



# London Underground Railway Society

## Four Lines Modernisation

Kasper Dixon – Tues 8 October 2019





# What is 4LM?



The Circle, District, Hammersmith & City and Metropolitan lines are among the oldest parts of the Underground – in places dating back to 1863.

Estimated  
Final Cost  
**£5.4bn**

Together these lines...

make up  
**40%**  
of the Underground  
network

carry over  
**1.3 million**  
customers  
each day

**4**  
**L**ines  
**M**odernisation

Because these lines share stations and track, we are modernising them together in one combined programme.





"From Uxbridge to Upminster, Chesham to Wimbledon, over one million customers a day will benefit from this radical modernisation"

Mark Wild  
Managing Director London Underground



4LM will deliver a capacity increase

**33%**

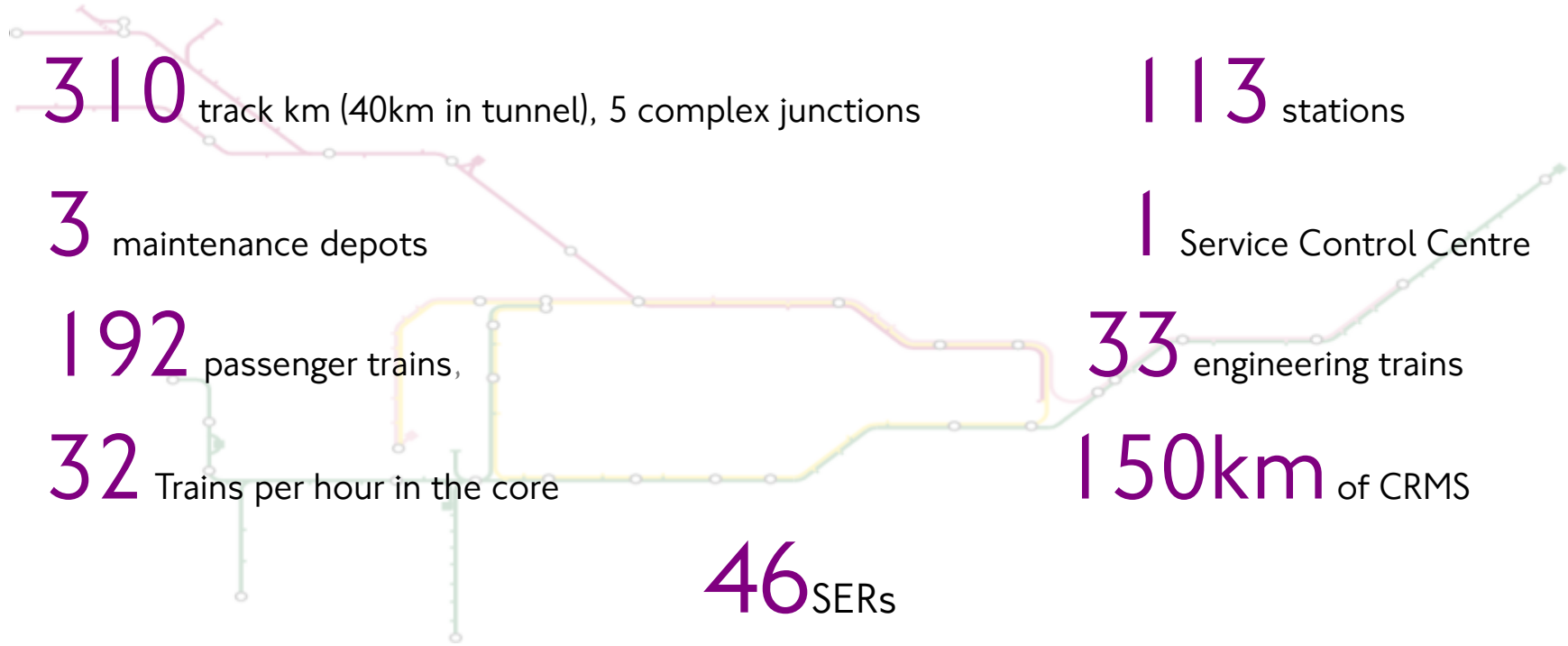
across all four lines



# Four Lines Modernisation Programme Video



# ATC Re-signalling project



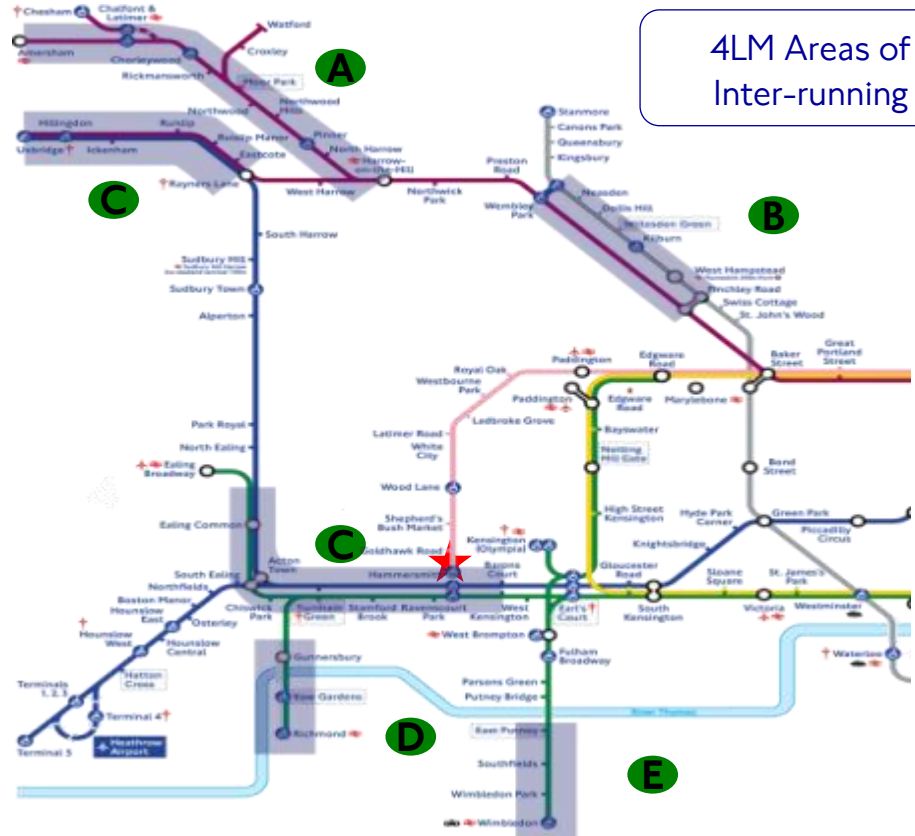
# ATC Re-signalling Scope



- New Signalling System
  - In-cab signalling
  - Automatic train protection, operation & regulation
- Single Integrated Service Control Centre
  - Covers whole 4LM network
  - Replaces 11 separate facilities
- Inter-running with Network Rail, other Operators and LU Lines



- A** Chiltern Trains/Network Rail
- B** Jubilee Line
- C** Piccadilly Line
- D** London Overground/Network Rail
- E** Southwest Trains/Network Rail



4LM Areas of Inter-running

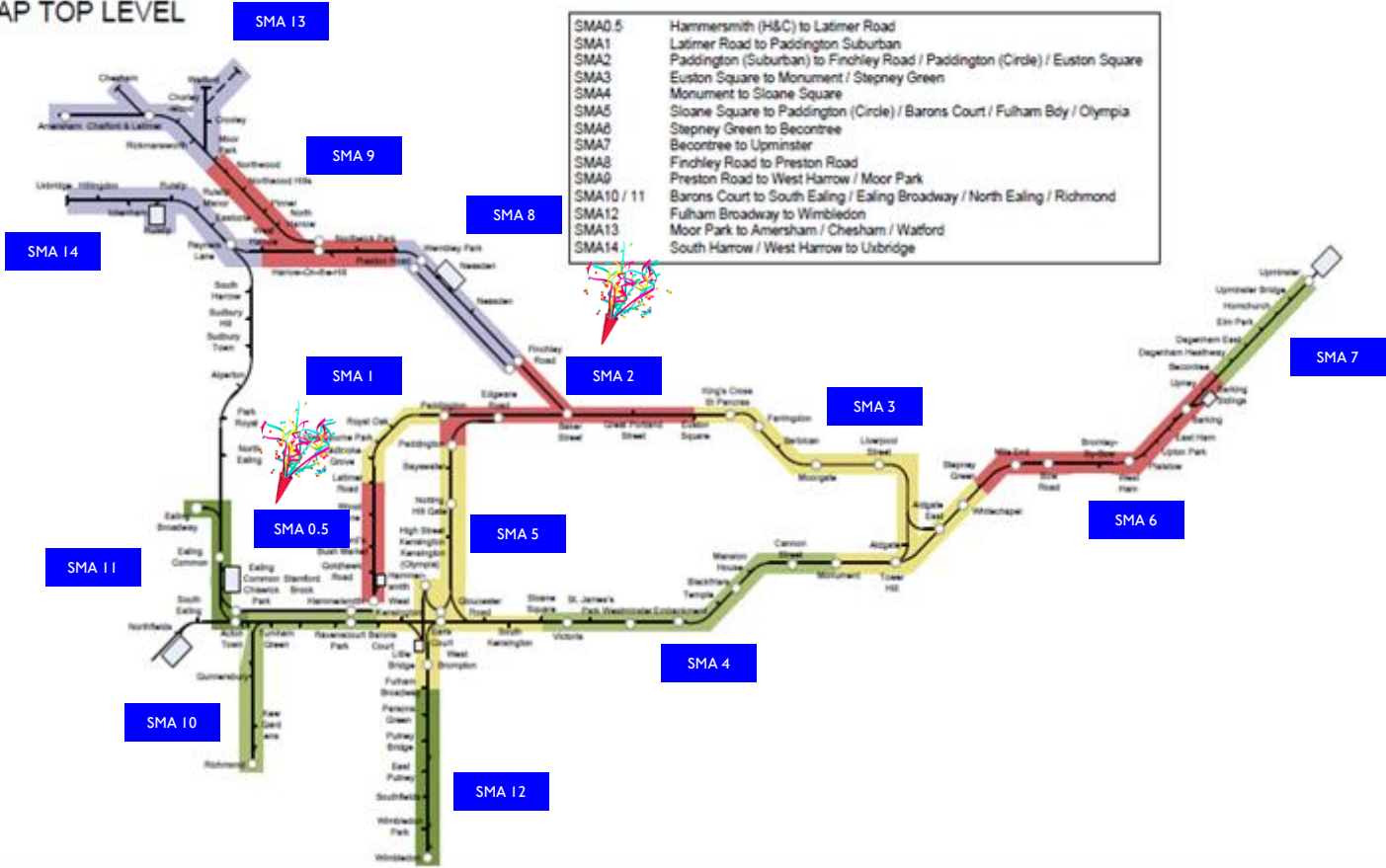


# 4LM Delivery Strategy

## ROUTE MAP TOP LEVEL

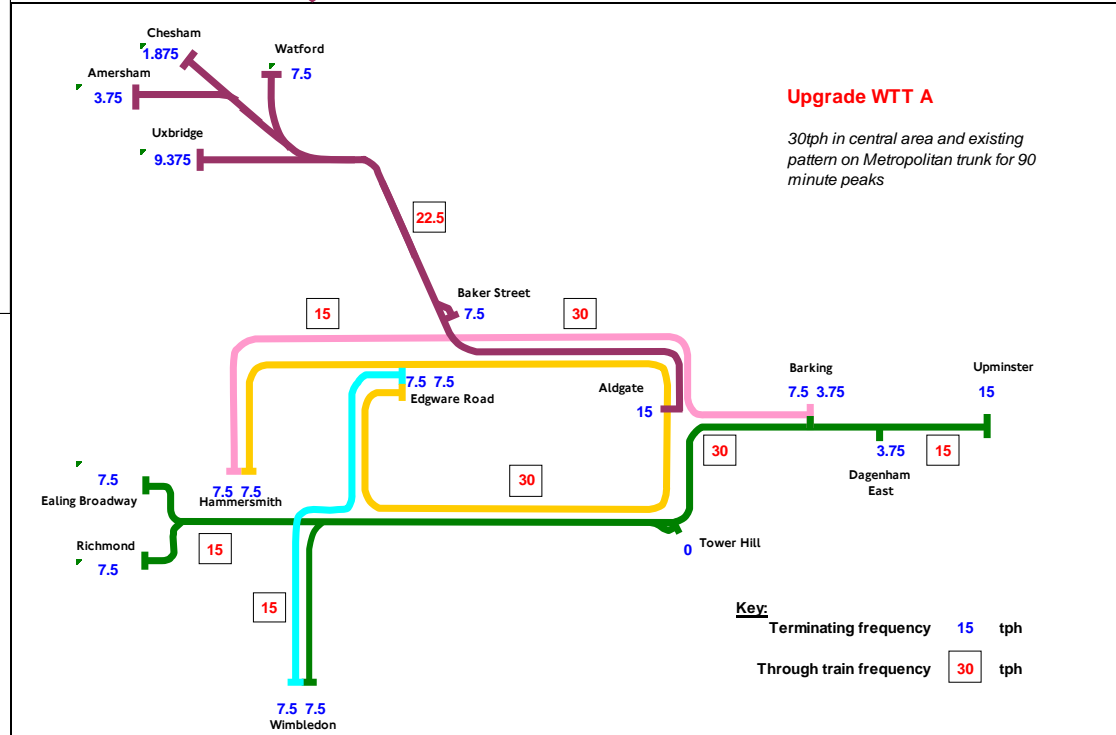
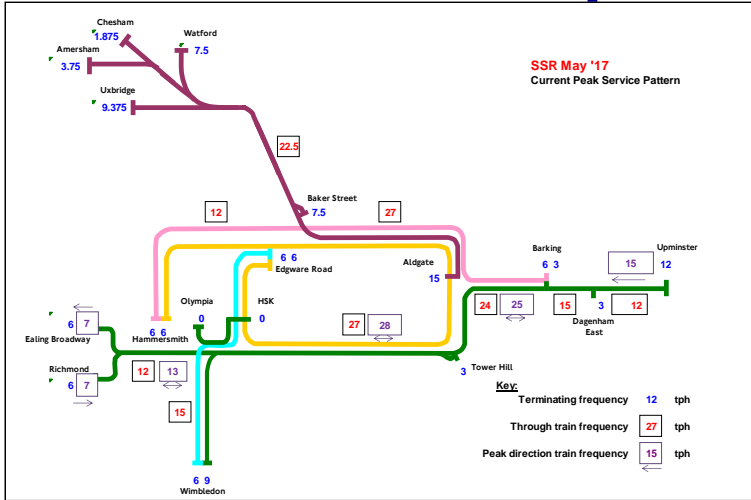


- SMA0.5 Hammersmith (H&C) to Latimer Road
- SMA1 Latimer Road to Paddington Suburban
- SMA2 Paddington (Suburban) to Finchley Road / Paddington (Circle) / Euston Square
- SMA3 Euston Square to Monument / Stepney Green
- SMA4 Monument to Sloane Square
- SMA5 Sloane Square to Paddington (Circle) / Barons Court / Fulham Bdy / Olympia
- SMA6 Stepney Green to Becontree
- SMA7 Becontree to Upminster
- SMA8 Finchley Road to Preston Road
- SMA9 Preston Road to West Harrow / Moor Park
- SMA10 / 11 Barons Court to South Ealing / Ealing Broadway / North Ealing / Richmond
- SMA12 Fulham Broadway to Wimbledon
- SMA13 Moor Park to Amersham / Chesham / Watford
- SMA14 South Harrow / West Harrow to Uxbridge





# Timetable Implementation



## WTT A: 30tph in the Central Area

- SMA0.5 – SMA06 implemented
- Full train fleet fitted (SMA03)
- Depot works complete
- Train and operator availability to support WTT A
- Maintenance Capability for 10% increase in S7 kms run

# Signalling Equipment Rooms



159 pile retaining structure at Barking SER



Piling beneath an undercroft of Sainsbury's, all deliveries by Engineering Trains at Triangle sidings



Extensive excavation at Ealing Common to protect heritage of the existing station building



Major mining work at Turnham Green & Gunnersbury SERs



Plaistow SER

# Cable Route Management System



- Scope of 150km of Cable Route Management System (CRMS) to be designed & installed
- Constraints of undertaking this on an operational railway with legacy assets has resulted this increasing to 235km (+57%)



- Varied types of CRMS installation across the network, e.g. Over Track Crossings (OTX), Under Track Crossings (UTX), Under Road Crossings (URX), Hangers, Trough & Cable Post Routes
- CRMS installation for the programme currently 95% complete



# Thales Installation



Approximately 2,550 Person shifts per week

17,500 remaining assets & 3078km of cable to be installed.

Thales installation depot is now fully operational.





SLC migration night 5 May 2018



Hammersmith Service Control Room in operation at Service Line Control 4LM migration phase



Hammersmith Service Control Centre

## Hammersmith Service Control Centre

- Newest and largest London Underground Service Control Centre
- Baker Street control (Met and District) teams moved there 5 May 2018
- **Now used to run existing railway on the 4 lines today!**
- All communications (Thales ICS CMS, Connect) and service control systems (VDS, Telephony) into Revenue service

## Service Line Control (SLC)

- First and largest people move on the 4LM programme
- Completed prior to the signalling teams moving to Hammersmith SCC



# Delivered S stock train fleet Nov 2016

- Walk-through
- Air-conditioned
- Floor level with platform
- 59 x S8s (eight carriages) on Metropolitan line
- 133 x S7s (seven carriages) on Circle, District and H&C
- **Total 192** x S stock trains now run exclusively on the 4 lines
- Largest ever order for a fleet of trains in the UK at just over 1,400 carriages



# Complete! New signalling kit installed in-cabs

- Total 192 x S stock trains - Complete
- Plus 33 engineering vehicles - Ongoing
- Each to be fitted with Thales equipment
- S Stock trains were sent to Derby for fitment
- Engineering Vehicles are being fitted in Ruislip



# ATC EV Train Fitment



Ruislip Element of EV Fitment



Day 0  
Transplant

Day 1-8  
Mechanical  
Install

Day 9-15  
Electrical  
Install

Day 16-17  
LU Testing

Day 18-19  
Thales  
Static  
Testing

Day 20  
Thales  
Dynamic  
Testing

Day 20  
Transplant



## Progress

2 Battery A  
Locomotives  
fitted and in test

## Next Steps

Hand first Locos  
back to service

Complete Battery  
Loco B design



# Depots Upgrade

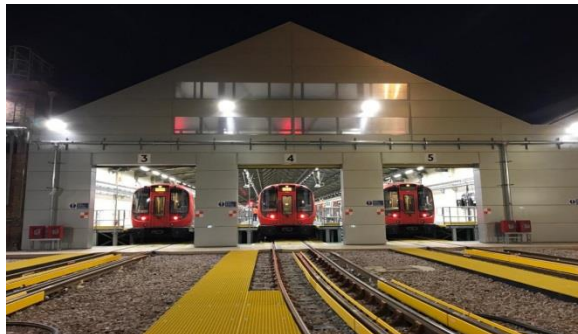


Track fan demolished and site set up



New track installation across all sheds

Unstable gable wall demolished



Installation of new gable wall steelwork

Inside of EC1 and EC2 sheds demolished



Installation of new pits and platforms

# Line Operations

Training, Trial Operations, Introduction into service



Rigorous operational trials to give confidence of system readiness



150 signalling and control staff trained on the new system

Over 1,000 Train Operators trained on the new signalling



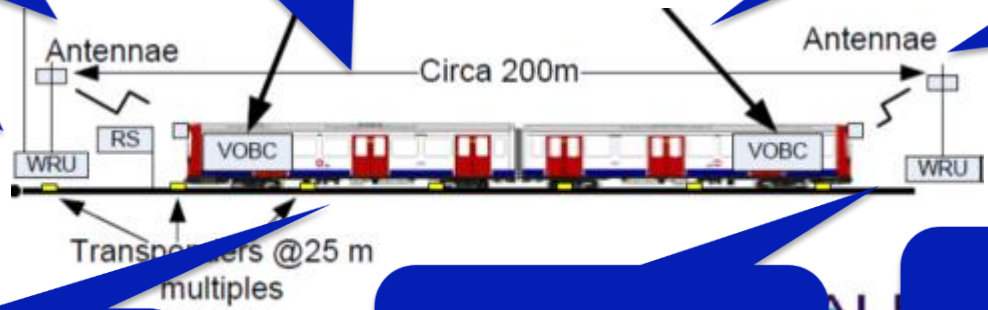
# Maintenance Readiness

Specialist tooling & Equipment developed & in place

Development of new 2<sup>nd</sup> line support team

New Works Process & Risk Assessments being developed

£2m spares delivery & onsite 'Lean' equipment



10,000+ Hours of multi layered Technical Training

CBTC system engineers in place for 'Go Live'

2 years of engagement with our people and the Trade Unions

Process Confirmation Workstreams including Cyber Security, Materials Management



# Timeline



**2018:** New Hammersmith Service Control Centre ready for staff training

**2019:** First section of new signalling complete. Improved reliability and customer information on sections of Circle and Hammersmith & City lines

**2020:** New signalling complete across central London

**2021:** Initial improvements to journey times in central London and to Barking - up to 30 trains per hour during the peak

**2022:** Final section of new signalling system completed. Trains increased to 32 per hour in central London and to Barking during peak times

**2023:** More trains on the Metropolitan line at peak times. Increased services on the busiest sections and better customer information



# We are transforming the world's oldest metro into one of its most modern





# Any questions?

