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Delivering a High-Speed Rail Project in a UK urban / rural environment

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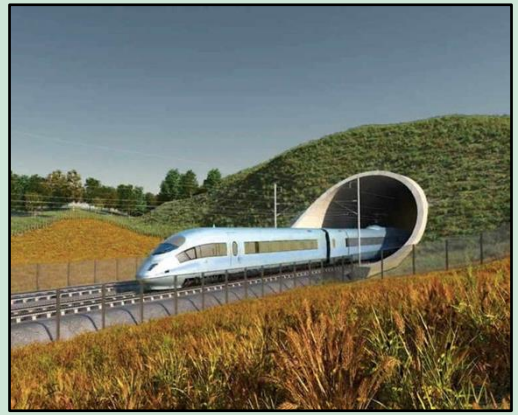

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CZECH TUNNELLING ASSOCIATION ITA-AITES

High Speed Rail Panel Discussion

Theme of my presentation – non technical issues that influence the delivery of a major UK HSR project

- Contents
- Physical Features
- Tunnels and Contracts
- Procurement
- Observations

UK HS1


EURO
TUNNEL


Great Britain
Amsterdam
The Netherlands
London
Lille
Germany
Belgium
Luxembourg
Paris
France

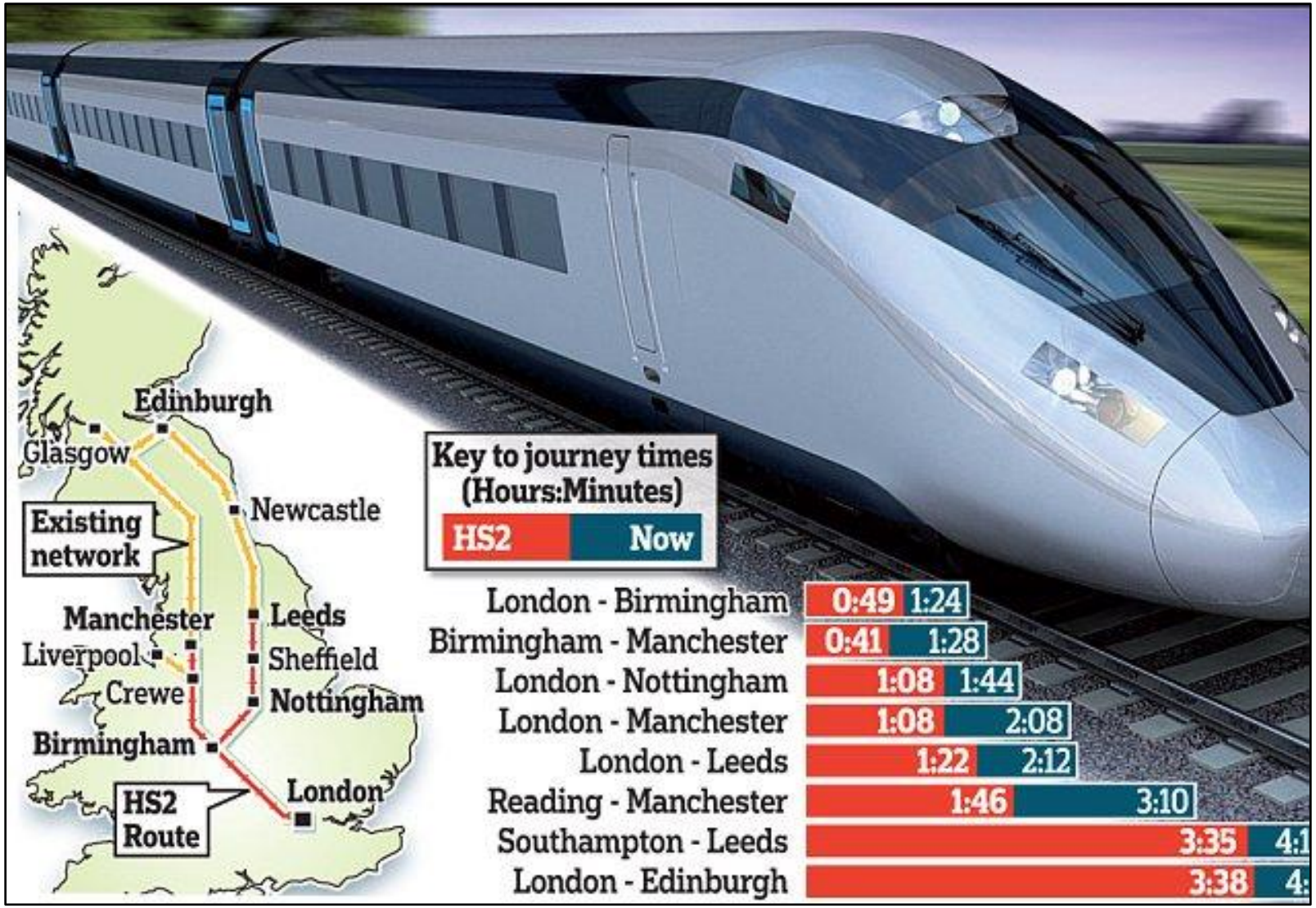
United Kingdom

Britian's HS2 high-speed rail link

HS2 was originally meant to connect London with:

- Birmingham
- Manchester
- Leeds

The original UK HS2 strategy

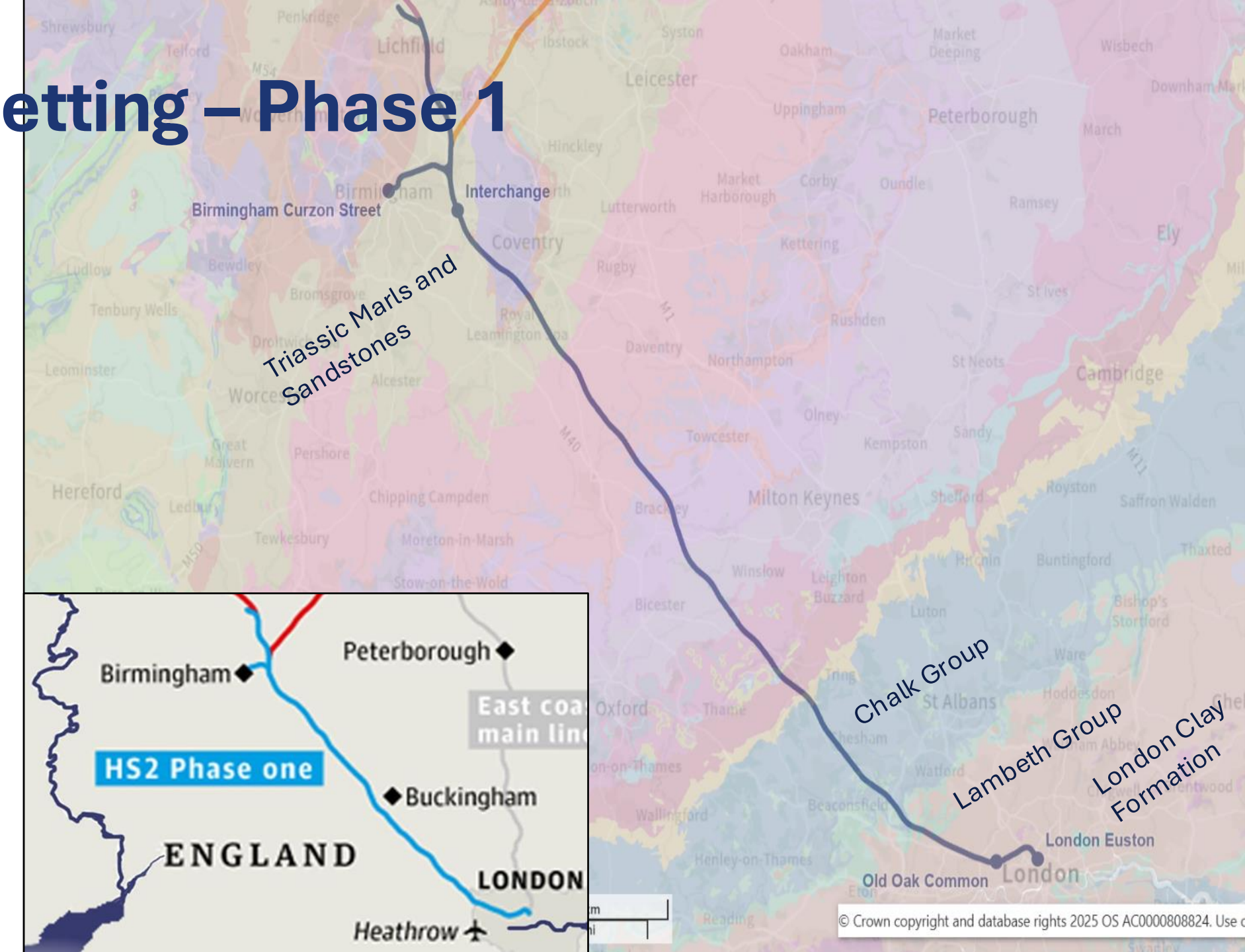


HS2 Phase 1 & 2

Four Major JV civil contracts that included the tunnels / bridges, cuttings etc & tendered at £3-5bn each in 2016.

Costs, number and length of tunnels and programme significantly increased in past 10 years

Geological setting – Phase 1



Based on an HS2 Slide

HS2 Tunnels

BBV IPT – West Midlands / Warwickshire Tunnels:

Tunnel	Length	Dia	Type
Burton Green Tunnel	760m	-	C & C
Long Itchington Wood Green Tunnel	430	-	C & C
Long Itchington Wood tunnel	1480	8.8	Slurry
Bromford Tunnel	5790m	7.55	Slurry
1No. Intervention and Ventilation Shaft			

EKFB IPT - Green Tunnels:

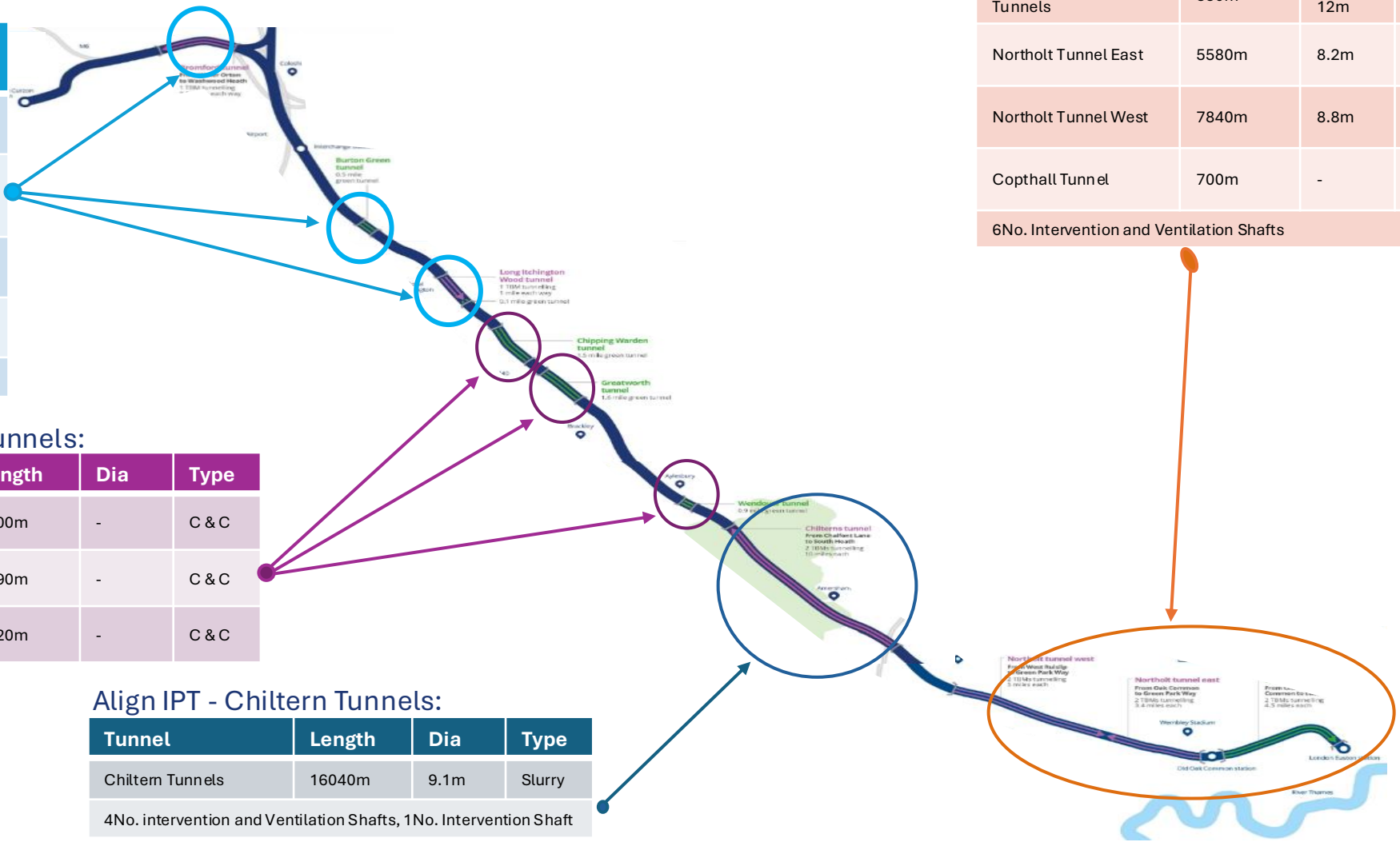
Tunnel	Length	Dia	Type
Greatworth Green Tunnel	2100m	-	C & C
Chipping Warden Green Tunnel	2490m	-	C & C
Wendover Green Tunnel	1420m	-	C & C

Align IPT - Chiltern Tunnels:

Tunnel	Length	Dia	Type
Chiltern Tunnels	16040m	9.1m	Slurry
4No. intervention and Ventilation Shafts, 1No. Intervention Shaft			

SCS IPT – London Tunnels:

Tunnel	Length	Dia	Type
Euston Cavern and Tunnels	375m	Up to 15m	Mined
Euston Tunnels	7290m	7.55m	EPBM
Old Oak Common Tunnels	350m	Up to 12m	Mined
Northolt Tunnel East	5580m	8.2m	EPBM
Northolt Tunnel West	7840m	8.8m	EPBM
Copthall Tunnel	700m	-	C & C
6No. Intervention and Ventilation Shafts			



Development of the tunnelling route

Route comparison - key differences

- New bored tunnels:
  - Northolt Tunnel East
  - Bromford Tunnel
- New cut and cover tunnels:
  - Greatworth Green Tunnel
  - Copthorne Tunnel
- Significant tunnel extensions:
  - Chiltern Tunnels

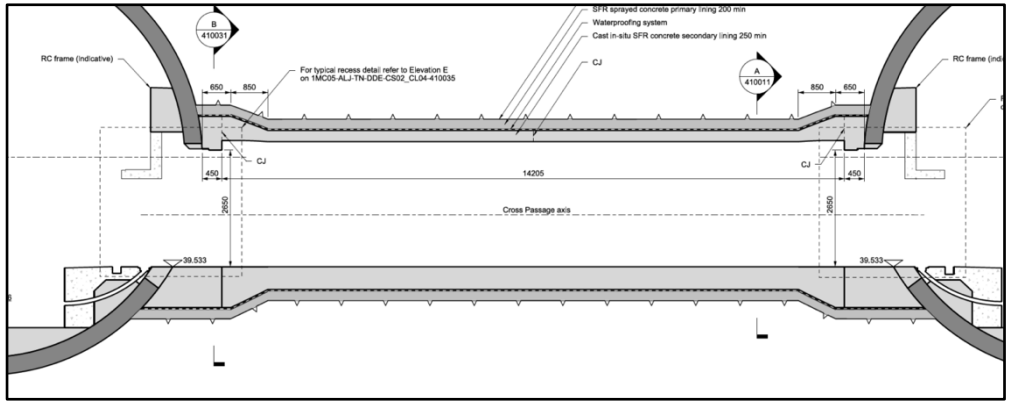
Tunnel	Type	Post Consultation	Current	Difference
Euston Tunnels	Twin bore	7.4km	7.4km	-
Northolt Tunnels	Twin bore	4.4km	13.5km	+9.1km
Copthorne Tunnel	Single cell cut and cover	-	0.55km	+0.55km
Chiltern Tunnels	Twin bore	13.3km	16km	+2.7km
Wendover Green Tunnel	Twin cell cut and cover	1.3km	1.4km	+0.1km
Greatworth Green Tunnel	Twin cell cut and cover	-	2.1km	+2.21km
Chipping Warden Green Tunnel	Twin cell cut and cover	2.1km	2.5km	+0.4km
Long Itchington Tunnel	Twin bore	1.5km	1.5km	-
Burton Green Tunnel	Twin cell cut and cover	0.5km	0.75km	+0.25km
Bromford Tunnel	Twin bore	-	5.8km	+5.8km

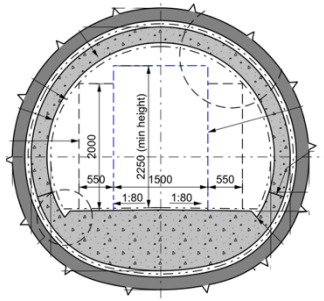
- **17.6km increase** in twin bore TBM tunnels or 40%
- **2.85km or 40% increase** in twin cell cut and cover tunnels
- **0.55km or 100% increase** in single cell cut and cover tunnels.

HS2 Tunnels

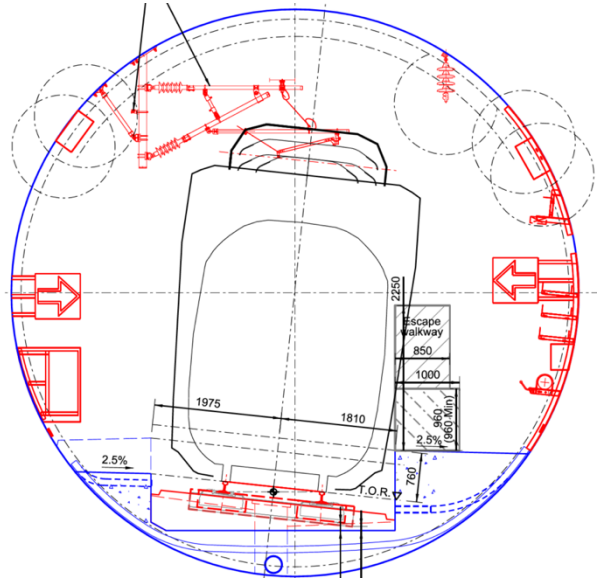
Typical Cross Sections

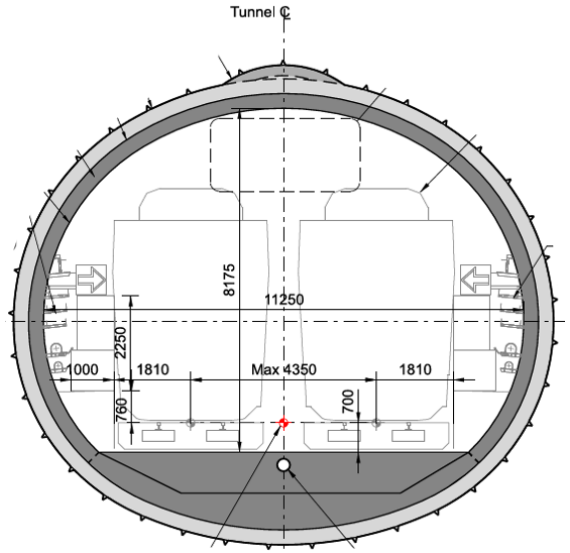
Cross Passages 12-30m long, 3-4m ID



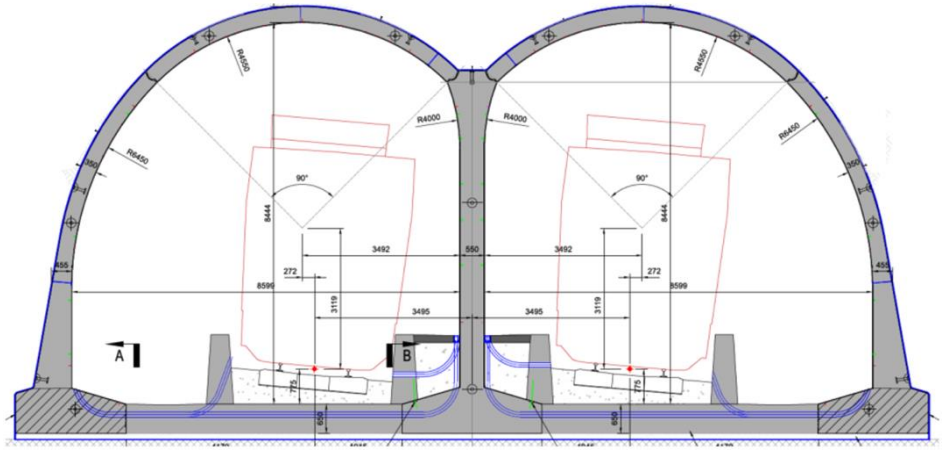


Bored Tunnels – 7.44 to 9.1m ID



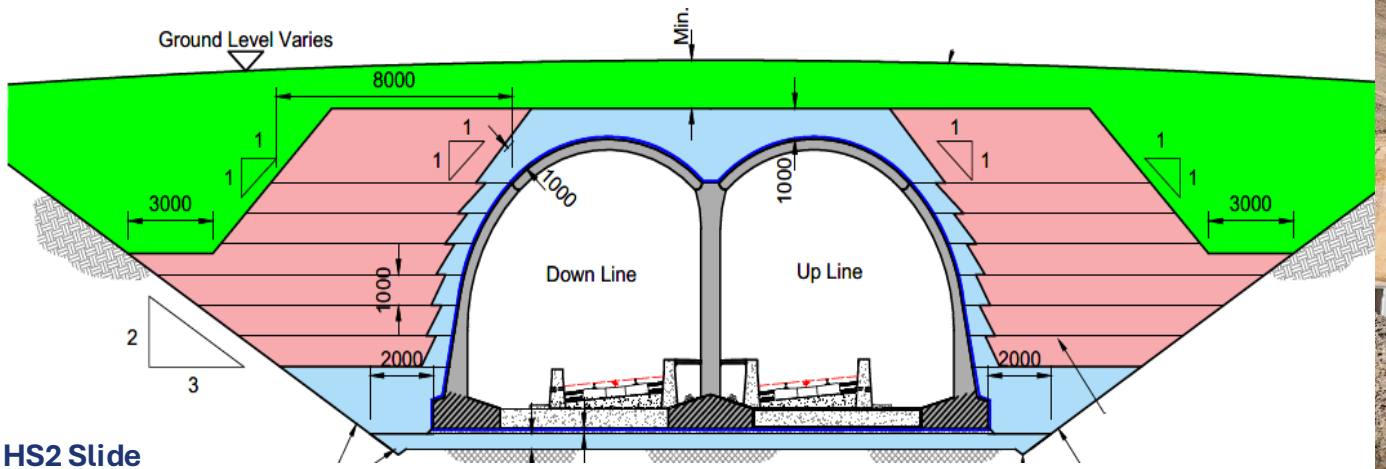


Old Oak Common SCL tunnels – up to 11.25m across the axis



Precast Cut and Cover Tunnels – each cell 8.4m high by 8.6m wide

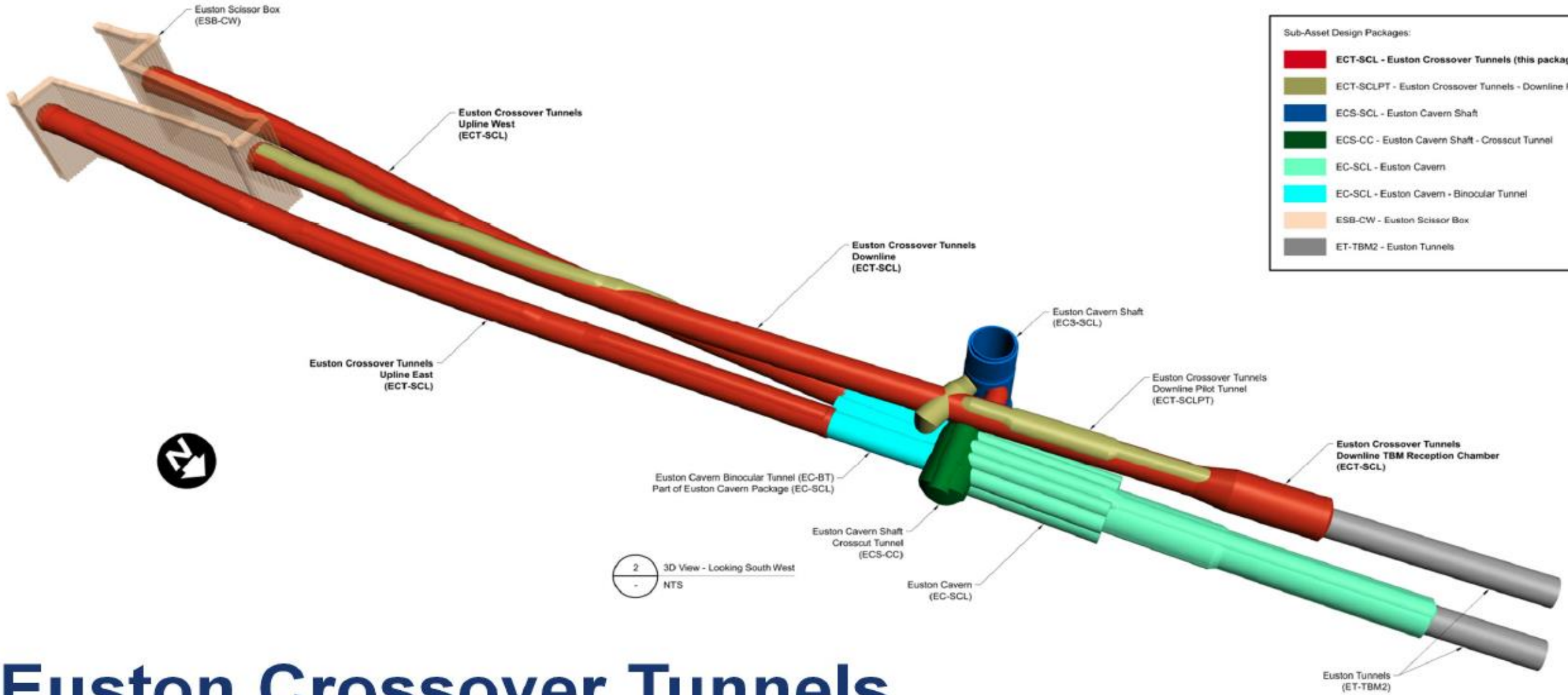
‘Green Tunnels’



HS2 Slide

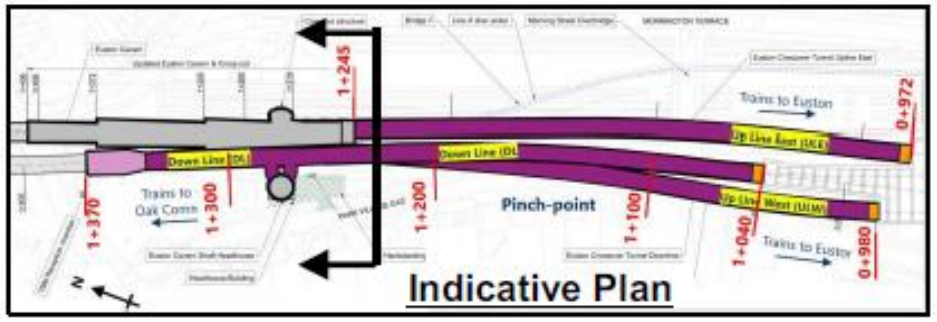
Integrated Project Team

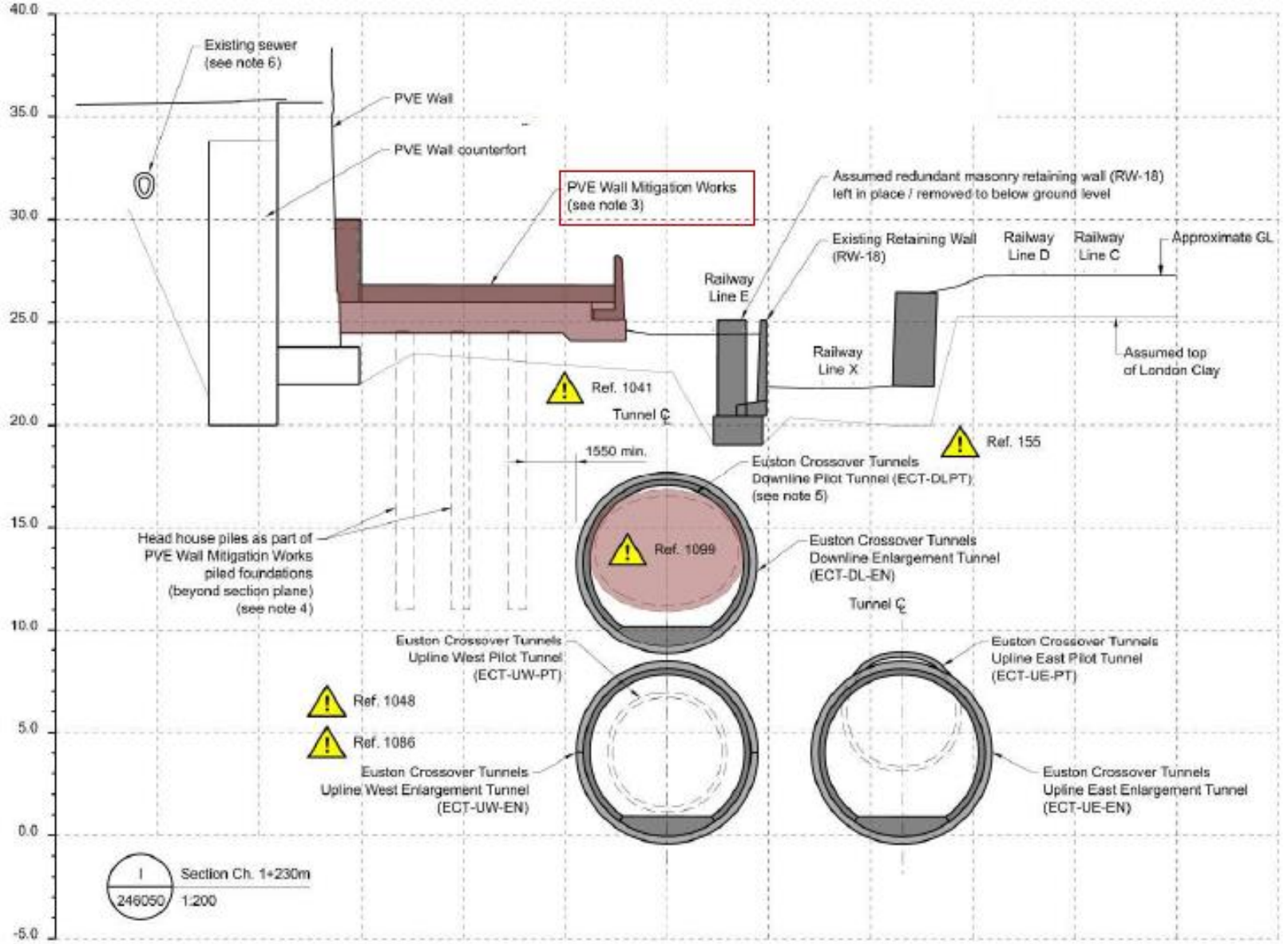
ARUP TYPSA STRABAG SKANSKA COSTAIN STRABAG Working on behalf of HS2



Euston Crossover Tunnels

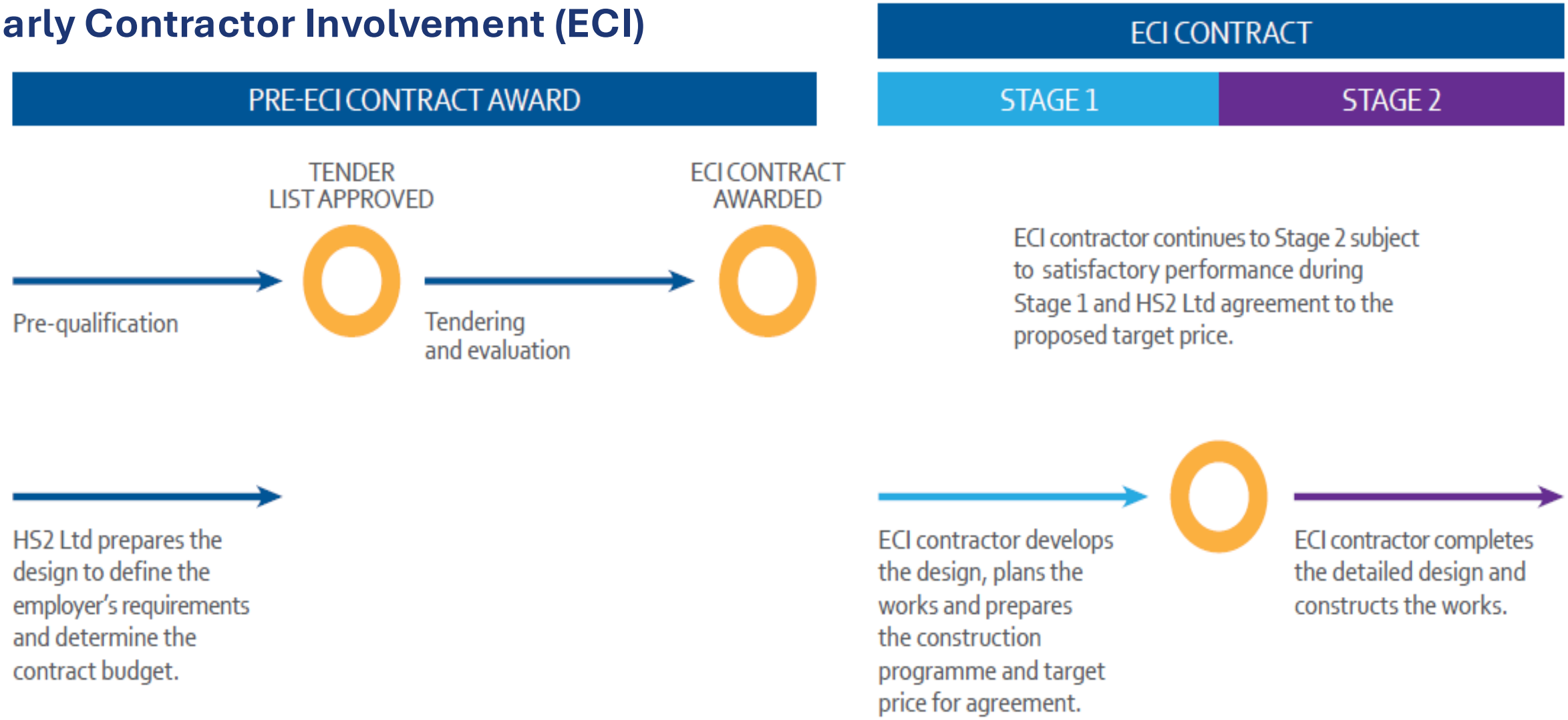
Cross Section Downline 1+230





HS2 Procurement

Early Contractor Involvement (ECI)



Benefits of ECI Projects (UK experience)

Some of the key aims and benefits of ECI:

Partnership

- Aligned, joint approach and collaborative

Best person for the project

- Elected from owner, designer and contractor

Improved & shared cost & programme control

- Integrated Project Teams (including owners)

Benefits of early contractor participation

- Constructable designs linked to logistics etc

Shared risks

- Allocation of risk, ‘no blame’, collaborate

Value and costs

- Incentivised remuneration e.g., cost reduction, VFM, quality improvements time

Better project delivery

- Focus on agreed outcomes

However … ECI!

Essential ingredients

- Need to **invest** time and effort to achieve success
- Collaboration has to be **genuine,** aligned and demonstrated - each and every day!
- Need an **integrated project team** and **common data platform**
- **Trust** and commitment are required
- **Selection** of partners is critical
- More suitable for major or portfolio of projects
- Needs $ incentives to **large complex projects** encourage behaviors
- **$ incentives** to reduce costs & deliver quality

- **Not easy!**
- ECI widely adopted on **complex long term major urban UK** projects for past 20 years

HS2 Delays and Cost Increases

- Design was **not mature** at the time of award of contracts (~10-15%)
- Contracts were particularly **'generous' to contractors** (and particularly lacked sufficient incentive to drive down costs with low penalties)
- Frequent **political intervention** over 16 years – particularly 2016 - 2026
- **Political cancellation** of Northern Section and delay to London Approaches
- **Significant increase in length of tunnels** - post Act of Parliament. (Though it wasn't all post award of contracts)
- Gradual **increase in scope** and public / environmental requirements.
- 2025 / 2026 **Govt review** to 'renegotiate' contracts
- Delays and cuts to the HS2 Phase1 scope effectively damaged the **'business case'**

Widely published in UK public domain

Final Comments

- **Political Will:** Forced early ***immature*** start for HS2 in 2016
- **Political Will:** Political support and initiative for projects versus interference from politicians
- UK is a **democracy** and an informed society where people and interest groups can significantly influence and obstruct the project scope.
- There is **no perfect way** to achieve **'The common good'** ie **Local vs National 'good'**
- Civil Engineering industry is too siloed and **lacks integration**
- Our industry seldom **learns from the past experience .**
- **Negative UK public perception** of the HS2 project
- Recent international **HSR projects have a varied reputation**, however…
- UK public will **eventually** be grateful for HS2 …when it is **completed**

Thank You!

Děkuji!

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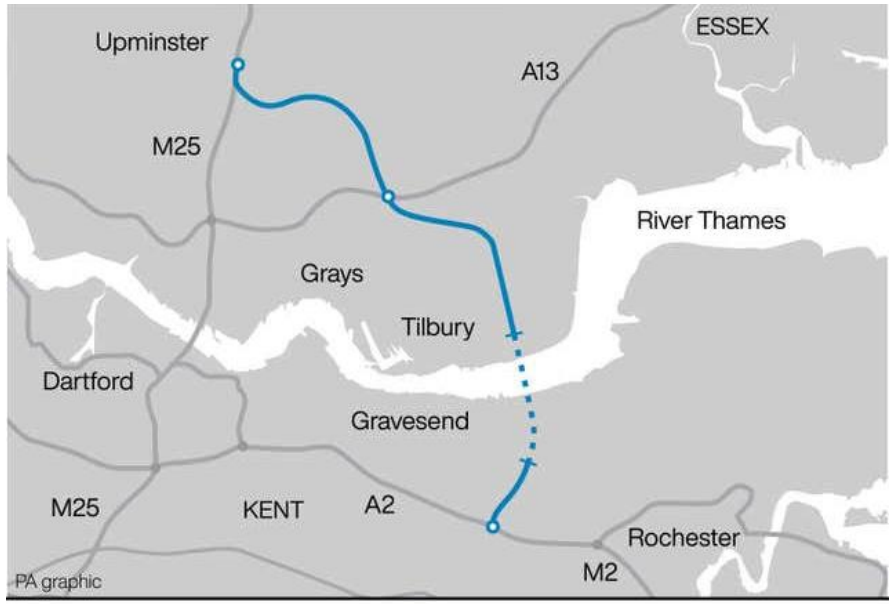
Optional Slides

ECI : Two other major UK tunnel projects

- 2 no Optional slides if required during Q&A after the presentations

Lower Thames Road Tunnel Crossing Procurement 1/2



Features

-Collaborative Contract
-Competitive Dialogue
-Long planning & environmental consent
-Construction started
-Funding options :Govt to 2028 & thereafter
-Private Finance
-Target Cost with incentives/penalities
-Net zero target
-3 Contracts: 22km/4.25km twin tunnel16m dia
-£9bn

HV Power Cable Tunnels –South London Procurement 2/2

Features

-Collaborative Contract
-Common IT and Data sharing platforms
-Integrated Project Team
-Competitive D&C tenders based on performance
-Financial rewards for short and long term outcomes
-Construction and installation in progress
-£2bn