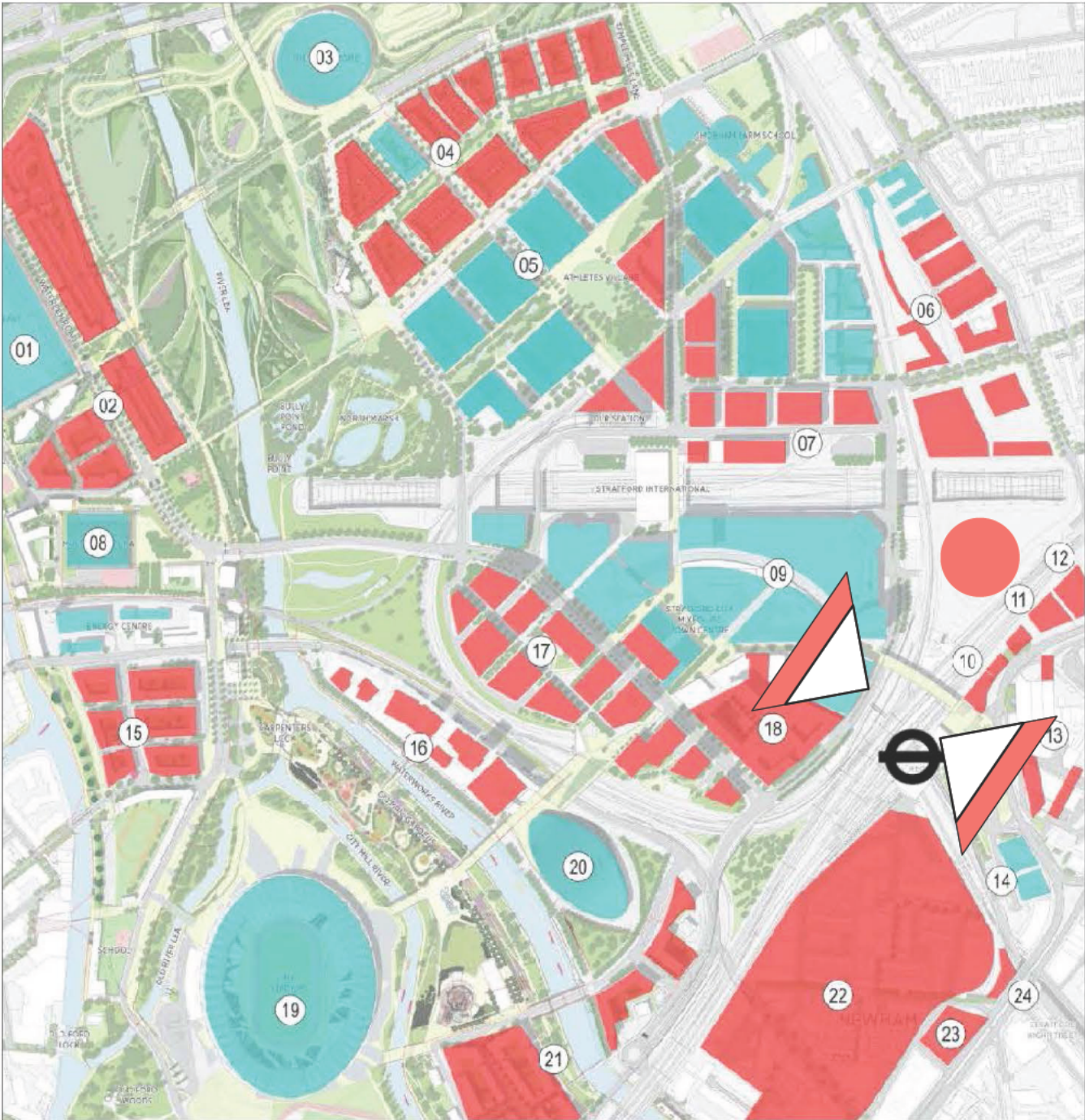


The London Plan (2015) identifies Stratford as a Metropolitan Centre with potential to become an International Centre.

- 1 Here East
- 2 Eastwick
- 3 Velodrome
- 4 Chobham Manor
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- 6 Chobham Farm
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- 24 The Collective

New Developments - Built

New Developments - Future



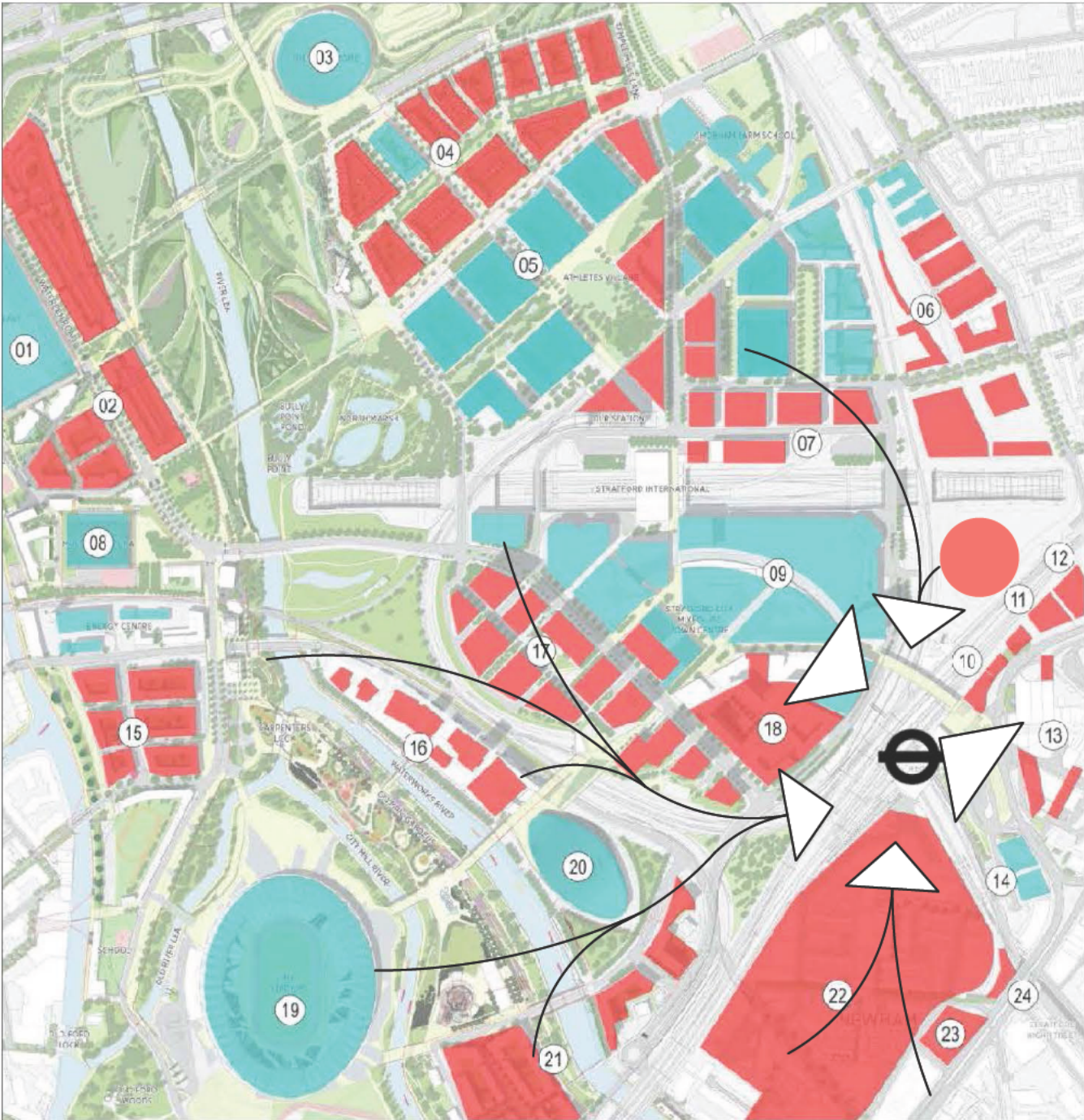
Future Development - Built and Emerging Schemes

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Future Development - Built and Emerging Schemes



# Stratford Station Scenarios

## Scenario 1

- Baseline 2016 PM peak model

## Scenario 3

- MSG ingress in PM peak
- 'Normal event'
- 15,000 event capacity

## Scenario 5

- MSG egress in PM peak
- 'Special event'
- 21,500 event capacity

## Scenario 2

- 2021 PM peak model

## Scenario 4

- MSG ingress in PM peak
- 'Special event'
- 21,500 event capacity

## Notes

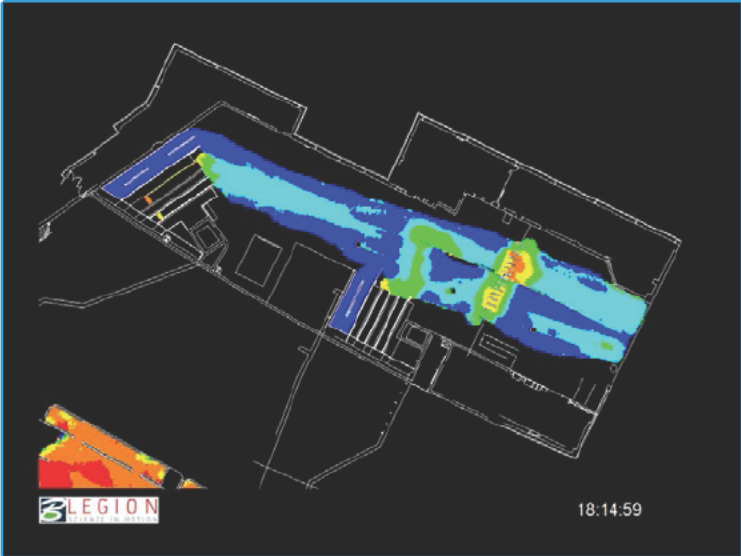
- Assumed event start time: 20:00
- All heat maps shown are for the peak period in each location (the time period where experienced densities are highest).
- Outputs presented are underground 15-minute cumulative mean density heat maps, using Fruin's LoS.

Overground Pforms	1,2,9,11	3.65%
Jubilee Line	13,14,15	28.05%
Rail	10	6.50%
DLR	16,17	0.50%
DLR	4	0.50%
Central/Crossrail EB	6,8	54.40%
Central/Crossrail WB	3,5	1.90%

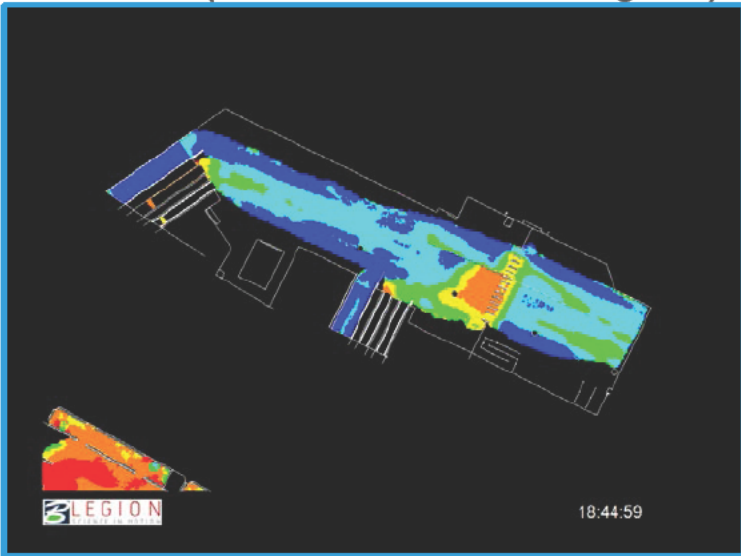
Platform	Main TH	Mezzanine	North TH
1			100.00%
2			100.00%
4a		100.00%	
4b		100.00%	
3,3a		50.00%	50.00%
6			100.00%
5			50.00%
8			100.00%
9			100.00%
10			100.00%
10a			100.00%
11			100.00%
13		60.00%	40.00%
14		60.00%	40.00%
16		60.00%	40.00%
16		100.00%	
17	100.00%		

# Stratford Station Northern Ticket Hall

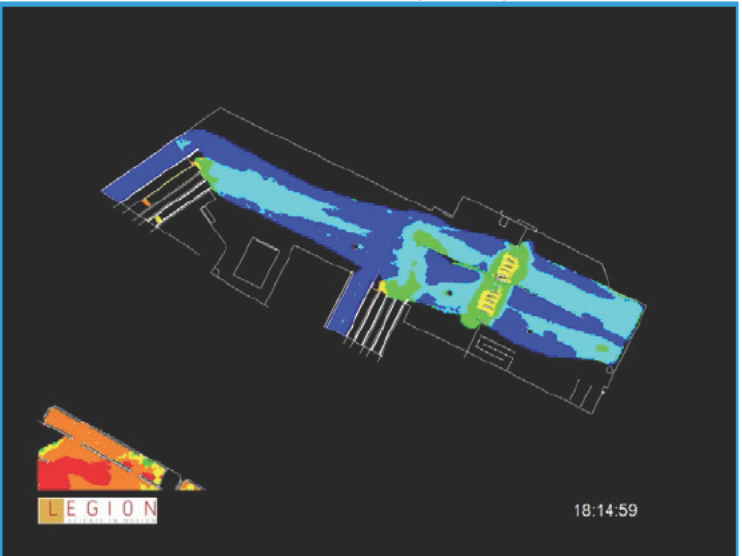
Scenario 1 (2016)



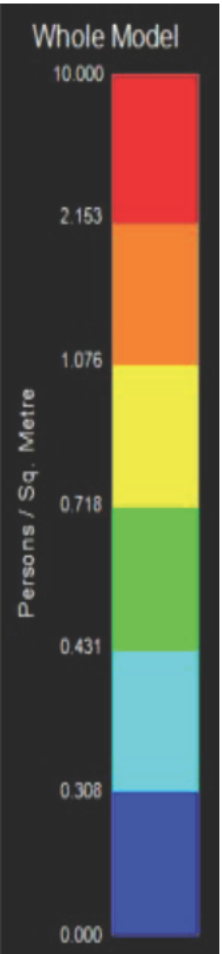
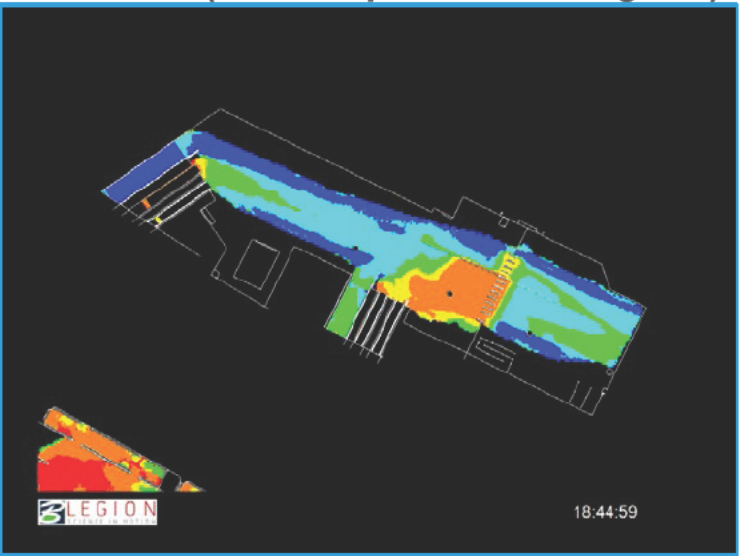
Scenario 3 (2021 + 'Normal event' ingress)



Scenario 2 (2021)

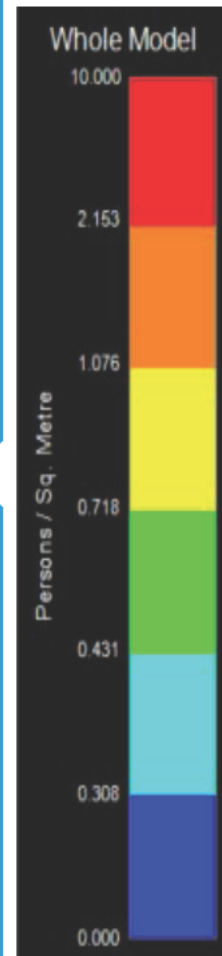
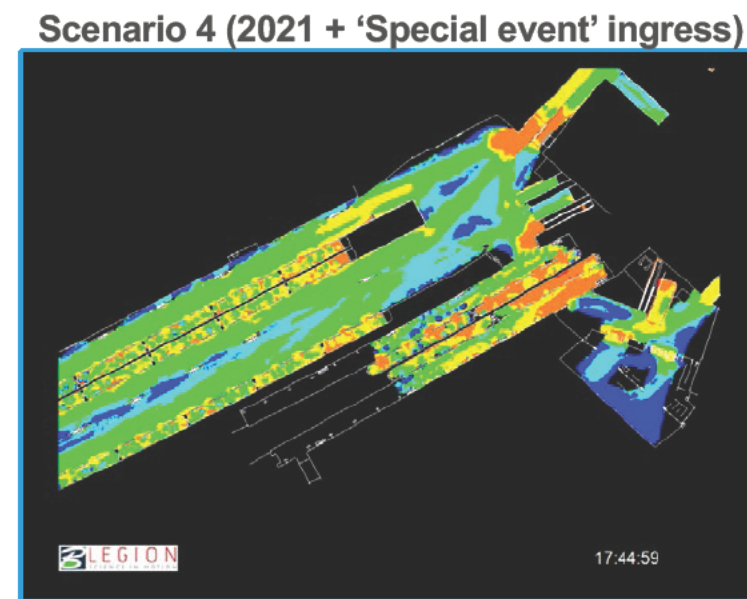
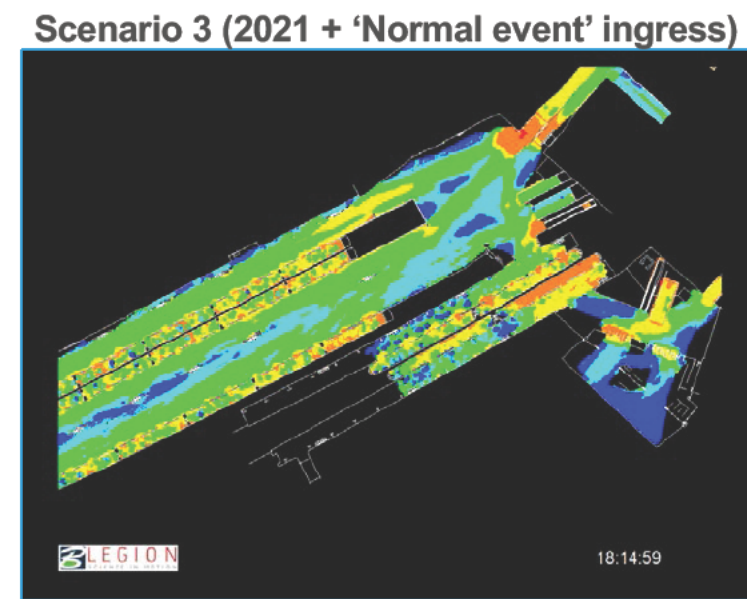
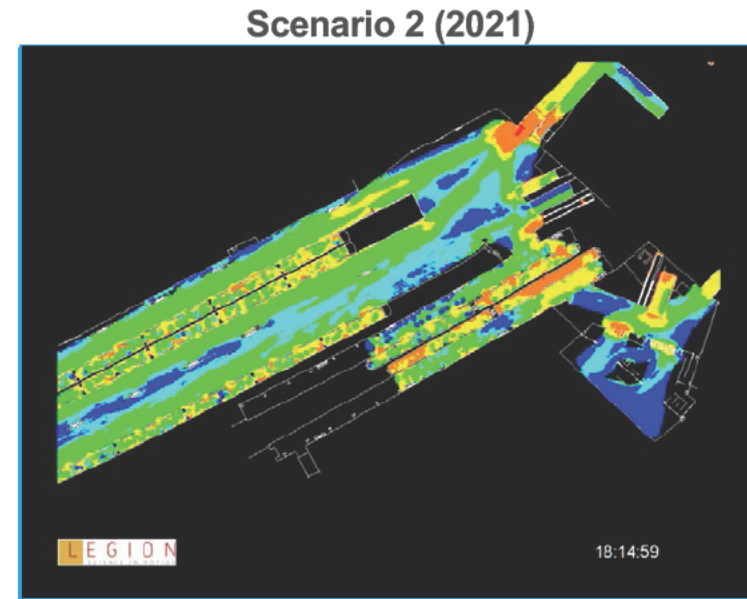
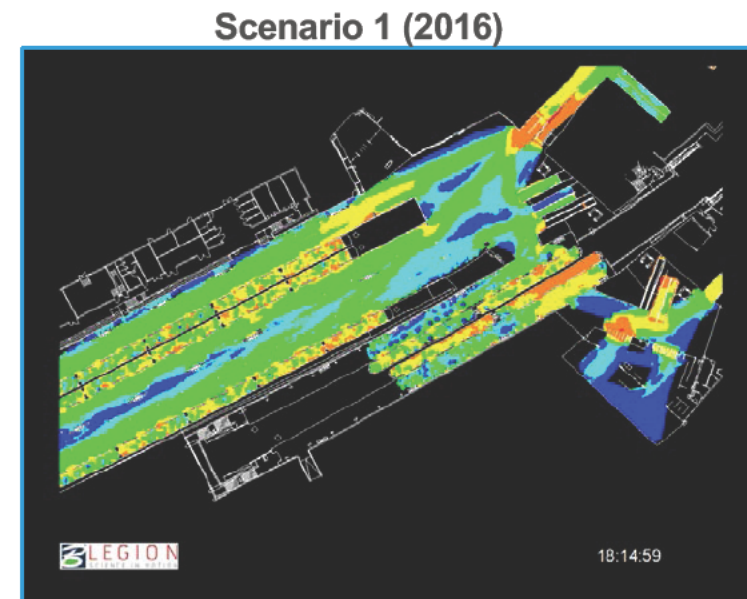


Scenario 4 (2021 + 'Special event' ingress)

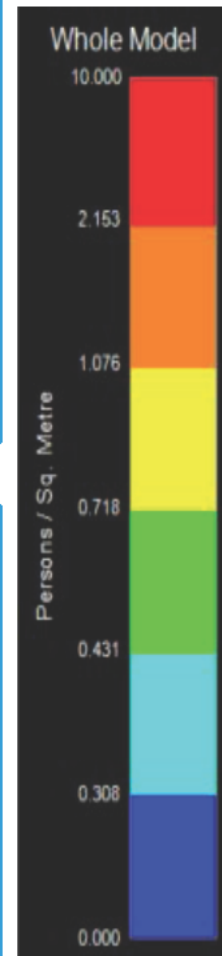
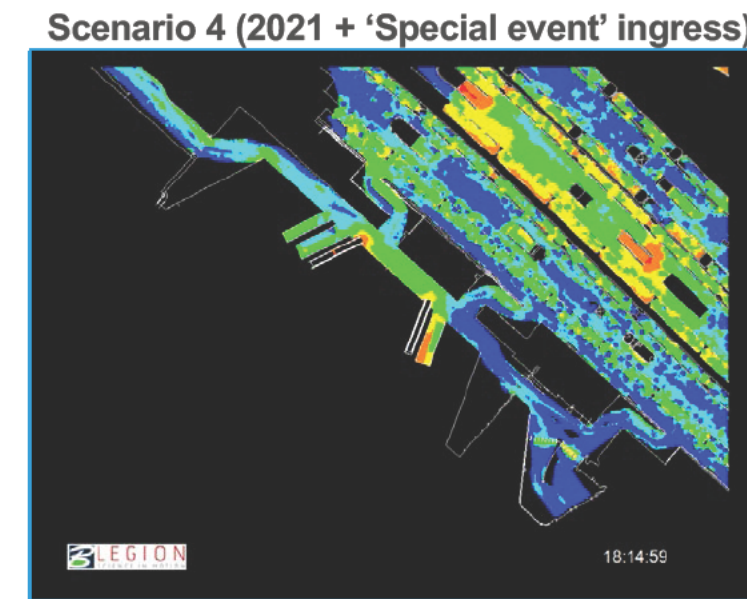
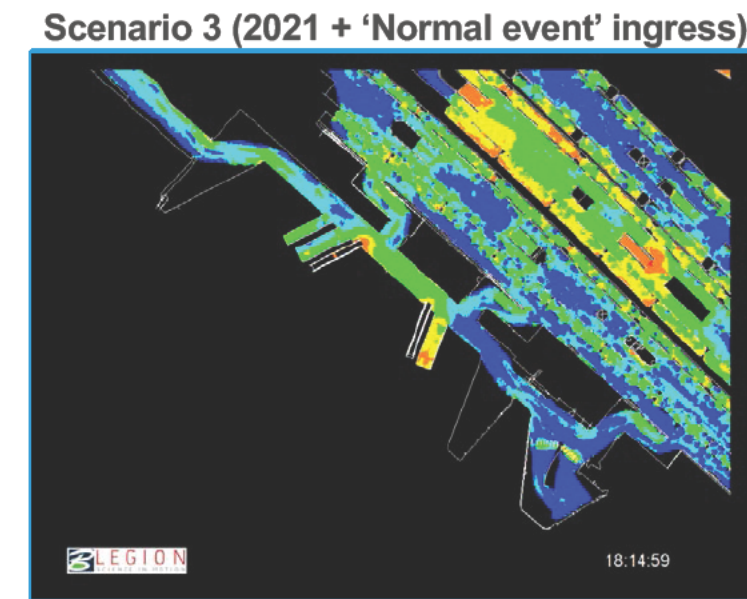
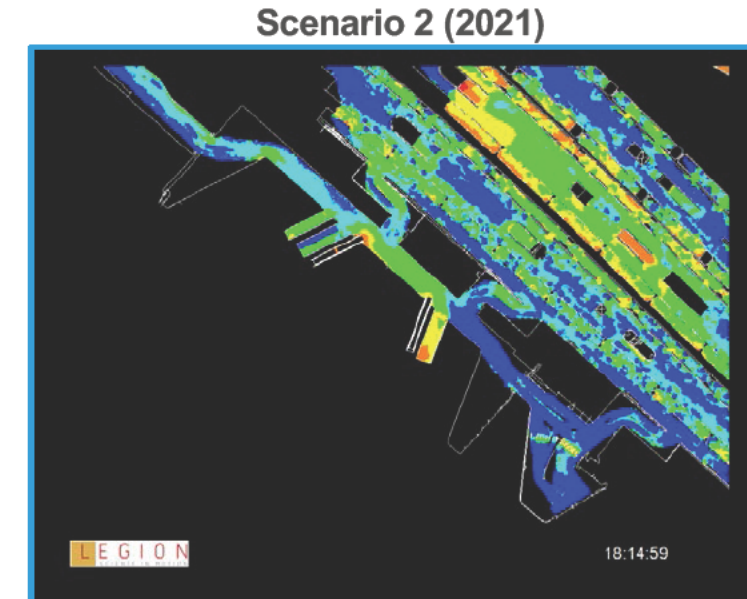
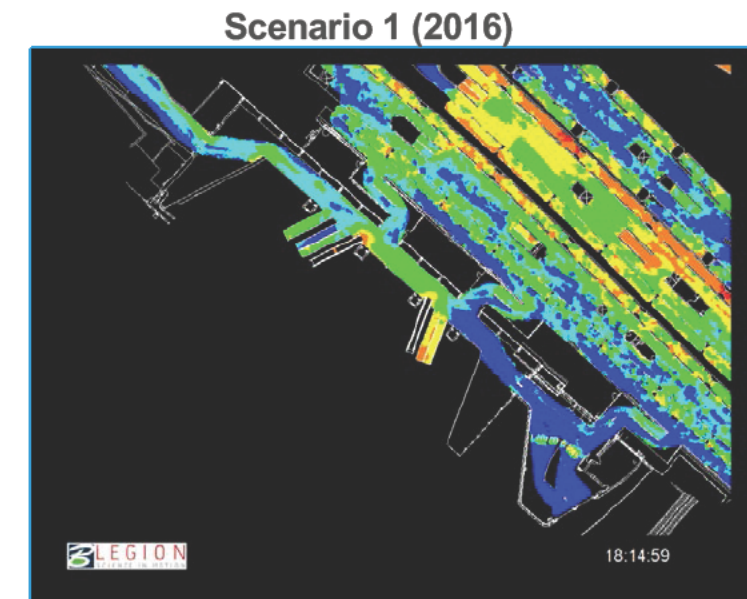




# Stratford Station Jubilee Platform and Main Ticket Hall



# Stratford Station Mezzanine

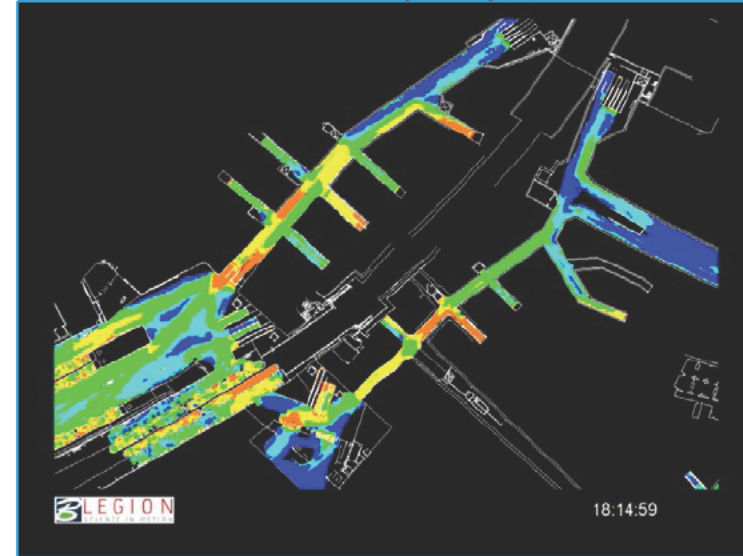




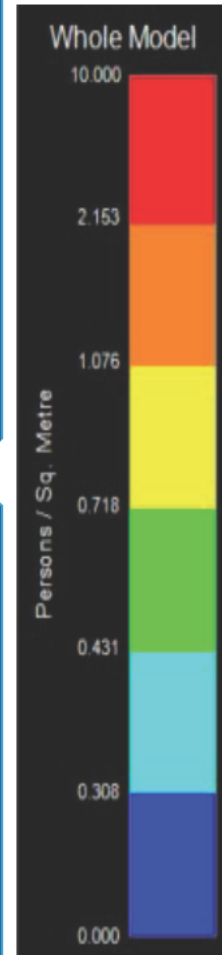
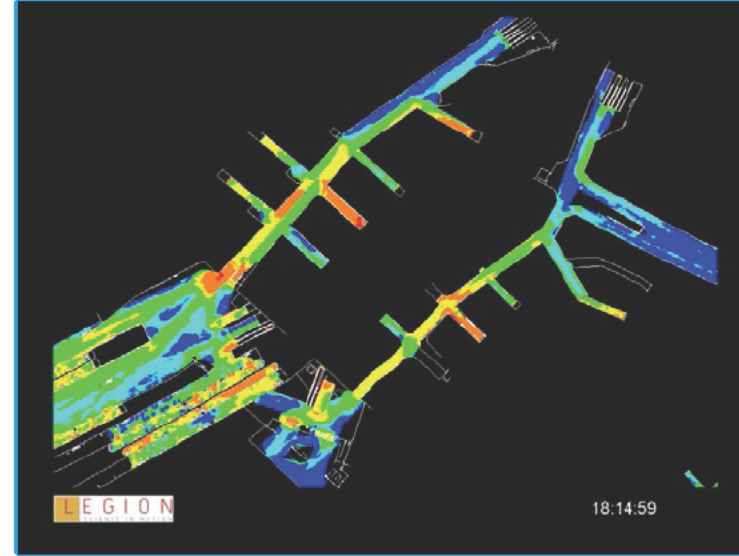
# Stratford Station West Underpass



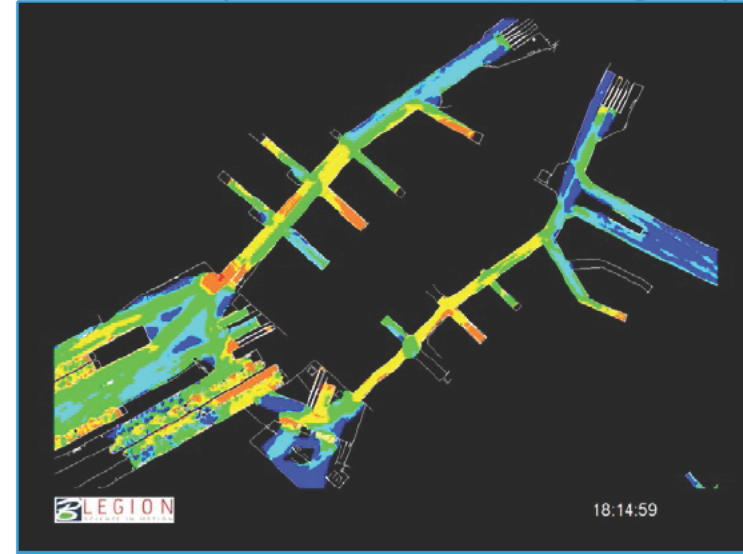
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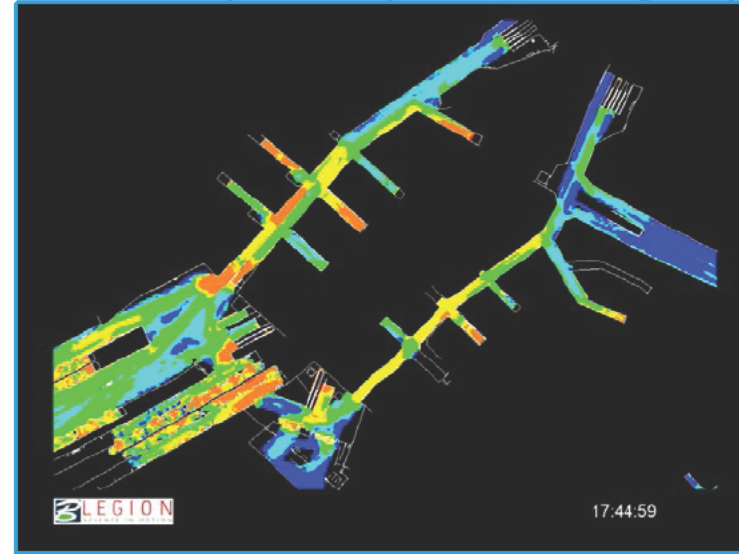
Scenario 2 (2021)



Scenario 3 (2021 + 'Normal event' ingress)



Scenario 4 (2021 + 'Special event' ingress)



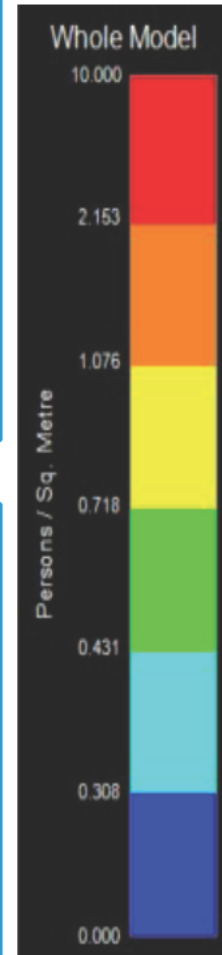
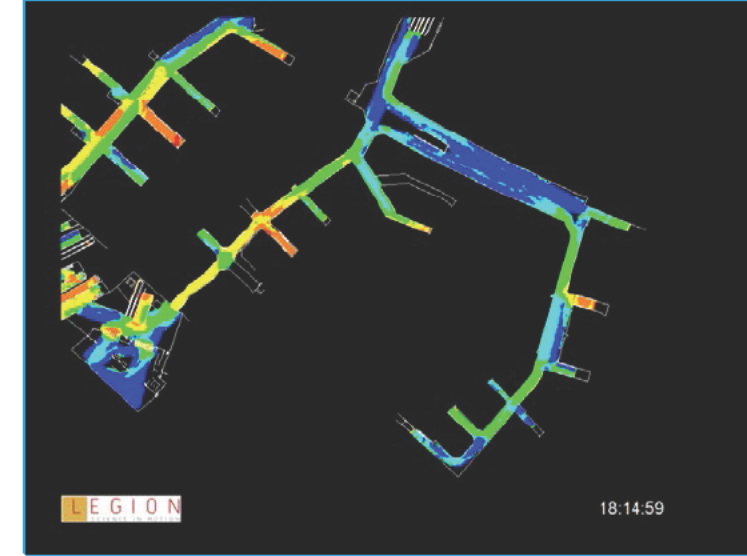
# Stratford Station East Underpass



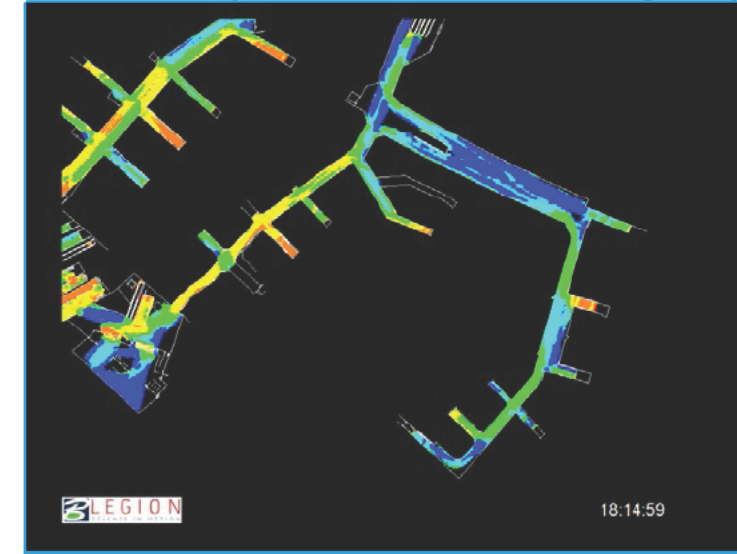
Scenario 1 (2016)



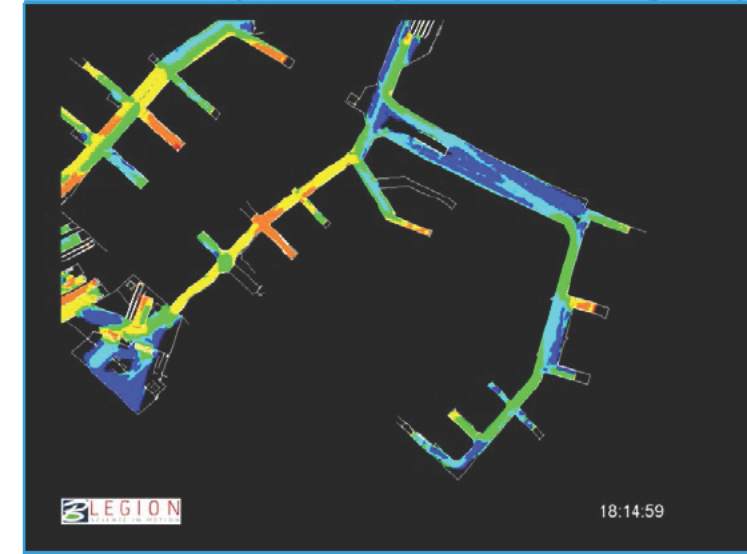
Scenario 2 (2021)



Scenario 3 (2021 + 'Normal event' ingress)



Scenario 4 (2021 + 'Special event' ingress)

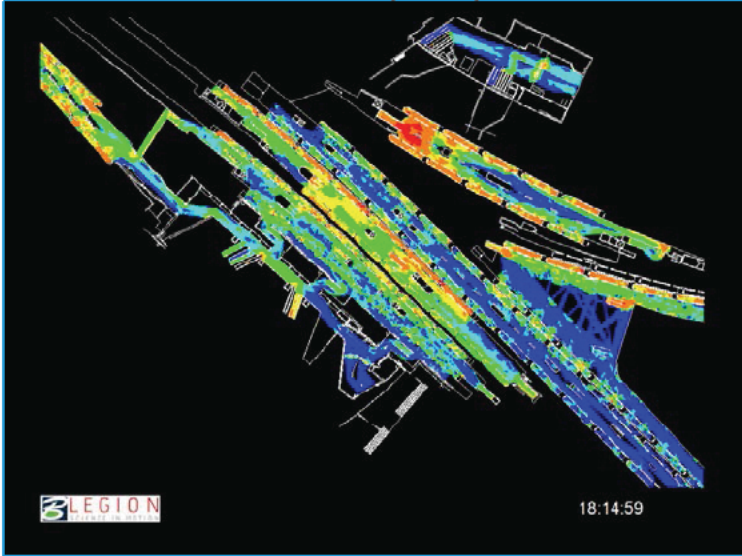




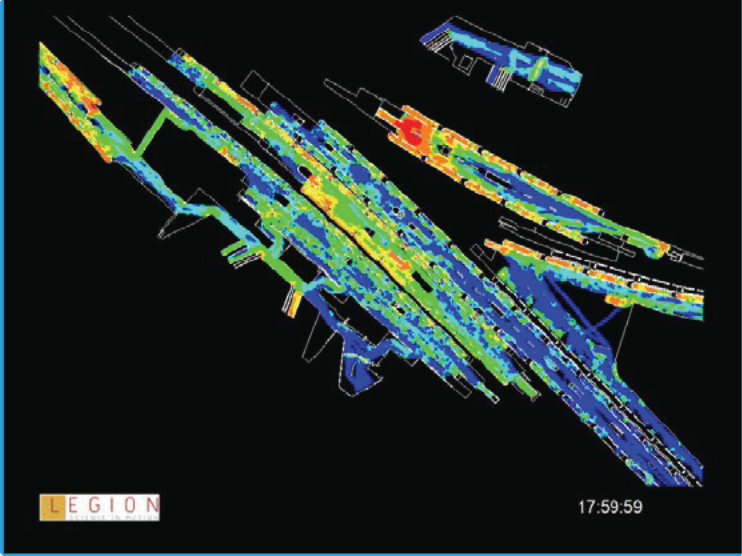
# Stratford Station Upper Platforms



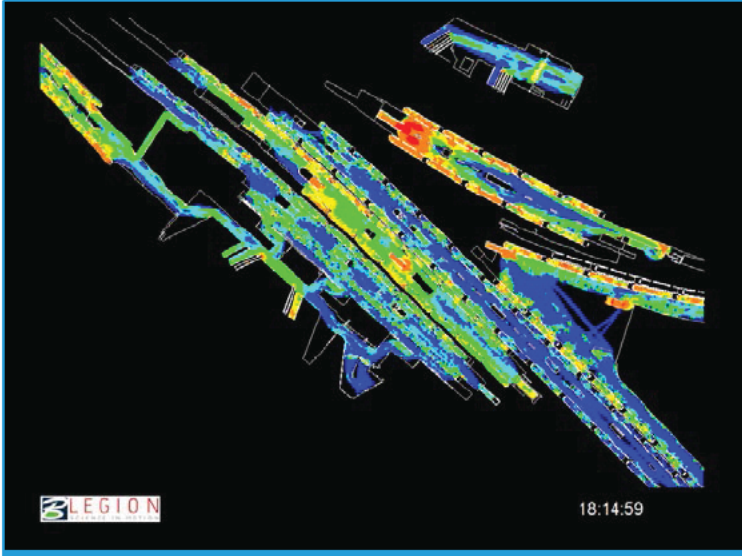
Scenario 1 (2016)



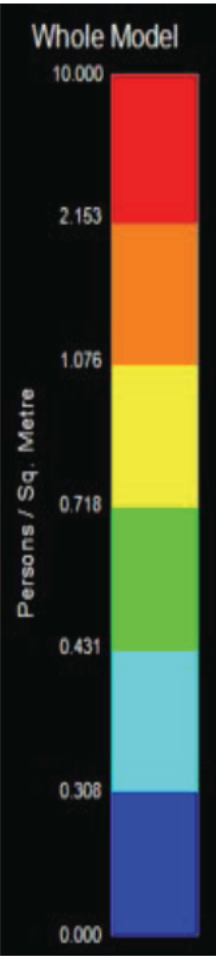
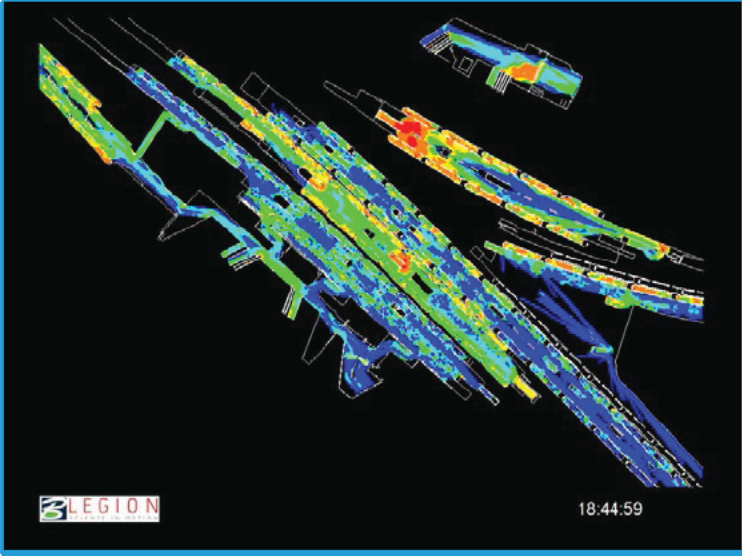
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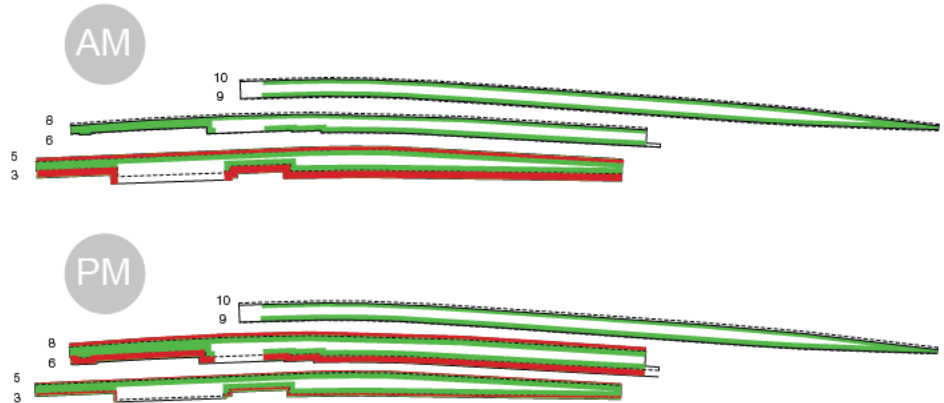
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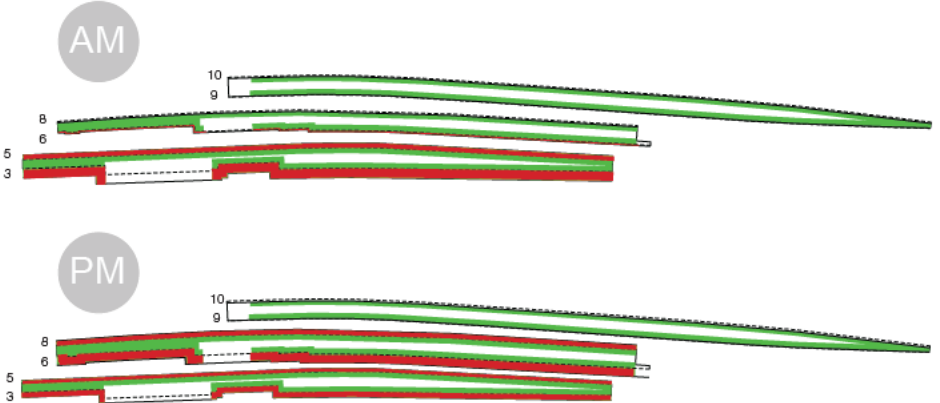
Scenario 4 (2021 + 'Special event' ingress)



2021

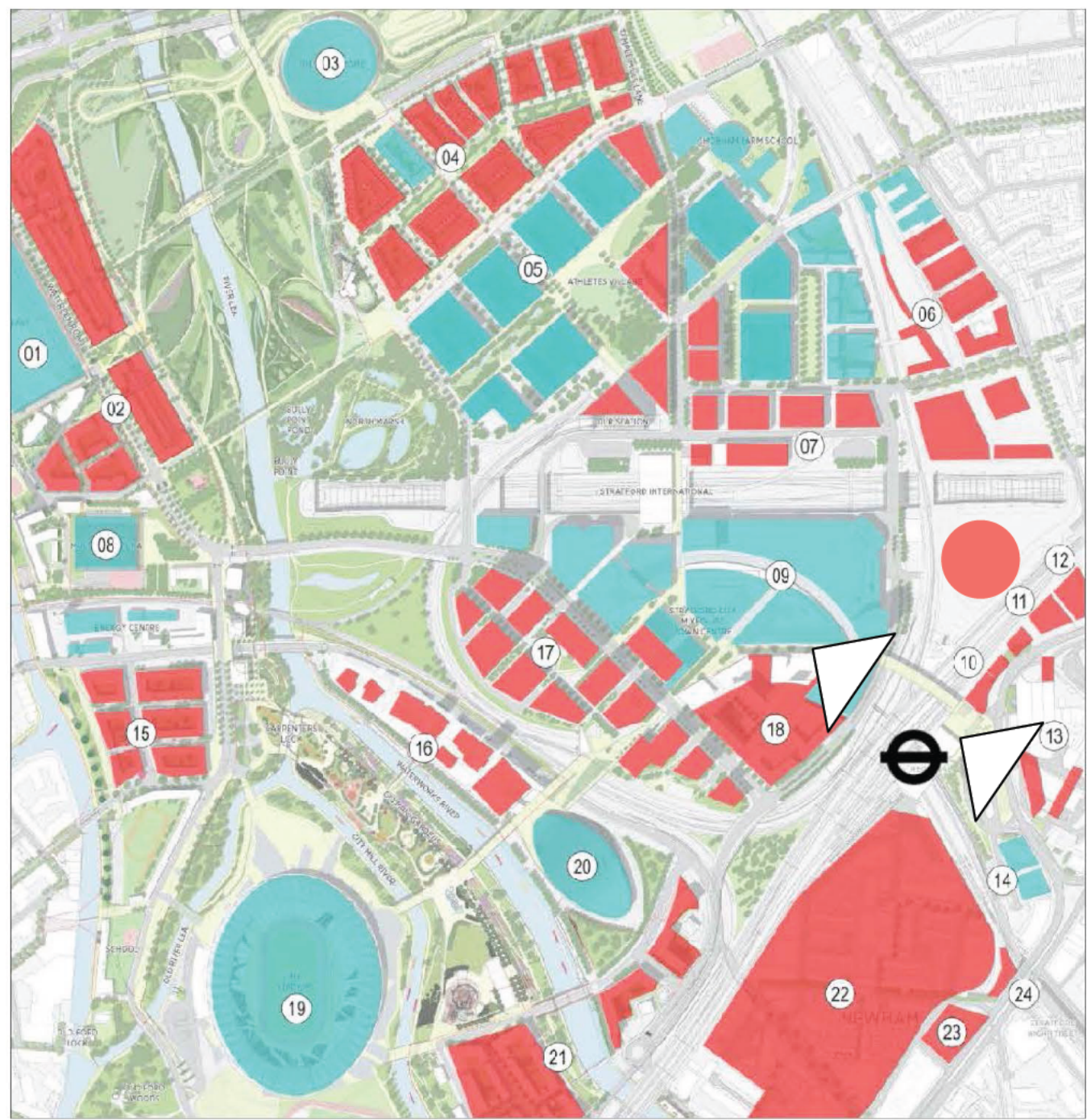


2031 +30%



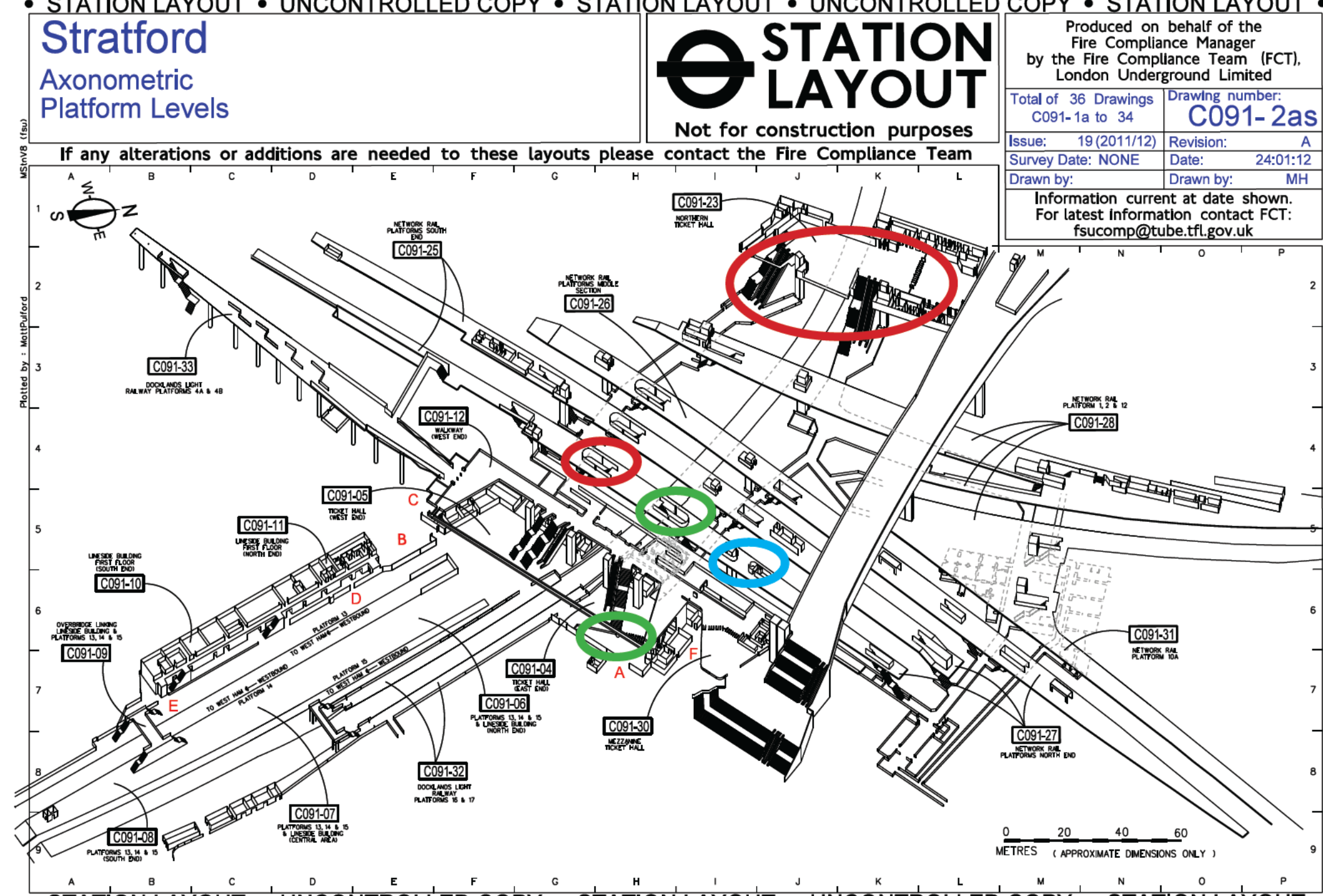


 New Developments - Built  
 New Developments - Future



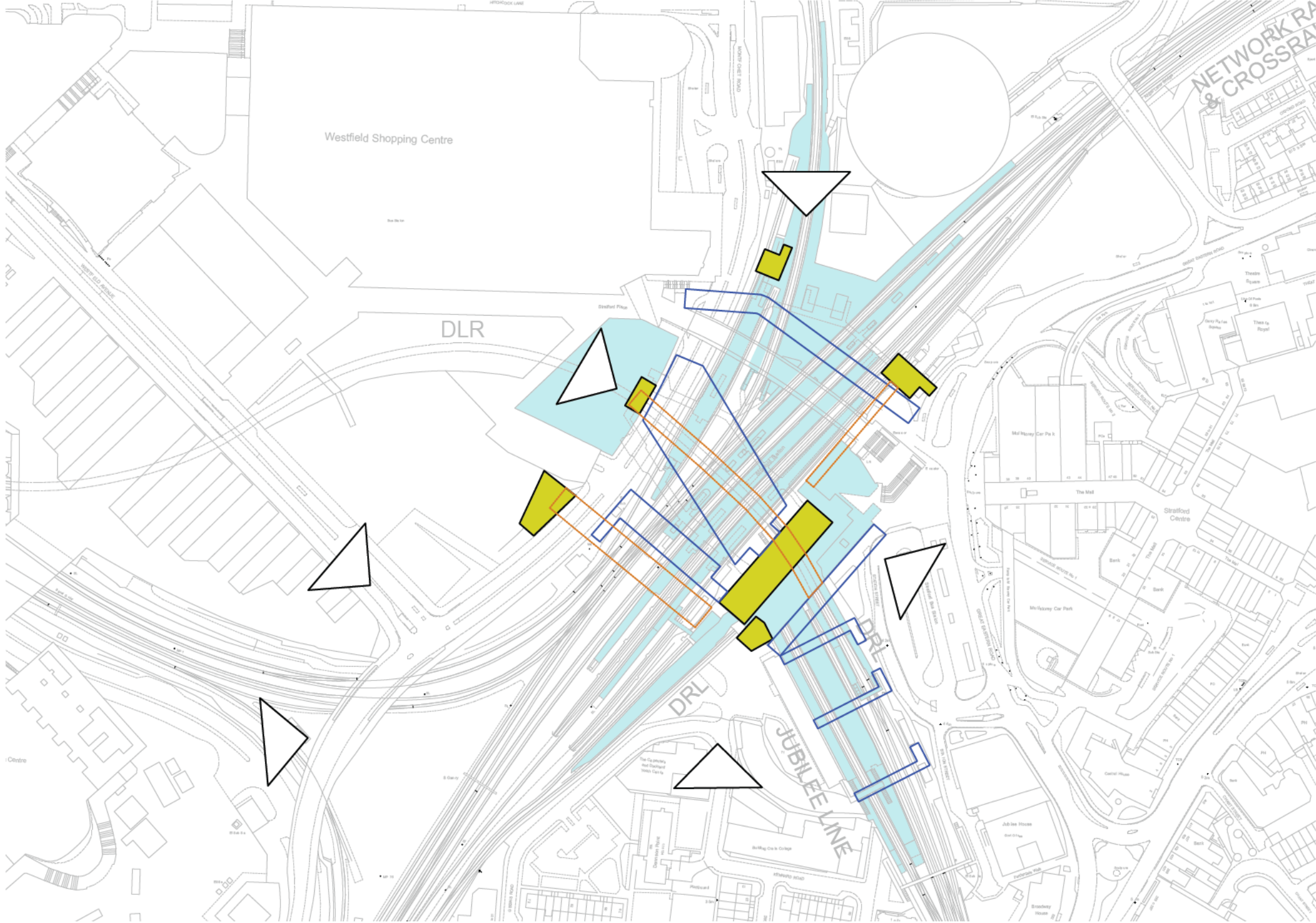
## Future Development - Built and Emerging Schemes

## PM Peak Management



Produced by London Underground Limited. Enquiries should be directed to Auto 55492





Each intervention reviewed by this report has been scored against the nine indicators, based on the scoring criteria in the table below.

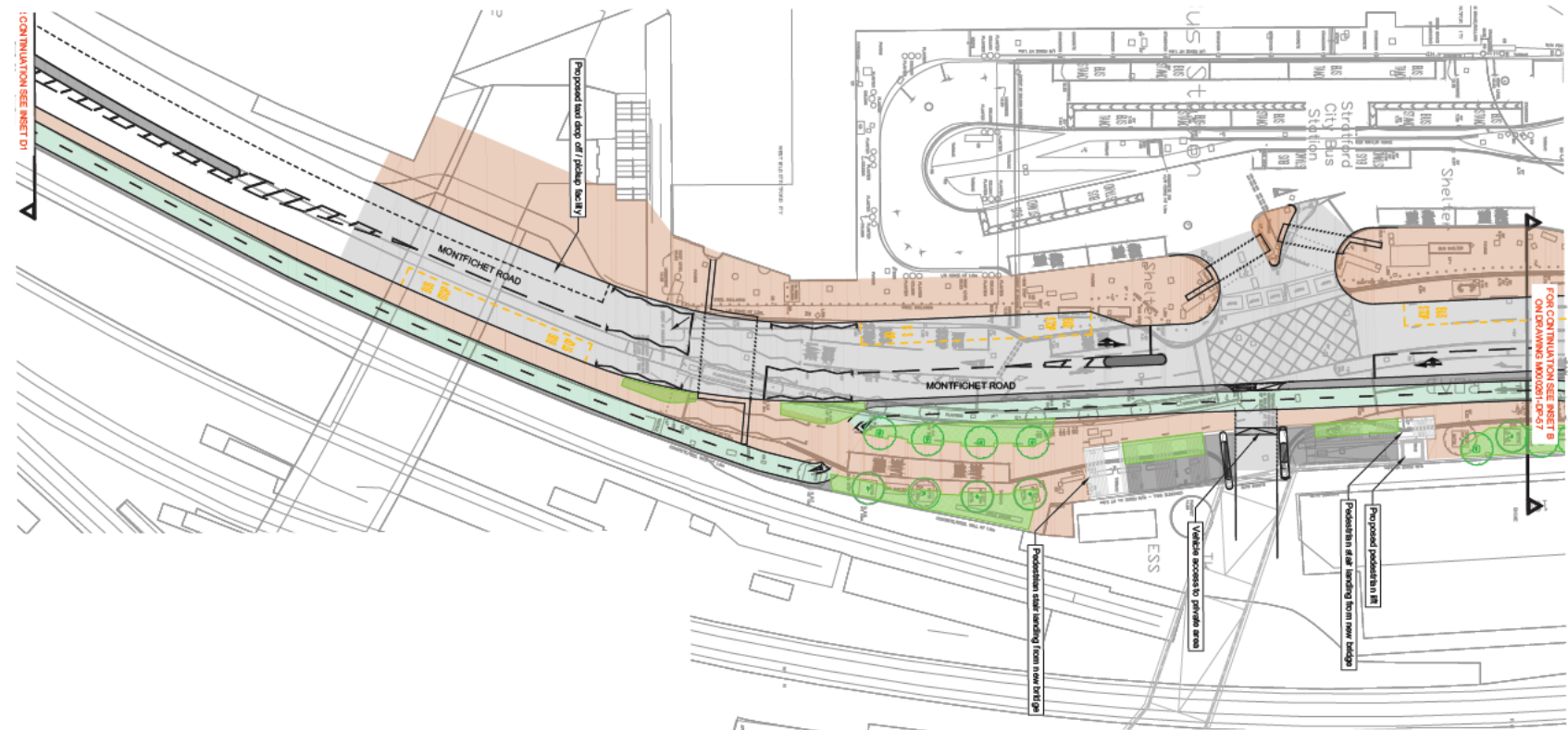
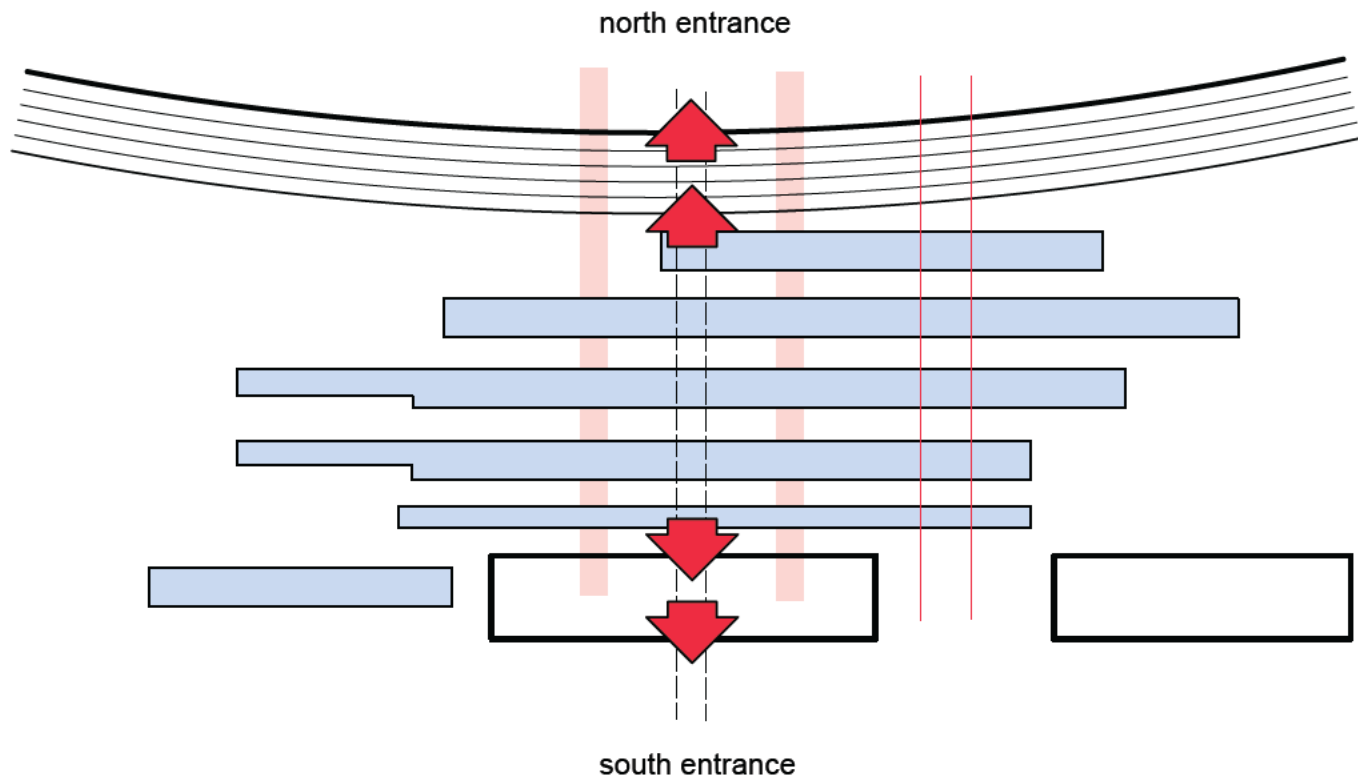
Score	Value
-2	strong negative impact
-1	negative impact
0	no impact
1	positive impact
2	strong positive impact

Scores will take into account contradictions and impact on other interventions. A score of not applicable (n/a) will be given to those interventions which have no relevance to the indicator. This is different from a score of zero.

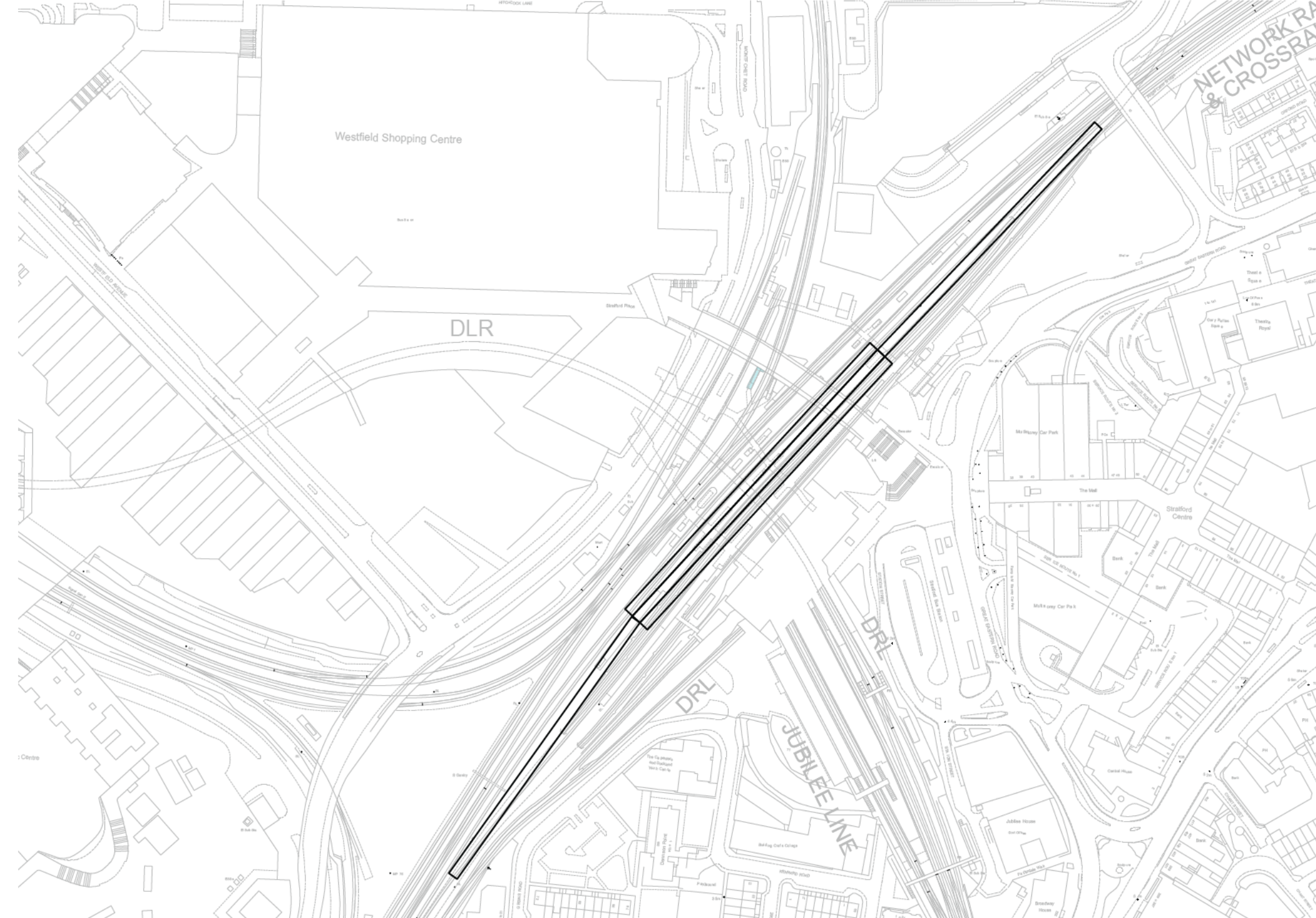
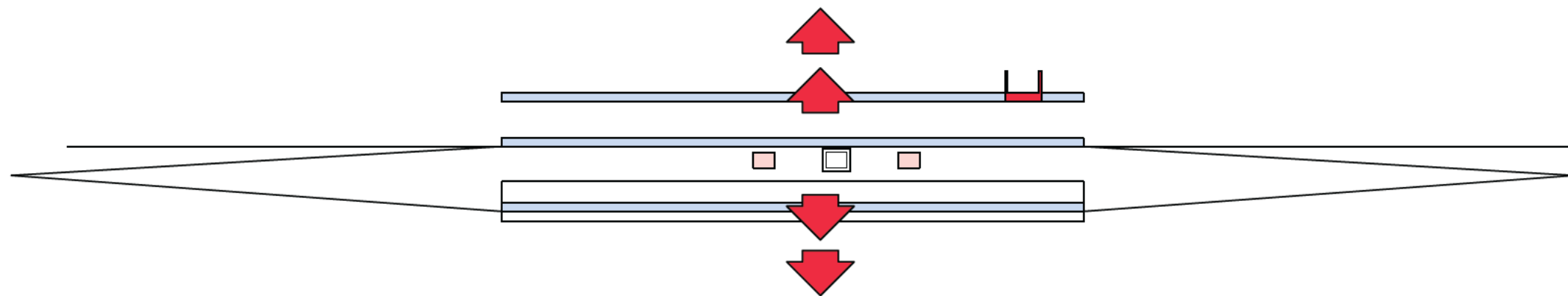
Interventions	1/ Improves platform capacity	2/ Improves circulation capacity	3/ Improves legibility and interchange	4/ Improves accessibility	5/ Increases event day provision	6/ Feasible to construct	7/ Land available for construction	8/ Reduces severance within station	9/ Integrates station with urban environs
Eastern overbridge	0	1	-1	0	1	1	-2	1	0
Western overbridge	0	1	-1	1	1	1	-2	1	0
Central overbridge (paid access)	0	2	-1	2	1	1	-2	1	0
East – west linear bridge	0	0	1	0	0	1	1	0	1
Jubilee line bridge (paid access)	0	1	-1	0	1	2	1	0	0
Jubilee line bridge (unpaid & paid access)	0	1	-1	0	1	2	1	0	1
Jupp Road bridge	0	0	0	0	0	2	-1	0	1
Angel Lane to mezzanine subway	0	1	-1	0	1	-1	-1	0	1
Diversion and reuse of Channelsea subway	0	1	-1	0	0	-1	-2	1	0
DLR tunnel subway	0	1	-1	1	0	2	2	2	0
Ground floor south western entrance	0	0	0	0	1	2	2	0	1
First floor south western entrance	0	0	0	1	1	2	2	0	0
Angel Lane entrance	0	0	0	0	1	-1	2	0	0
Cherry Park entrance	0	0	0	0	1	1	-2	0	1

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Montfichet Road – event day entrance	0	0	0	0	1	2	2	0	0
Northern ticket hall – event day entrance	0	0	0	0	1	2	2	0	0
Extend existing entrances - north and south ticket halls	0	1	1	0	0	2	2	0	0
Swapping platforms 8 for wider platforms 10A or 9	1	0	0	0	0	1	2	0	0
Relocation of a stop board on Platform 8	1	0	0	0	0	2	2	0	0
Removing the control hut on Platform 8	1	0	0	0	0	2	2	0	0
Run more class 345 trains	1	0	0	0	0	0	0	0	0
Enhance customer information on the platform	0	0	1	0	0	0	0	0	0
Improve customer engagement	0	0	1	0	0	0	0	0	0
Nudging customer behaviour	1	0	0	0	0	0	0	0	0
Bus depot redevelopment	0	0	0	0	0	2	2	0	-1
South West Entrance Commercial Development	0	0	0	0	0	2	2	0	1

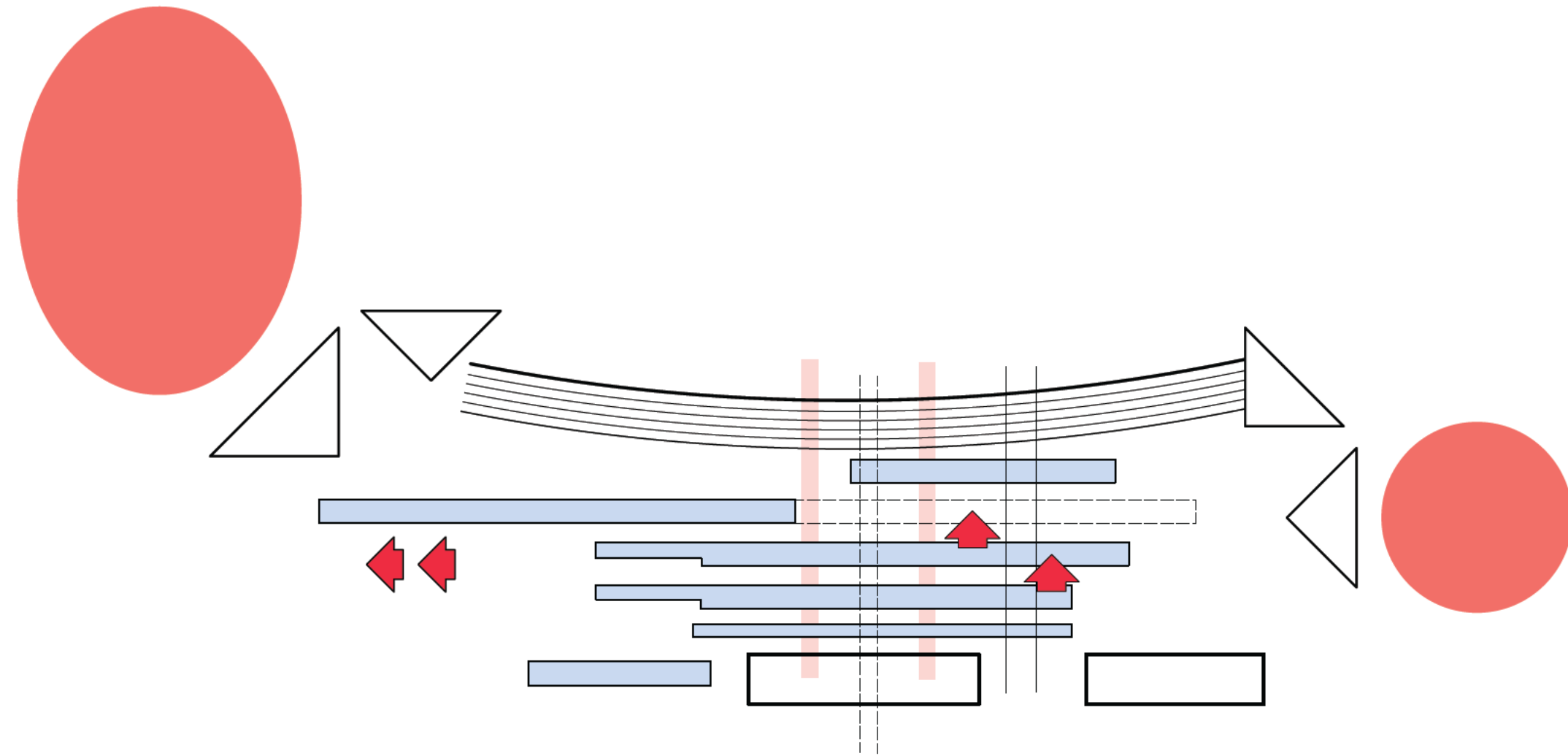
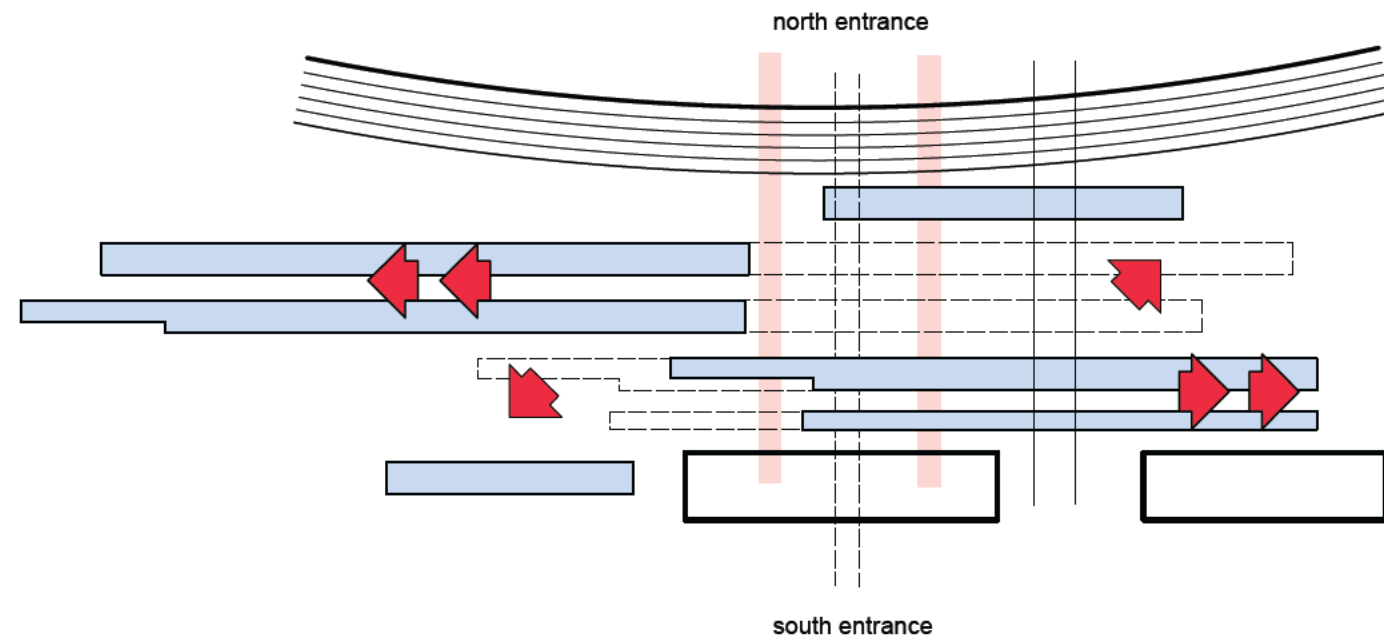




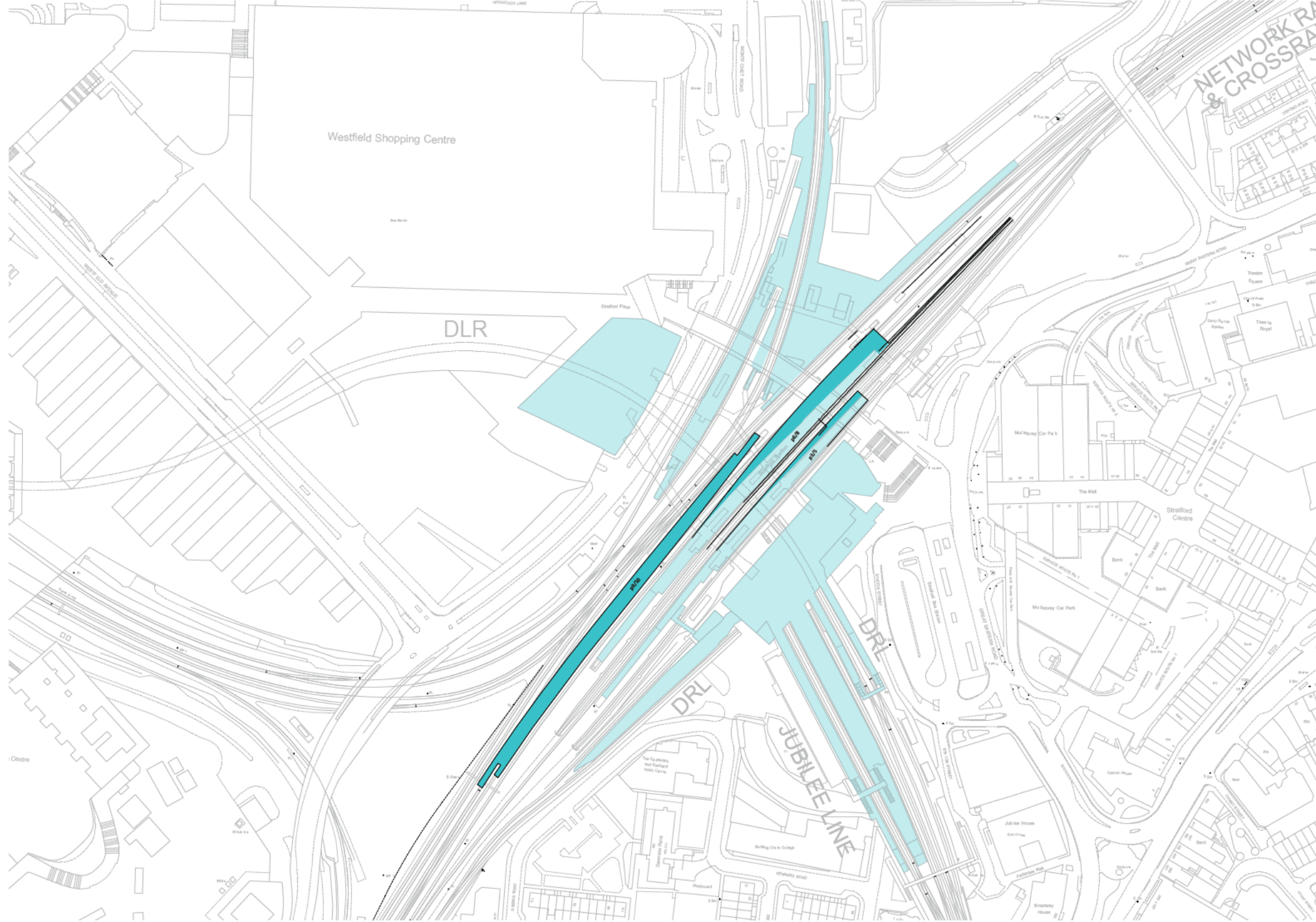








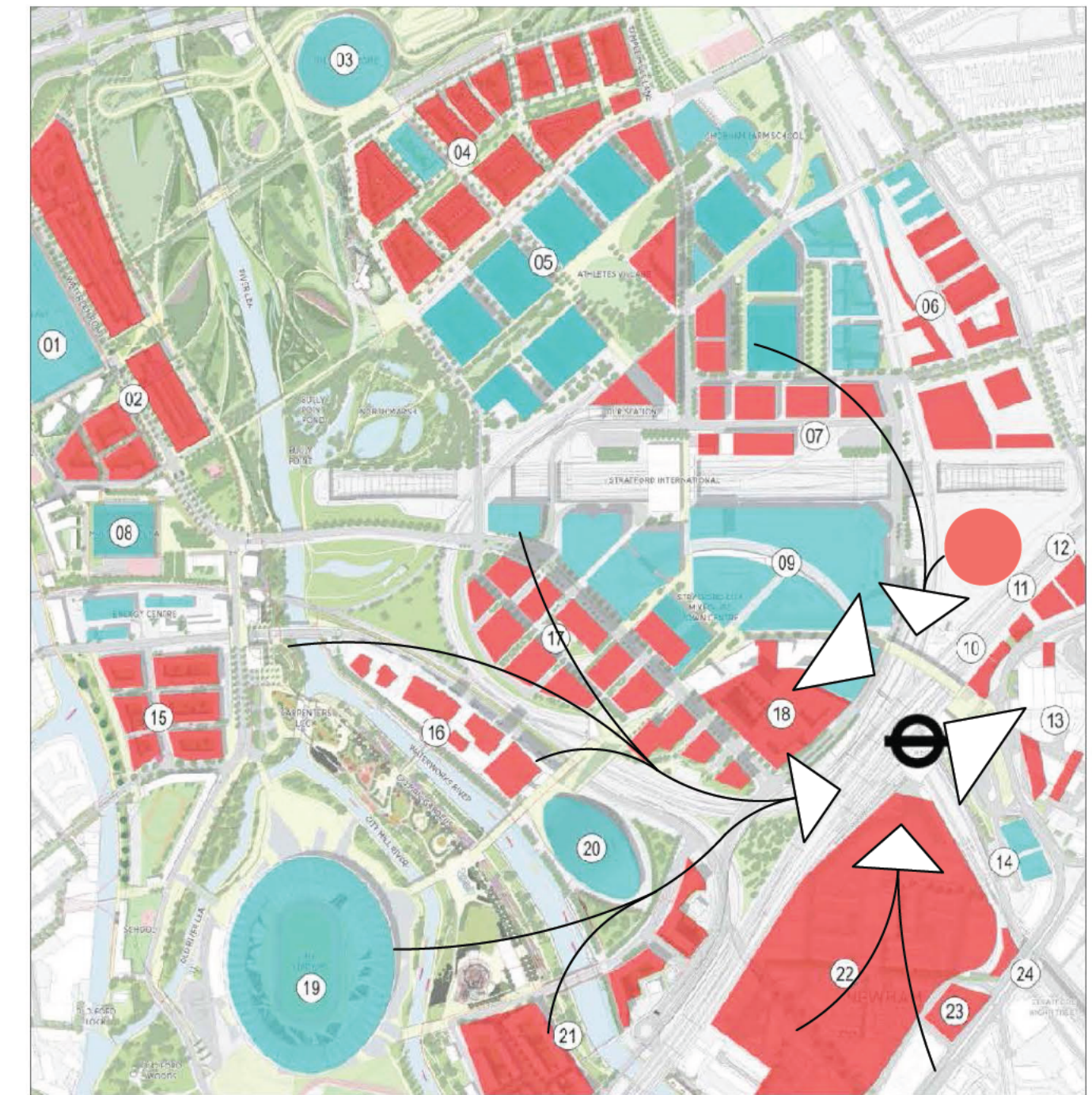




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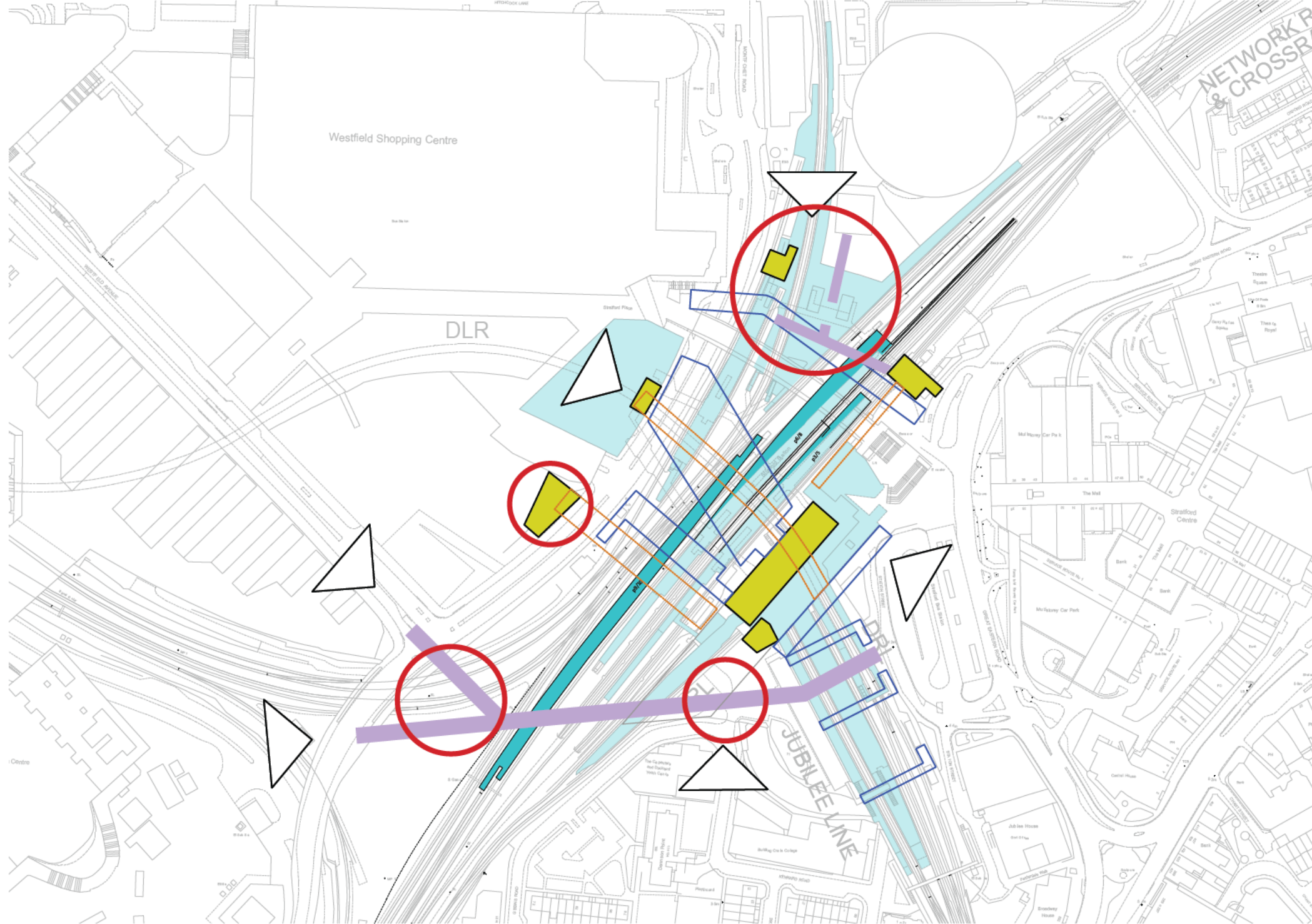
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