London Crossrail - mega-infrastructure as keyhole surgery
Michael Hebbert, Bartlett School of Planning, UCL
Joining up the dots, a 150-year-old puzzle

Paddington
Marylebone
Euston
St Pancras
King’s Cross
Broad Street
Liverpool Street
London Bridge
Cannon Street
Blackfriars
Embankment
Waterloo
Victoria
Joining up the dots, a 150-year-old puzzle

first solution (1862)
Metropolitan Railway connects Paddington via Euston and King’s Cross to Farringdon
Joining up the dots, a 150-year-old puzzle

Circle Line completed 1884 and fully electrified by 1905.

1896 LCC recommends future links be built with 16’ bore for heavy rail.

Continuing debate about London’s need for a Grand Union Station...
Joining up the dots, a 150-year-old puzzle

1943 *County of London Plan* proposal for consideration to be given to new cross-London rail infrastructure

1944 appointment of the Railway (London Plan) Committee, reports 1948
Joining up the dots, a 150-year-old puzzle

1948 formation of British Transport Commission, integrating all the main line railway companies with the London Passenger Transport Board

1949 British Transport Commission report - origins of modern Crossrail
London Railways Plan (1949)
London Railways Plan (1949)

Proposal

34 miles of large-bore tunnel under central London

designed for main line, heavy-rail services not Tube trains

10-carriage trains, ample seats, sliding doors

through-London routes
London Railways Plan (1949)

Proposal

34 miles of large-bore tunnel under central London
designed for main line, heavy-rail services, not Tube trains
10-carriage trains, more seats, sliding doors,
through-London routes
London Railways Plan (1949)

Recommended routes:

(A) linking Euston lines with Blackfriars

(D) linking Cambridge line via Tottenham Hale with Victoria

(F) connecting London Bridge lines via Fenchurch St and Marylebone to LMR at Neasden

(G) linking Fenchurch St lines via Bank and Southwark with Waterloo
London Railways Plan (1949)

(D) linking Cambridge line via Tottenham Hale with Victoria
London Railways Plan (1949)

(D) linking Cambridge line via Tottenham Hale with Victoria

opened 1969 as a conventional deep-tunnel tube, the Victoria Line
A Railway Plan for London (1965)
A Railway Plan for London (1965)

report of the Working Party of the Passenger Transport Planning Committee for London

assumes outward spread of commuting, with crowding of peak hour trains but surplus capacity on inner-suburban lines

recommends new Fleet Line Underground, Baker Street to New Cross

Victoria, Piccadilly & Northern Line extensions

some rationalisation of existing BR lines, but no new tunnels
A Railway Plan for London (1965)

context of Buchanan Report *Traffic in Towns* (1965) and GLC Primary Road Network (1969)

trend forecasts of employment and demographic decline, rising motorisation, surplus rail capacity

8% decline in rail commuting to Central London 1966-73

transport investment channelled into the Motorway Box, Ringways and Radial Motorways
London Transportation Study (1968)
London Transportation Study (1968)

First large scale application of American land use/transportation methodology to a British city

Phase 3 (published 1968) includes Plan G: two ‘main line tube’ links through central London with a major interchange under Covent Garden

**Paddington to Liverpool St**
24 tph between Reading/HighWycombe lines and Southend/Chelmsford lines

**London Bridge to Victoria**
28 tph connecting two branches of Southern Region
London Transportation Study (1968)

Analysis predicts minimal benefits from Plan G - net increase of 1% in peak-hour public transport trips.

Estimated annual rates of return:
Plan G Crossrail  2%
Motorway Box     8.8%

1973 Labour wins control of GLC:
‘the world was stood on its head’
London Rail Study (1974)
London Rail Study (1974)

Joint committee of Department of Transport, British Rail, Greater London Council and London Transport Executive, chaired by Sir David Barran

technical team led by David Bayliss, using innovative computer forecasting and cost-benefit analysis

acknowledged the decline scenario but also tested growth scenarios based on rail investment, congestion charging and revival of the London economy

PROPOSALS

BR non-radial schemes
Ring Rail and N.London Line

BR through running via Blackfriars (Thameslink)

Bakerloo & Victoria line extensions

Chelsea-Hackney Line

Fleet Line

River Line to Thamesmead via Surrey Docks & Isle of Dogs
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PROPOSALS

two BR Crossrail lines

Paddington - Liverpool Street

Victoria - London Bridge

interchanges at Blackfriars and Leicester Square

‘an imaginative and exciting solution to the problems of overcrowded public transport in Central London’
London Rail Study (1974)
London Rail Study (1974)

Precedents
Hamburg and Munich S-Bahn
Paris RER Ligne A - under construction and due to open in 1976

NB a remarkable symmetry . . . in all respects but timing
A Cross London Rail Link (1980)
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1977-1980 study of Crossrail options by BR Strategic Planning Office

released November 1980 with foreword by BR Chairman Sir Peter Parker:

‘The Link Scheme demonstrates that BR is capable of innovatory thinking and can reason expansively, constructively and at a high technical level in bad times as well as good’
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A Cross London Rail Link (1980)
LPAC London Rail Study (1988)
Globalisation and Big Bang - the upturn in Central London labour market, and the beginning of Docklands development

1982-1990 70% increase in passenger miles on London Underground

post GLC abolition, the 33 Boroughs commission a study from Colin Buchanan & Partners

the consultants contrast the timid abandonment of the Fleet Line with the ‘brilliant opportunism’ of the DLR
‘The DLR has been a dramatic demonstration not only of the way in which a rail investment can trigger major development in the right sort of area but also of the fact that this is something which developers are prepared to pay for.’

Trends of ridership and congestion indicate need for major expansion of rail capacity in Central London

Five Crossrail options reviewed:
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CROSSRAIL OPTIONS

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Liverpool St - Waterloo

CLAPHERPOOL LINE
Liverpool St - Clapham Junction
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**CLAPHERPOOL LINE**
Liverpool St - Clapham Junction

**LIVERPADD LINE**
Liverpool St - Paddington

**KING VIC LINE**
King’s Cross - Victoria
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Five Crossrail options reviewed:
Central London Rail Study (1989)
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Secretary of State acknowledges to Parliament that further network capacity will be needed - even after completion of Jubilee Line Extension

Joint study group of Department of Transport, London Underground, British Rail examines the options
Central London Rail Study (1989)

- **East-West Crossrail**
  Paddington - Liverpool Street

- **Chelsea-Hackney Line**
  Fulham Broadway - Leytonstone

- **North-South Crossrail**
  Victoria - Kings Cross

- **East-South Crossrail**
  Liverpool St - Victoria via Tottenham Ct Rd & Green Pk
narrowed down to two options with Treasury assistance

**East-West Crossrail**
- cost: £1.4 bn
- CBR: 1.32

**Chelsea-Hackney Line**
- cost: £1.8 bn
- CBR: 1.29

- recommended option: Crossrail
Central London Rail Study (1989)

Crossrail Bill presented to Parliament 1993

Widespread concern over project’s environmental impact, construction disruption, damage to historic fabric

Treasury unpersuaded, Prime Minister John Major lukewarm

Crossrail Bill voted out by Parliament at Committee Stage, 1994
Docklands - the driver of change
Docklands - the driver of change
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Docklands - the driver of change

sustained growth around the Canary Wharf hub, 02, Stratford, London City Airport - & trajectory predicted to continue

travel demand outstrips new capacity on DLR and Jubilee Line extensions

Mayor Ken Livingstone’s *London Plan* (2004) sees West End, City and Docklands joined together by infrastructure into ‘a virtual unified economic & business core’
Crossrail - on or off?
Crossrail - on or off?

2003 Department of Transport sets up ‘Cross London Rail Links’ (CLRL) in partnership with TfL and Strategic Rail Authority

Olympia & York successfully lobby for alignment through Isle of Dogs to serve Canary Wharf

2005 London Crossrail Bill submitted to Parliament - three and a half years of petitioning, debate and scrutiny, with Design Review for stakeholders

2008 July Royal Assent
Crossrail - on or off?

2009 May construction phase launch at Canary Wharf by Prime Minister Gordon Cameron and Mayor Boris Johnson
Crossrail - on or off?

2009 financial crisis, market crash, demands for the £1bn project to be stopped
2010 October Comprehensive Spending Review confirms ‘value for money’
2011 May - tunnelling contracts signed, ‘momentum unstoppable’
Tunnelling today . . .
Tunnelling today . . .
Tunnelling today . . .

station excavations, ventilation shafts, grouting shafts, spoil tips - construction impacts across London
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major road closures and diversions at Eastbourne Terrace, Charing Cross Road, Whitechapel Road
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January 2013, 5 tunnel boring machines (TBMs) excavating under London - Phyllis, Ada, Elizabeth, Victoria and Sophia
Tunnelling today . . .

intersections of Crossrail tunnels and excavations with earlier infrastructures of underground London

enlargement and integration of ticket halls, eg Tottenham Court Rd

reutilization of earlier tunnels, eg Connaught Tunnel under Royal Victoria Dock and Royal Albert Dock

Kingsway Tram Tunnel (grout injection shaft)
Tunnelling today . . .

Civil engineering as media spectacle: ‘double-decker bus’ statistics

- time-lapse web cams
- construction videos
- bird’s-eye flyovers
- picture galleries
- Near You mapping tool
Crossrail tomorrow
Crossrail tomorrow

a megaproject expected to carry 200,000,000 passengers per year

real estate portfolio of 2.5m sq foot above stations and other sites worth estimated £1.6 billion

GVA estimate total property uplift of £5.5 billion

public realm improvements of £90m
Crossrail tomorrow

designed to minimise environmental impact and disruption of urban fabric – ‘megaproject as keyhole surgery’
Crossrail tomorrow

Paddington Station with Crossrail platforms under Eastbourne Terrace
Crossrail tomorrow

Bond Street Station with eastern ticket hall on Hanover Square
Crossrail tomorrow

Tottenham Ct Rd Station with new integrated ticket hall under Charing Cross Rd
Crossrail tomorrow

Tottenham Ct Rd Station with new integrated ticket hall under Charing Cross Rd
Crossrail tomorrow

Farringdon – connection to Thameslink - London’s Chatelet-Les Halles
Crossrail tomorrow

Liverpool St Station with western ticket hall at Moorgate
Crossrail tomorrow

Whitechapel Station inserted behind existing London Underground entrance
Crossrail tomorrow

Canary Wharf - completing its trio of stations with Crossrail located in the Import Dock
Crossrail tomorrow

Canary Wharf - completing its trio of stations with Crossrail located in the Import Dock
Crossrail tomorrow

and then... job done, London’s expert tunnellers can turn their hand to upgrading the Northern Line