



RIVER CROSSINGS: SILVERTOWN TUNNEL

SUPPORTING TECHNICAL DOCUMENTATION

FURTHER DEVELOPMENT OF TUNNEL ENGINEERING

Mott MacDonald

July 2013

This report builds upon previous studies to develop the bored tunnel concept and addresses design development of key areas.

This report is part of a wider suite of documents which outline our approach to traffic, environmental, optioneering and engineering disciplines, amongst others. We would like to know if you have any comments on our approach to this work. To give us your views, please respond to our consultation at www.tfl.gov.uk/silvertown-tunnel

Please note that consultation on the Silvertown Tunnel is running from October – December 2014.



Silvertown Tunnel

Further development of Tunnel Engineering

298348/MNC/TUN/002

July 2013
Transport for London




Silvertown Tunnel

Further development of Tunnel Engineering
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July 2013

Transport for London

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
1.0	15/04/13				Draft Issue
2.0	23/04/13	D Naylor S Johnson M Dilling G Taylor F Ellis	J Baber	J Baber	Formal Issue to TfL
3.0	26/04/13	D Naylor S Johnson M Dilling G Taylor F Ellis	J Baber	J Baber	Document updated in line with TfL comment log and addition of drawing volume (Appendix A)
4.0	24/06/13	D Naylor	J Baber	J Baber	Revision to close out comment log
4.1	17/07/13	D Naylor 	J Baber 	J Baber 	Minor revision to wording in commercial section

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	19/01/12
	05/03/13
	05/04/13
GLA / Quintain	04/04/13

Naylor, David

From: Twum-Barima Sam <Sam.TwumBarima@dlr.tfl.gov.uk>
Sent: 27 March 2013 16:39
To: Naylor, David; Wickremasinghe Stephen (DLR); 'JonathanStott@ardent-management.com'
Cc: Collett Martin (DLR); Woodhouse Mostyn
Subject: RE: Silvertown Meeting today

David

As promised a brief summary of the main actions and key points made at the meeting ::

- Works Agreement will be required to summarise terms of engagement.
- Assumptions around settlement predictions for cable car north intermediate tower to be reviewed by Design team. Original predictions based on an adjacent tunnelling solution whereas what is currently proposed is cut and cover. South tower and station may need review to ensure current alignment (vertical/horizontal) matches safeguarding.
- Further detail required on how the DLR piers will be protected (from ground movement effects and adjacent plant).
- Details of monitoring being proposed to be supplied to DLR as soon as these become available.
- Monitoring fundamentals include: minimum 1 year baseline monitoring, local temperature measurements (to correlate thermal effects to data), data available via a remote access portal, degree of redundancy through use of mixed monitoring types e.g. optical (prisms & ATS) with Hydrostatic/Electro levels.
- Details on method of constructing secant or diaphragm wall to be made available to DLR as soon as these become available (incl ground movement predictions, spatial arrangement of plant relative to viaduct to inform if possession works required)
- Importance of timely and early submission of documents emphasised to Motts Design team. Typically a minimum of 20 day review period by DLRL & SERCO per iteration of three stage assurance documents & method statements.

Regards

Sam

From: Naylor, David [<mailto:David.Naylor@mottmac.com>]
Sent: 26 March 2013 09:29
To: Twum-Barima Sam; Wickremasinghe Stephen (DLR); JonathanStott@ardent-management.com
Subject: Silvertown Meeting today

Gents,

Looking forward to meeting you all for the proposed meeting at 2pm today at Poplar. Think I've asked for this before - could one of you please provide instructions or a map on how we reach your offices from Poplar DLR station please?

Thanks in advance,

David Naylor
Engineer
Tunnel Division

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Record of meeting/discussion



Project Title Silvertown Crossing Study

Division MNC/TUN

Subject Fire Life Safety

Project No. 298348

Location Union Street, London

Date of Meeting 19th December 2011

Present N J Tucker (MM)
R Hall (MM)
D Bulbrook (LFB)

Recorded by	Distribution	
NJT	R Hall, D Bulbrook, Tony Wilson (TfL), J Baber (MM), M Leggett (MM)	
Item	Text	Action on
1.	This was an introductory meeting to give LFB a brief overview of the project and highlight some key issues.	
2.	MM advised LFB that MM has been advised by TfL to assume that the tunnel would be ADR Category E. The intention would be to take HGVs away from the Blackwall Tunnel.	
3.	D Bulbrook stressed that the fire life strategy would need to be have a robust audit trail and be in accordance with BS 7974. Decisions on design basis and high level strategy should be clearly recorded in minutes or other agreed format.	
4.	D Bulbrook recommended that a Qualitative Design Review (QDR) should be carried out.	
5.	R Hall advised that the tunnel would not be allowed to have contra-flow traffic.	
6.	R Hall suggested that cross passages would be used for intervention rather than evacuation. People would use the portals as primary evacuation route (in opposite direction to traffic flow).	
7.	D Bulkbrook was concerned about the need to have clear traffic flow beyond the tunnel portal to allow all vehicles in the tunnel to be able to exit the tunnel in an incident.	
8.	R Hall described some of the ventilation and fire life safety options that could be implemented (longitudinal or transverse ventilation, deluge system and fire size to be design for etc.)	
9.	MM emphasised the construction difficulties (cost, risk long term water-proofing etc.) of building cross-passages below the river and wanted to keep these to a minimum or eliminate passages beneath	R Hall

**Record of meeting/discussion
Continuation sheet**



Project No.

Date of Meeting

Item	Text	Action on
	<p>the river. LFB's view was that cross-passages at 100m centres should be provided the full length of the tunnel. This was to allow emergency services to get within 100m of a fire (dragging equipment more than this length was difficult) and to provide means of escape. It was agreed, however, that MM would provide LFB with plans and an outline of fire strategy regarding cross-passage spacing for LFB's consideration and further discussion on cross-passage spacing.</p>	
10.	<p>It was agreed to hold a more formal meeting to discuss fire life safety issues on the 19th January 2012 at 11am.</p>	
11.	<p>LFB suggested that other key considerations would include;</p> <ul style="list-style-type: none"> • Design size fire • Integrated intervention and evacuation strategies • Recent research in HRR fire spread and behaviour in tunnel fires • Evacuation of mobility impaired (including disabled) • Potential fire loading and protection of infrastructure • Command and Control of tunnel 	
12.	<p>Post Meeting Note: The following issue has been raised for future discussions regarding the Immersed Tube Tunnel Option:</p> <ul style="list-style-type: none"> • Whether or not a central escape tube is needed between the two road tubes. 	

Record of meeting/discussion



Project Title Silvertown Crossing Study

Subject Fire Life Safety

Location Union Street, London

Present N J Tucker (MM)

R Hall (MM)

L Christiansen (MM)

D Bulbrook (LFB)

Division MNC/TUN

Project No. 298348

Date of Meeting 19th January 2012

Recorded by NJT	Distribution R Hall, D Bulbrook, Tony Wilson (TfL), J Baber, M Leggett , L Christiansen
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Item	Text	Action on
1.	Robin Hall outlined the fire life strategy for Silvertown Crossing.	
2.	Tunnel to be ADR Category E. No pedestrians. No cyclists.	
3.	Traffic flows (guessed at 40,000/day and 25% HGV) – values need to be confirmed from traffic analysis reports.	
4.	Ventilation assumed to be longitudinal and the Green wave assumed to work. Risk of Green wave not working properly to be captured in Risk Analysis.	
5.	Fire Size – R Hall proposed fire size of 100MW to be adopted for design. Then review situation should a 200MW actually happen.	
6.	LFB requested clarification on TfL Strategy for diverting HGVs from Blackwall Tunnel to Silvertown Tunnel.	
7.	Worse Case Fire Scenario – R Hall outlined worse case fire scenario. This would consider fire smoke analysis, tenability and evacuation analysis (spread sheet & STEPS).	
8.	LFB noted their concern about evacuation times and that evidence shows that often a small number of people are reluctant to leave their vehicles.	
9.	LFB advised that they would go straight to the nearest cross-passage of the un-affected bore and should be able to reach this location within 10-15 minutes of being alerted. They would anticipated dual attendance and would immediately carry out a dynamic risk assessment that may take 1-5 minutes but would always be dependent on actual situation.	

**Record of meeting/discussion
Continuation sheet**



Project No.

Date of Meeting

Item	Text	Action on
10.	LFB stressed their desire for cross-passages at 100m centres as this is defined in BD 78/99 and what their procedures are based around. Cross passages are needed for intervention. A 500m spacing may be too long to enable the LFB to deal with an incident. LFB stated that the starting point should be 100m centres and then justify a greater spacing by putting in other mitigation measures for LFB's review.	
11.	A further meeting with LFB was desired before the 15 th Feb 2012. There was insufficient time for this to be arranged due to other commitments. So no further meetings have been arranged. LFB to review report once completed.	

Meeting Minutes



Project Title	Silvertown Tunnel – Further design development	Division	Tunnels
Subject	Fire life safety provisions	Project no.	284595
Location	LFB offices, Union Street, Southwark	Date of meeting	05/03/13
Attendees	David Yates, Martin Hayes (LFB) John Evans, Gary Poole (TfL) David Naylor, Robin Hall, Simon Johnson (MM)	Time of meeting	9.30 – 12.00

Item	Text	Action
1.0	Introductions and Background of scheme	
1.1	A project overview of Silvertown tunnel was presented by RH. This included background information, the previous work undertaken and the scope of the current work.	
1.2	Similarities between Silvertown tunnel and other existing London tunnels were discussed.	
1.3	RH explained that the fire life safety strategy was based upon twin tubes with uni-directional traffic and longitudinal ventilation. The Green Wave traffic plan concept was discussed. This system will be implemented for Silvertown tunnel to clear the tunnel of congestion in the event of a fire. Control of congestion at the entry portal was also discussed using a system similar to Blackwall tunnel.	
1.4	The location for the operation and control of Silvertown tunnel was discussed. It has not yet been decided but could be based in LSTOC which GP indicated is currently set for upgrade/expansion.	
1.5	Spacing of cross-passages brought up as a topic for further discussion later in the session. Cross-passage spacing may be driven by LFB intervention practicalities rather than evacuation due to the twin tube/longitudinal ventilation strategy. BD 78/99 cross passage spacing of 100m will be discussed further – the standard will be 20 years old when Silvertown tunnel is likely to open and does not take into account the further risk mitigation modern systems provide.	
1.6	It was discussed whether contraflow operations during bore closures (for maintenance) should be reflected in the design. It was agreed that given the proximity of Blackwall Tunnel as an alternative route, contraflow operations are unlikely to be used. However, the possibility of contraflow operations cannot be discounted completely at this stage, given the likely lifetime of the tunnel.	

2.0	Design Approach and Benchmark Case	
2.1	It was agreed during the previous design stage that the fire life safety strategy would be carried out in accordance with BS 7974. RH outlined the BS 7974 and QDR process which will now be followed.	
2.2	RH outlined the proposed MM approach for assessing the comparative fire life safety of various tunnel configurations.	
2.3	The benchmark safety level for the comparative assessment was discussed. The EU directive only states minimum requirements so will not be used. The disparity of tunnel safety provisions in UK road tunnels makes benchmarking against existing UK precedents ambiguous.	
2.4	It was proposed to use BD 78/99 as an appropriate benchmark level of safety for the Silvertown tunnel. The various tunnel configurations will be compared against this benchmark safety level. This approach was agreed by those present.	NOTE
3.0	Options for Comparative Study	
3.1	Discussion moved on to the different tunnel configurations to compare to the BD 78/99 benchmark.	
3.2	A range of cross passage spacing was discussed; from 100m to 500m. Further mitigation based on modern systems will be introduced to offset this increase, the aim being to maintain the overall fire life safety at the benchmark level.	
3.3	DY confirmed that fire brigade intervention would involve fire appliances being driven into the non-incident bore, next to the nearest cross passage upstream of the fire. Fire fighters would then access the incident bore, potentially using breathing apparatus.	
3.4	Fixed fire fighting systems (FFFS) were discussed as a further mitigation option. It was noted that generally FFFS cannot extinguish fires but should be able to control fire spread between vehicles. FFFS will be considered as one of the tunnel configuration options in the study. It was noted that there is currently relatively little UK experience with these systems.	
3.5	RH presented details of the tool to be used to compare safety levels. It will be the internationally recognised PIARC DG-QRAM software, modified slightly to allow the simulation of a wide range of fire sizes.	

<p>3.6</p> <p>3.7</p> <p>3.8</p> <p>3.9</p>	<p>RH explained that the tool will not be used to undertake a full quantitative risk assessment (QRA), rather the tool will be used to compare the relative levels of fire life safety between the various tunnel configurations. For this reason, the fire frequencies will be kept constant across all tunnel configurations. This approach will be clearly documented in the final report.</p> <p>A design fire of 100MW was suggested by RH based upon fire incident rates and existing precedents at other UK tunnels (e.g. Blackwall, Dartford, Hatfield). This fire size was agreed for use on Silvertown tunnel. The rationale for this decision will be fully documented in the final report.</p> <p>Discussion moved on to the different tunnel configuration options to model. It was agreed that modelling of smoke extraction configuration would not be undertaken based on the assumption that the tunnel would not operate in contraflow. It was agreed that longitudinal ventilation is the best solution when traffic is uni-directional. The other cases listed in the briefing note were agreed to be modelled.</p> <p>DY raised a query on the evacuation of injured or trapped people from the tunnel in the event of a fire given the need to transport heavy cutting equipment from the nearest cross passage. It was agreed that MM would investigate the nature and timescales of such a scenario, for a range of cross passage intervals. This will require assistance from LFB for confirmation of LFB's likely tactics, procedures and timescales for undertaking the associated activities.</p>	<p>MM</p>
<p>4.0</p>	<p>Dangerous Goods Category</p>	
<p>4.1</p> <p>4.2</p> <p>4.3</p>	<p>RH outlined the main implications on the design of changing the dangerous goods regime to ADR category A. It was agreed that the most significant change would be to the drainage design, perhaps to incorporate slot gutters, flame arrestors, etc.</p> <p>Allowing DG vehicles through the tunnel would also increase the DG traffic on adjacent roads and routes. The effect of this is outside the scope of the present study.</p> <p>The use of ANPR / DG plate recognition technology was also discussed, to support the response to incidents involving DG vehicles in the tunnel.</p>	

Meeting Minutes



5.0	Conclusions	
5.1	MM will commence the fire life safety comparative assessment, using BD 78/99 as a benchmark level of safety.	MM
5.2	MM will use a design fire size of 100MW with longitudinal ventilation. This is based on there being no contraflow operations, and congestion risks being reduced by a green wave traffic plan.	MM
5.3	MM will consider the effect of cross passage spacing on a specific scenario involving the rescue of an injured person trapped in a vehicle.	MM
5.4	The next meeting (with MM work tabled beforehand) will be held at 9:30am on the 26 th March.	ALL



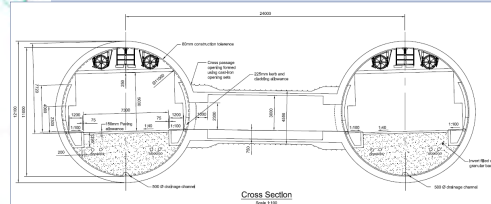
Silvertown Tunnel – Fire Life Safety

5 March 2013



Silvertown Tunnel

- Length \approx 1.4 km
- Traffic \approx 40,000 veh/day



Status of scheme development

- Previous work
 - Alignment, bored and immersed tube options, etc
 - Preliminary fire safety strategy
 - LFB meetings in Dec 2011 and Jan 2012
- Present study
 - To confirm tunnel configuration
 - To carry out further design development for M&E, etc
 - To issue report by mid-April 2013



Previous work – Assumptions

- Length \approx 1.4 km
- Twin-tube configuration with cross-passages at intervals
- Forecast traffic flow \approx 40,000 veh/day
- 'Green wave' traffic plan to mitigate congestion risk
- Class E under ADR regulations – prohibition of all DGs

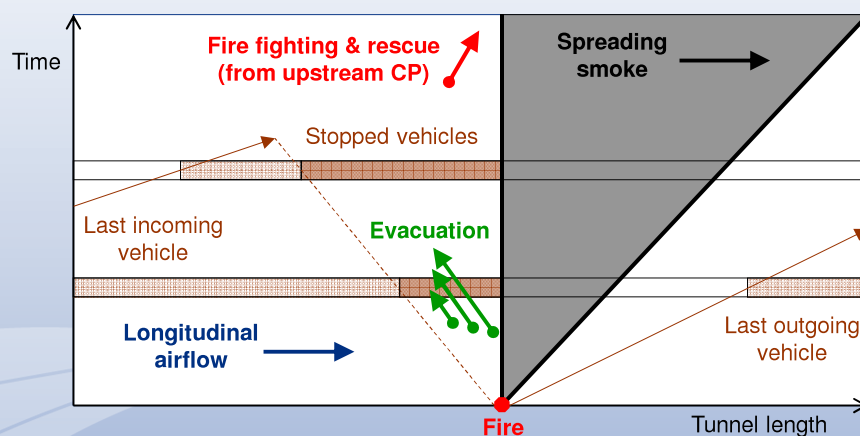


Previous work – Fire safety strategy

- Worst case fire scenario
 - Buses, PRMs, tunnel ventilation strategy, cross passage spacing
- Design fire size
 - Research, current practice – 100MW recommended
- Modelling of worst case fire scenario – FDS and STEPS
- Fire brigade intervention
- Tunnel facilities

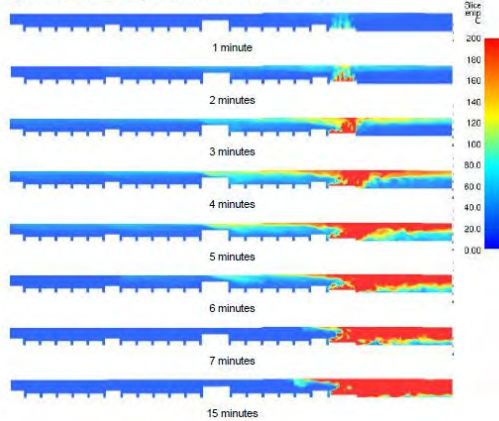


Previous work – Discussion of timelines



Previous work – Modelling results

Figure 6.3: Bored Tunnel – Temperatures in vertical section through centre of fire



- Fire and evacuation modelling (FDS, STEPS)

Figure 6.7: 'Camera' view of people evacuating in STEPS simulation

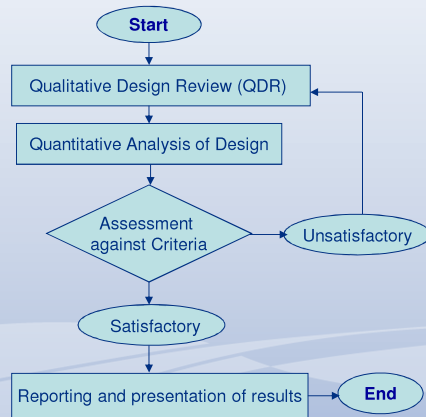


Present study – Fire life safety issues

- Confirmation of tunnel configuration
 - Tunnel ventilation strategy, cross-passage spacing, other key mitigation measures
 - BS 7974 fire engineering process
- Implications of unrestricted Dangerous Goods (category A)



BS 7974 fire engineering process



QDR steps

- review the layout and occupant characteristics;
- establish the fire safety objectives;
- identify fire hazards and possible consequences;
- establish trial fire safety designs;
- identify acceptance criteria and methods of analysis;
- establish fire scenarios for analysis.



Confirmation of tunnel configuration

- Fire safety objectives

Applicability of standards? Benchmark level of safety?

- BD 78/99 Design of road tunnels
- Road Tunnel Safety Regulations 2007 (EU Directive 2004/54/EC on minimum safety requirements for road tunnels on the TERN)

- Options

- Comparative assessment of options



Options

- Tunnel ventilation
 - Longitudinal + 'green wave' traffic plan, or Smoke extraction system
 - Design fire size will change depending on ventilation strategy
- Cross-passage spacing
 - 100m (as per BD 78/99) or more
- Additional mitigation measures
 - Fixed fire-fighting system? Other key systems?



Fire and evacuation analyses

- Integrated fire, smoke and evacuation model
 - PIARC DG-QRAM modified for range of HGV fire sizes
- For given option, calculate overall estimate of potential casualties for full range of vehicle fires
 - e.g. 20, 30, 50, 100 and 150 MW fires
- Focus on comparative assessment of safety achieved by different options
 - i.e. fire frequencies constant for all tunnel configurations



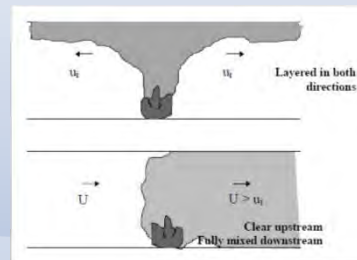
Model inputs

- Tunnel geometry and ventilation characteristics described in sections
 - Ventilation defined for normal and emergency conditions
 - Emergency exits (cross passages, etc) at specified intervals
- Traffic flows specified for each direction and time period
 - vehicle mix (light vehicles, buses/coaches, HGVs)



Modelled smoke behaviour

- Fires and smoke generation
 - Empirical model for large area source
- Smoke behaviour
 - If tunnel airflow $<$ critical velocity, transient smoke layer model is used
 - If tunnel airflow $>$ critical velocity, 1-D fully-mixed flow downstream of fire



Modelled evacuation behaviour and exposure

- Model considers both pre-movement + movement phase
- Evacuation direction and speed
 - Towards nearest exit (but not past fire)
 - Travel speed varies from 0.5 to 1 m/s, and depends on visibility
- Doses accumulated along route, exposure depends on
 - Arrival time of hazardous conditions
 - Duration of fire and normal & emergency ventilation phases
 - Travel time to emergency exit



Model results for casualties

- Model estimates casualties among road users for all accident locations, periods, etc
- Results are combined to produce Fatality-Frequency (F-N) curves which describe risk of multiple casualties
- Each curve can be integrated to give overall estimate of fatalities (and injuries) per year
- Allows for comparative assessment of safety levels for each tunnel configuration



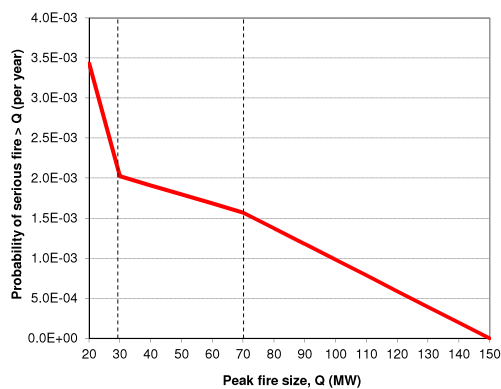
Design fire size

- Indicative vehicle fire sizes (UPTUN, 2006)
- Recent & current practice
 - 30 MW: Hindhead, Holmesdale
 - 100 MW: Blackwall NB, Dartford, Hatfield, Holmesdale (w/o adverse Δp)

HRR MW	Road, examples vehicles	At the fire boundary
5	1-2 cars	ISO 834
10	Small van, 2-3 cars, ++	ISO 834
20	Big van, public bus, multiple vehicles	ISO 834
30	Bus, empty HGV	ISO 834
50	Combustibles load on truck	ISO 834
70	HGV load with combustibles (approx. 4 tonne)	HC
100	HGV (average)	HC
150	Loaded with easy comb. HGV (approx. 10 tons)	RWS
200 or higher	Limited by oxygen, petrol tanker, multiple HGVs	RWS



Probability of different fire sizes



- Probabilities based on following assumptions
 - 40,000 veh/day
 - 14% HGVs
 - Typical HGV loads from UK road freight statistics
 - Loads related to fire sizes described by UPTUN



Implications of unrestricted Dangerous Goods

- DG categories defined under the ADR regulations
 - Category A – No restrictions
 - Category B – Restriction for dangerous goods which may lead to a very large explosion
 - Category C – Restrictions for dangerous goods which may lead to a large explosion or a large toxic release
 - Category D – Restrictions for dangerous goods which may lead to a large explosion, a large toxic release or a large fire
 - Category E – Restriction for all dangerous goods



Physical effects of DG incidents

- HGV and pool fires
 - Transient smoke movement (temperature and CO concentration)
 - Thermal radiation from fire and smoke layer
- Vapour cloud explosion (VCE) or BLEVE
 - Thermal radiation, blast overpressure
- Toxic gas releases
 - Dispersion of toxic gas along tunnel (concentration)
- Effects of risk reduction measures
 - Drainage, ventilation, warning & communications systems, etc



Meeting Minutes



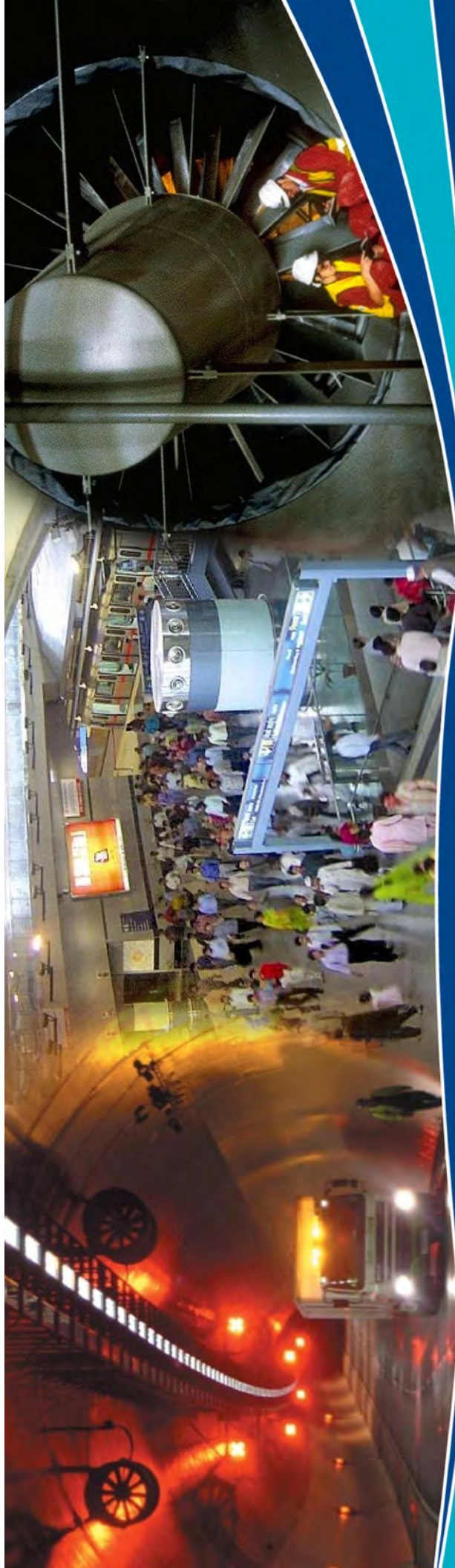
Project Title	Silvertown Tunnel – Further design development	Division	Tunnels
Subject	Fire life safety provisions	Project no.	298348
Location	LFB offices, Union Street, Southwark	Date of meeting	05/04/13
Attendees	David Yates, John Dowsett (LFB) David Fielder, Gary Poole, Jack Allen (TfL) Dennis Livingstone, Simon Johnson (MM)	Time of meeting	9.30 – 12.00

Recorded by	Distribution
SNJ	All Above plus Robin Hall, David Naylor, John Evans, Nicholas Watt, Martin Hayes

Item	Text	Action
1.0	Introductions and Background of scheme	
1.1	DL commenced meeting with introduction and background of the scheme and the key points from the previous meeting held on 05/03/13.	
1.2	The typical tunnel systems required by BD 78/99 were listed and described.	
1.3	The modern systems not reflected in BD 78/99 were listed and described including; automatic incident and fire detection, mobile phone coverage, PA, improved wayfinding signage, fixed fire fighting systems (FFFS), dedicated control room, green wave and intelligent traffic control. All these modern systems could be included in the Silvertown tunnel design.	
2.0	Comparative Assessment	
2.1	The details of the comparative assessment carried out were described. The PIARC quantitative risk assessment model (QRAM) was used which is widely used around the world.	
2.2	Details of the QRAM were described including high level calculation procedure and sub models.	
2.3	The assessment cases carried out were listed – benchmark DB 78/99 configuration, modern systems at various cross passage spacing and FFFS at various cross passage spacing.	
2.4	In the model inputs were described including geometry, traffic, ventilation strategy and response timescales.	

2.5	The model results were presented in two forms; a) detailed evolution of an incident for one location and one fire size, and b) fatality frequency (F-N) curves for each configuration.	
2.6	Evolution of an incident plots show how modern systems decrease pre-movement times, decrease ventilation response times, and increase the design fire size. All these lead to a smaller smoke exposure time to passengers. Increased cross passage spacing has little effect on passenger smoke exposure times.	
2.7	FFFS reduces the severity of fire effects as shown with the smaller smoke spread region on the incident plots.	
2.8	F-N curves for the benchmark case at different fire sizes were presented to show how the overall F-N curves are calculated.	
2.9	Overall F-N curves for all tunnel configurations were presented. Modern systems reduce the safety risks below the benchmark BD 78/99 level. Increasing the cross passage spacing has little effect on the level of safety	
2.10	FFFS potentially reduces the life safety risk by an order of magnitude below the benchmark BD 78/99 level.	
3.0	Fire Fighter Intervention	
3.1	A typical timeline for fire fighter intervention was described, from first notification to controlling and extinguishing the fire.	
3.2	Some of these tasks will be effected by increasing cross passage spacing, notably walking times to the incident from the non-incident bore. Worst case walking distances would equal to the maximum cross passage spacing. Increasing the cross passage spacing from 100m to 467m would add 6 minutes to intervention time.	
3.3	Incident rates for accidents and fires were presented. Statistics predict a fatal accident every 7 years and a major fire every 450 years.	
3.4	Possible incidents requiring fire fighter intervention were discussed - person trapped in a vehicle being the main focus. If there is no fire then intervention can be from any cross passage as well as through the incident bore. Cross passage spacing will have little effect.	
3.5	If there is a small fire the closest cross passage may or may not be blocked. If CP blocked walking distances may be at their maximum. Likelihood of this scenario is very small. LFB agreed this is the only scenario likely to be affected by CP spacing.	

3.6	If a person is trapped and there is a large fire then the reality is that person is unlikely to survive long enough for fire fighters to reach the scene irrespective of cross passage spacing.	
3.7	LFB stated that control room procedures will be a very important factor in fire fighter intervention and the timescales for response. GP described the planned improvements to the LSTOC facility and relocation to the Palestra building in Southwark. These improvements should improve intervention timescales and are likely to be completed by the time Silvertown tunnel is completed.	
4.0	Conclusions and Discussion	
4.1	DL presented concluding remarks: With modern 'fast response' systems, 350m or 467m CP spacing would provide better level of safety than BD 78/99. Intervention timescales would be greater but incidents would be rare, therefore closer CP spacing not justified. Addition of FFFS would control fire and further mitigate any increased risk from larger CP spacing.	
4.2	JD raised recent paper by David Charters stating that increased CP spacing can improve evacuation response as passengers are more likely to follow people already evacuating, longer walking distances makes this more likely.	
4.3	The point of this exercise was recapped – to show how modern systems can improve safety levels from the benchmark BD 78/99 level even with increased CP spacing. These systems will be included in Silvertown tunnel. The inclusion of FFFS is still to be confirmed but GP states this is quite likely as industry knowledge and experience improves over the next 10 years.	
4.4	JD asked about hydrant design and tunnel ventilation. DL confirmed it will be compliant with BD 78/99. Longitudinal ventilation will be achieved with tunnel jet fans.	
4.5	It was agreed that MM would complete the fire life safety report based on a CP spacing greater than the BD 78/99 100m spacing. LFB will be issued with a copy of this when completed for review.	MM
4.6	Next meeting date (if required) will be agreed after LFB have reviewed the fire life safety report.	



Silvertown Tunnel – Fire Life Safety


5 April 2013

Key points from meeting on 5-Mar-2013

- BD 78/99 represents appropriate level of safety
- Longitudinal ventilation is acceptable
- Silvertown tunnel options to provide same level of safety as BD 78/99 benchmark
- Comparative safety assessment to be undertaken to support decisions

- Cross passage spacing of 100m
- Minimum design fire size: 20 - 50 MW for 'Urban Major Route'
- Other safety provisions include
 - telephones, radio re-broadcast, CCTV, etc
- Broadly represents standard at existing TFL tunnels

Silvertown



SAFETY AND FIRE PREVENTION EQUIPMENT		TUNNEL CATEGORY				
		AA	A	B	C	D
Communication and Alarm Equipment	Emergency Telephones	•	•	•	•	*
	Radio Rebroadcasting System	•	○	○	○	○
	Traffic Loops	•	○	○	○	○
	CCTV	•	○	○	○	○
Fire Extinguishing Equipment	Hand Held Fire Extinguishers	•	•	•	•	○
	Pressurised Fire Hydrants	•	•	•	•	○
	Fire Hose Reels	•	○	○	○	○
Signs and Rescue Equipment	Emergency Exit Signs	•	•	•	•	○
	Lane Control and Tunnel Closure Signs/Signals	•	•	•	•	○
Other Provisions and Equipment	Emergency Stopping Lane	•	•	•	•	○
	Emergency Walkway	•	•	•	•	○
	Escape Doors	•	○	○	○	○
	Turning Bays	○	○	○	○	○
	Ventilation for Smoke Control	•	•	•	•	○

Measures not reflected in BD 78/99

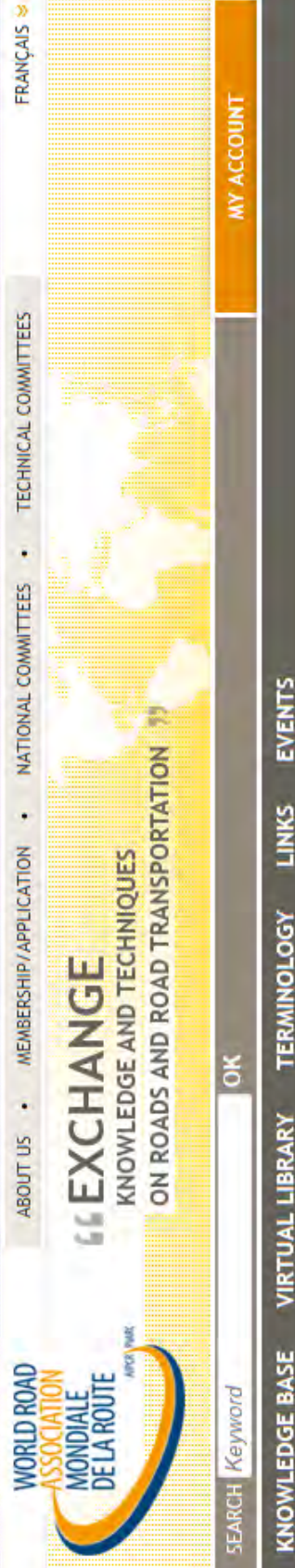
- Automatic incident detection (video or radar-based)
- Automatic fire detection (e.g. linear heat or video smoke)
- Mobile phone coverage
- Loudspeaker public-address (PA) systems
- Wayfinding measures (e.g. high conspicuity colour schemes, illuminated signs, directional sound beacons)
- Fixed fire-fighting system (water mist or deluge)
- Dedicated control room and operators, with improved response training and procedures
- ‘Green Wave’ traffic plan and intelligent traffic control on approach roads

... but could be included in the Silvertown tunnel

Comparative safety assessment

- Integrated fire, smoke and evacuation model
 - PIARC DG-QRAM modified for range of HGV fire sizes
- For given option, calculate overall estimate of potential casualties for full range of (heavy) vehicle fires
 - Fire size ranges: ≤ 30 , 30-50, 50-70, 70-100 and 100-150 MW
- Same fire frequency data used for all options

PIARC QRA Model software (World Road Association)



The screenshot shows the top portion of the World Road Association website. On the left is the logo for the World Road Association (Mondiale de la Route). The main navigation menu includes: ABOUT US, MEMBERSHIP/APPLICATION, NATIONAL COMMITTEES, TECHNICAL COMMITTEES, and FRANÇAIS. Below the menu is a yellow banner with the text "EXCHANGE KNOWLEDGE AND TECHNIQUES ON ROADS AND ROAD TRANSPORTATION". At the bottom of the banner is a search bar with the text "SEARCH Keyword" and an "OK" button. Below the banner is a dark grey navigation bar with the following links: KNOWLEDGE BASE, VIRTUAL LIBRARY, TERMINOLOGY, LINKS, and EVENTS. To the right of the navigation bar is a "MY ACCOUNT" button.

Home » Knowledge base » Road tunnel operations » QRAM software

Quantitative Risk Assessment Model for Dangerous Goods Transport through Road Tunnels

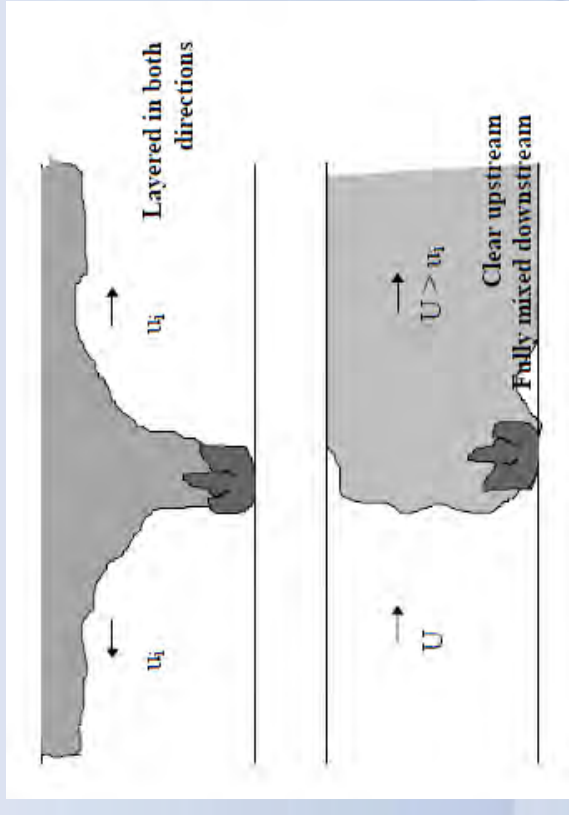
- Includes HGV fire scenarios
- Used in numerous countries worldwide
 - e.g. used for regulatory purposes in France since 2000

PIARC QRA Model software

- Consider range of HGV fires (30, 50, 70, 100 and 150 MW) at 5 locations along length of each tube
- For each fire scenario, calculate
 - Fire and smoke spread under normal and emergency ventilation regimes
 - Occupant evacuation, considering pre-movement and movement phases
 - Doses accumulated along route (thermal, toxicity)
 - %fatalities, using probit equations
 - Numbers of fatalities, taking account of vehicle flows & occupancies

Modelled smoke behaviour

- Fires and smoke generation
 - Empirical model for large area source
- Smoke behaviour
 - If tunnel airflow $<$ critical velocity, transient smoke layer model is used
 - If tunnel airflow $>$ critical velocity, 1-D fully-mixed flow downstream of fire



Modelled evacuation behaviour and exposure

- Model considers both pre-movement + movement phase
- Evacuation direction and speed
 - Towards nearest exit (but not past fire)
 - Travel speed varies from 0.5 to 1 m/s, and depends on visibility
- Doses (thermal and toxic) accumulated along route, exposure depends on
 - Arrival time of hazardous conditions
 - Duration of fire and normal & emergency ventilation phases
 - Travel time to emergency exit

Assessment cases

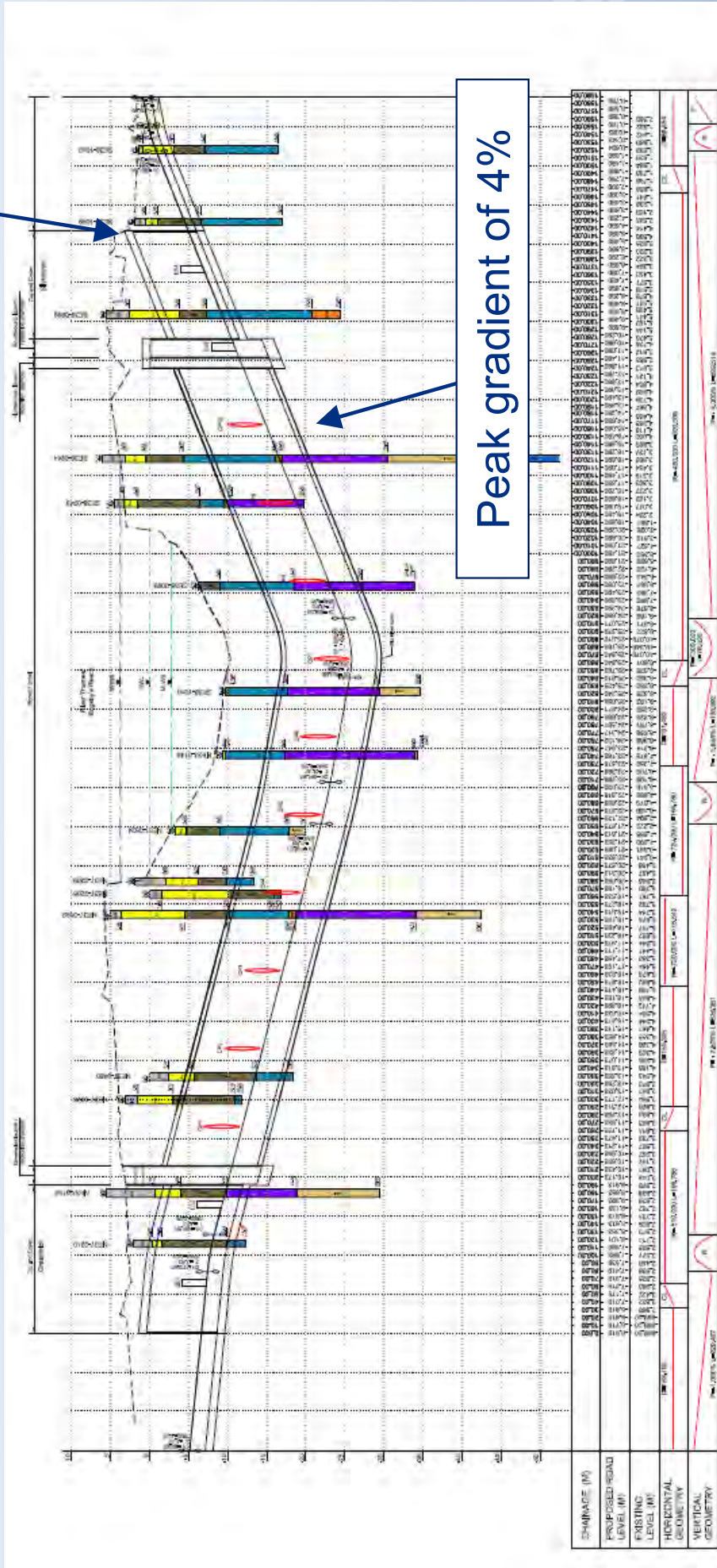
- **BD 78/99, 50 MW design fire (benchmark)**
 - CPs at intervals of 100m
- **Fast response measures, 100 MW design fire**
 - CPs at intervals of 100m, 200m, 350m, 467m corresponding to 12, 6, 3 and 2 CPs respectively
- **Fast response measures, FFFS, 40 MW peak fire**
 - CPs at intervals of 100m, 200m, 350m, 467m

Model inputs – tunnel geometry

- Vertical alignment

Silvertown portal

Peak gradient of 4%



Model inputs – traffic and ventilation

- Traffic flows
 - Northbound 20,000 veh/day, 7.1% HGVs
 - Southbound 30,000 veh/day, 7.3% HGVs
- Emergency ventilation
 - Traffic-induced piston effect during normal operations
 - Longitudinal ventilation to prevent smoke backlayering

Model inputs – timescales for response

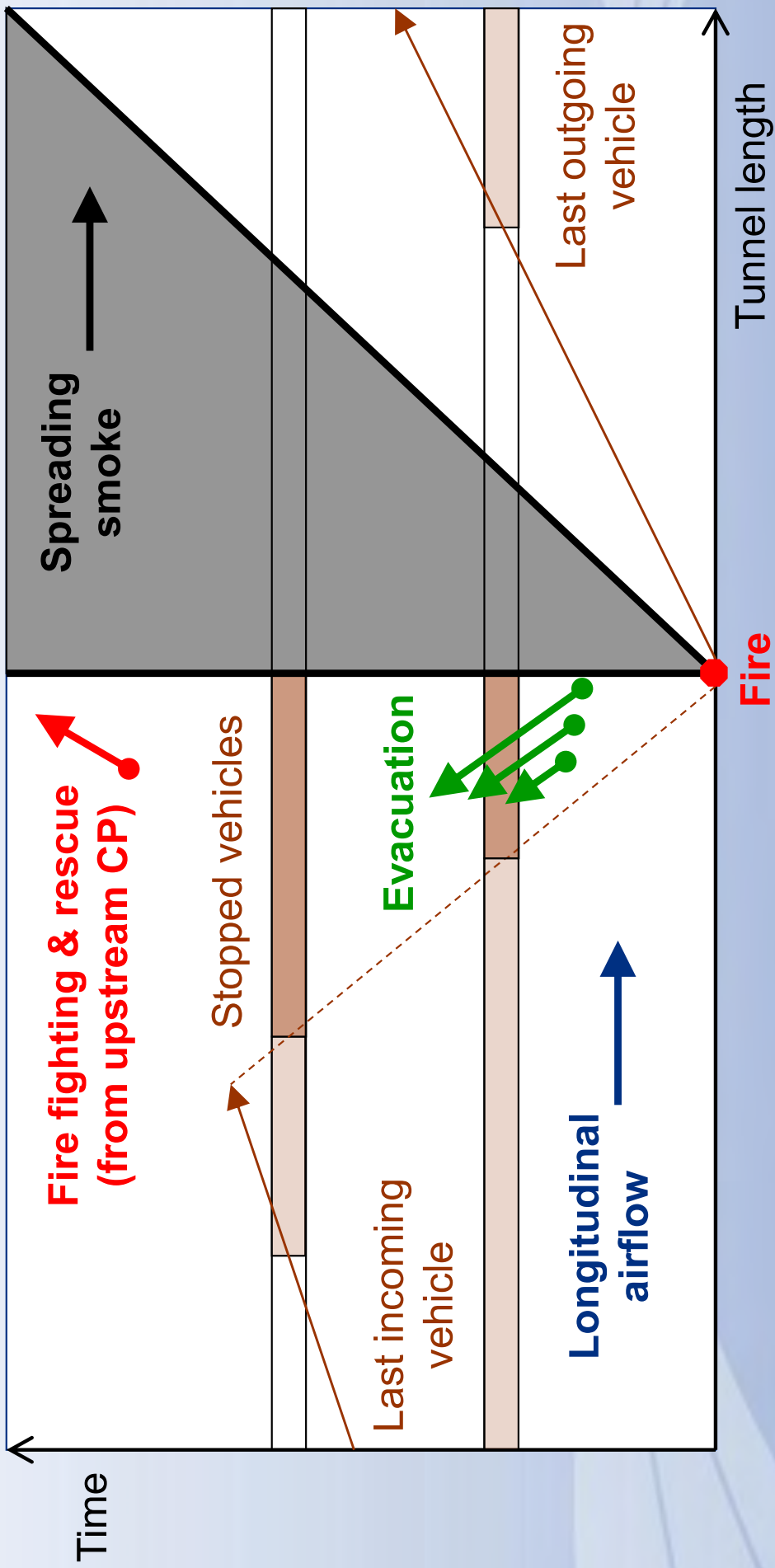
Phase	BD 78/99	Modern systems
Detection/alarm	2 - 3 mins	½ - 1 min
Operator response	1 - 2 mins	1 - 1½ mins
Pre-movement time	1 - 5 mins	1 - 3 mins
Travel speed	0.5 - 1 m/s	0.5 - 1 m/s

- Pre-movement times range from 1 min for persons adjacent to the fire, up to 3-5 mins for persons located 100m or more away from the fire
- **BD 78/99 responses could actually be much longer, given no automatic incident detection, loudspeaker PA, etc**

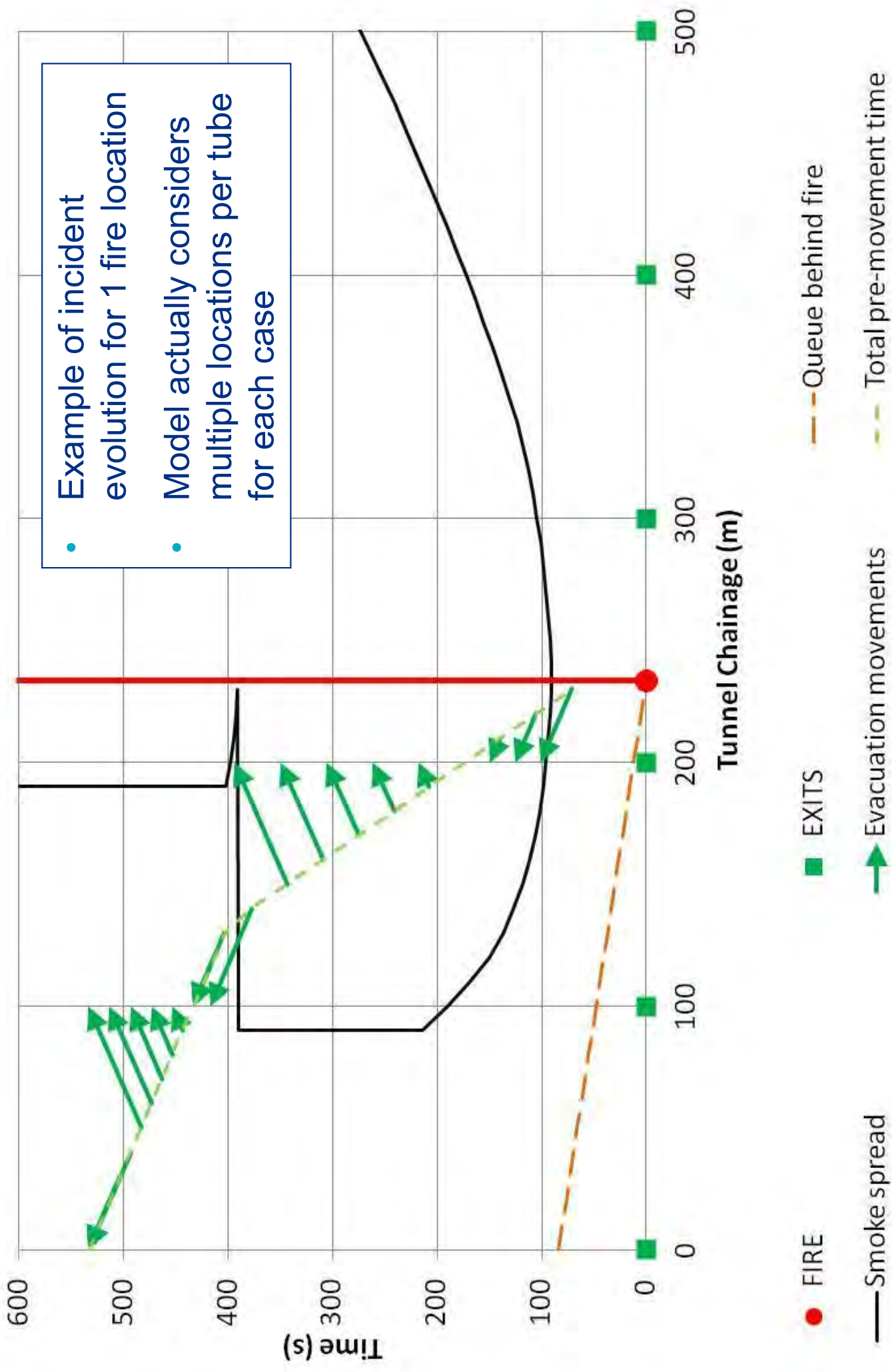
Presentation of model results

- Evolution of incidents
 - Limit of smoke spread
 - Evacuation
 - Plots illustrate extent of exposure to hazardous conditions
- Fatality-frequency (F-N) curves
 - Overall measure of safety for multiple vehicle fire sizes and multiple fire locations (5No per tube) along tunnel length

Evolution of an incident

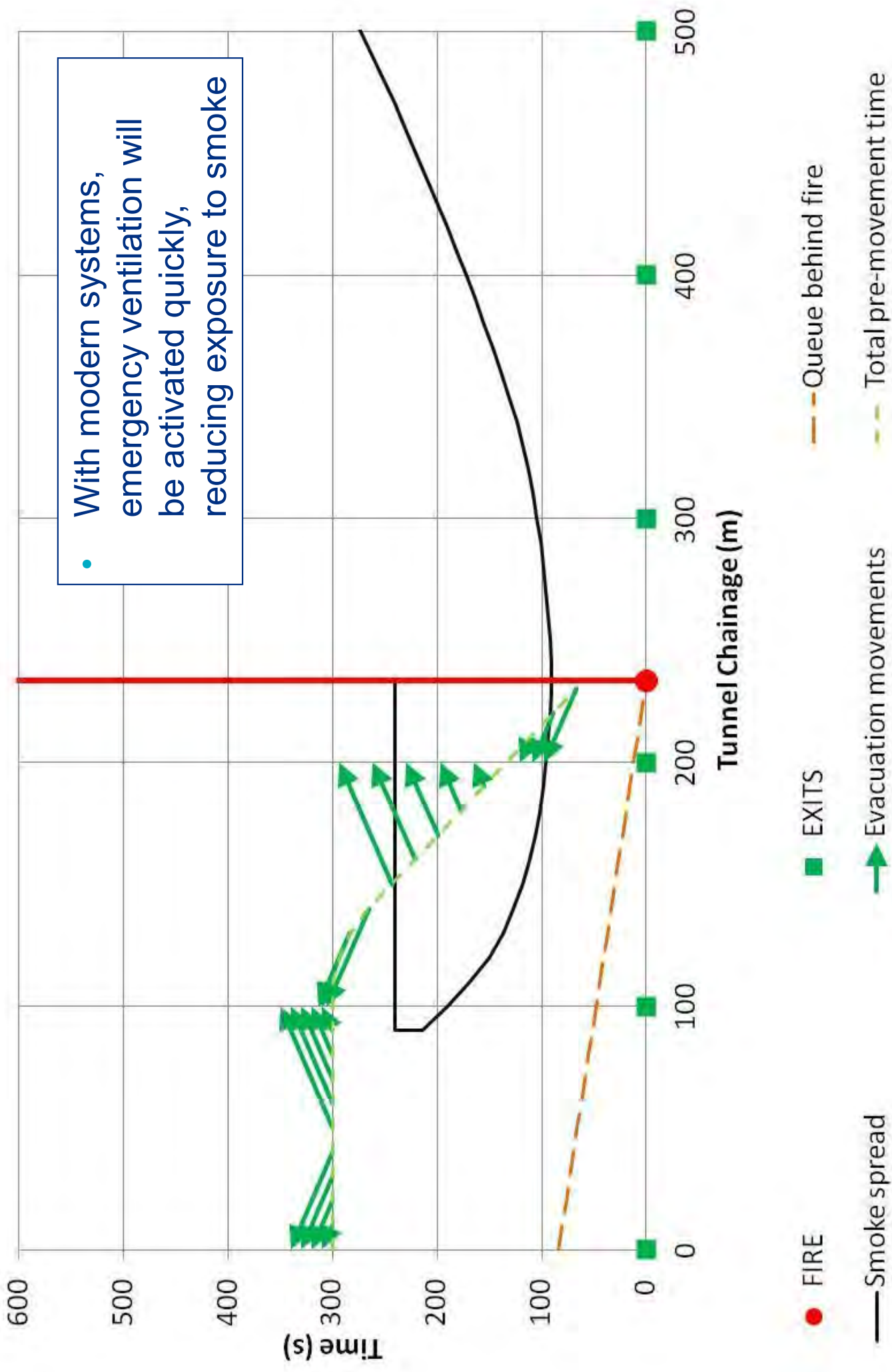


BD 78/99 benchmark, 50 MW design fire

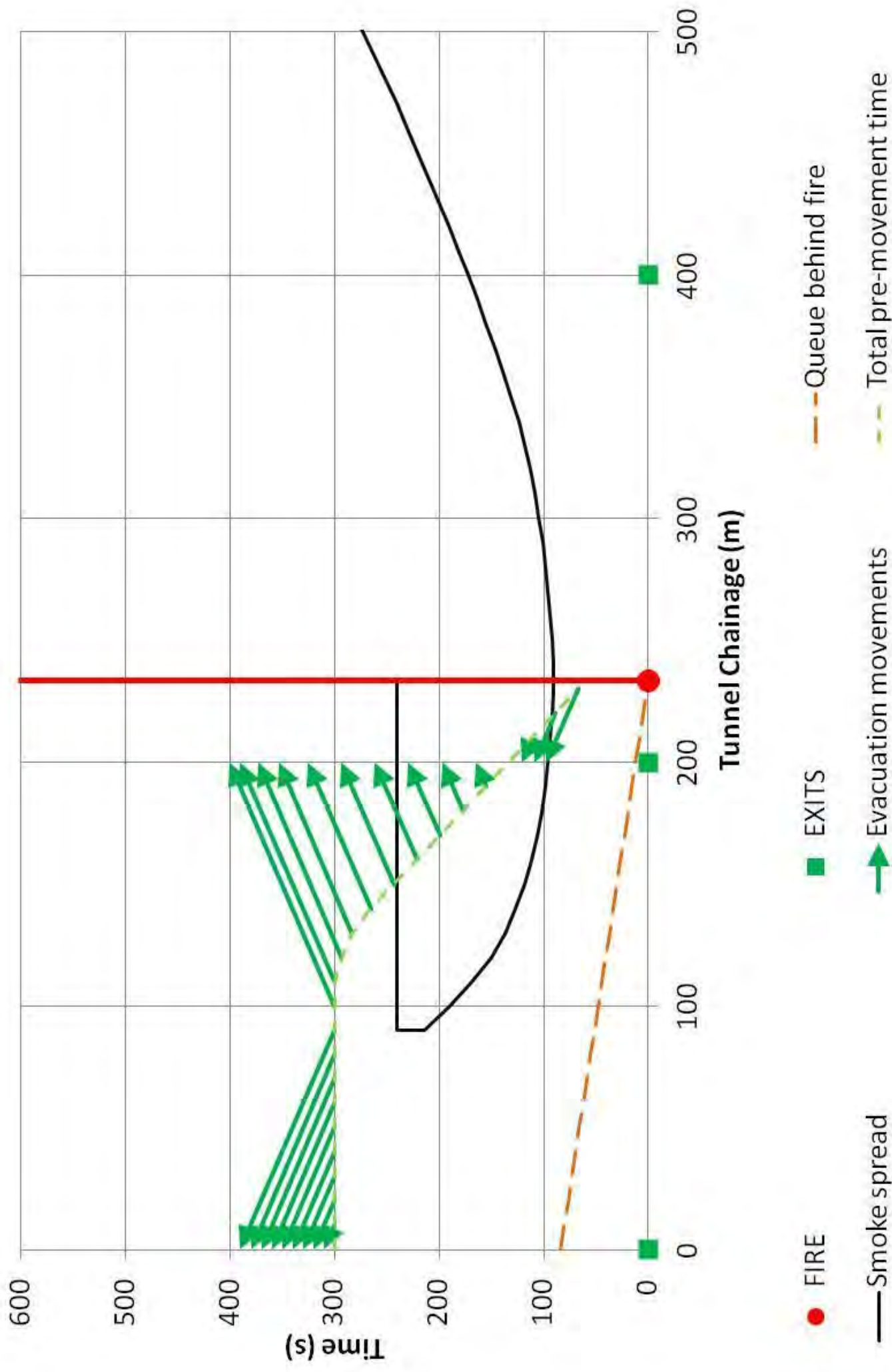


- Example of incident evolution for 1 fire location
- Model actually considers multiple locations per tube for each case

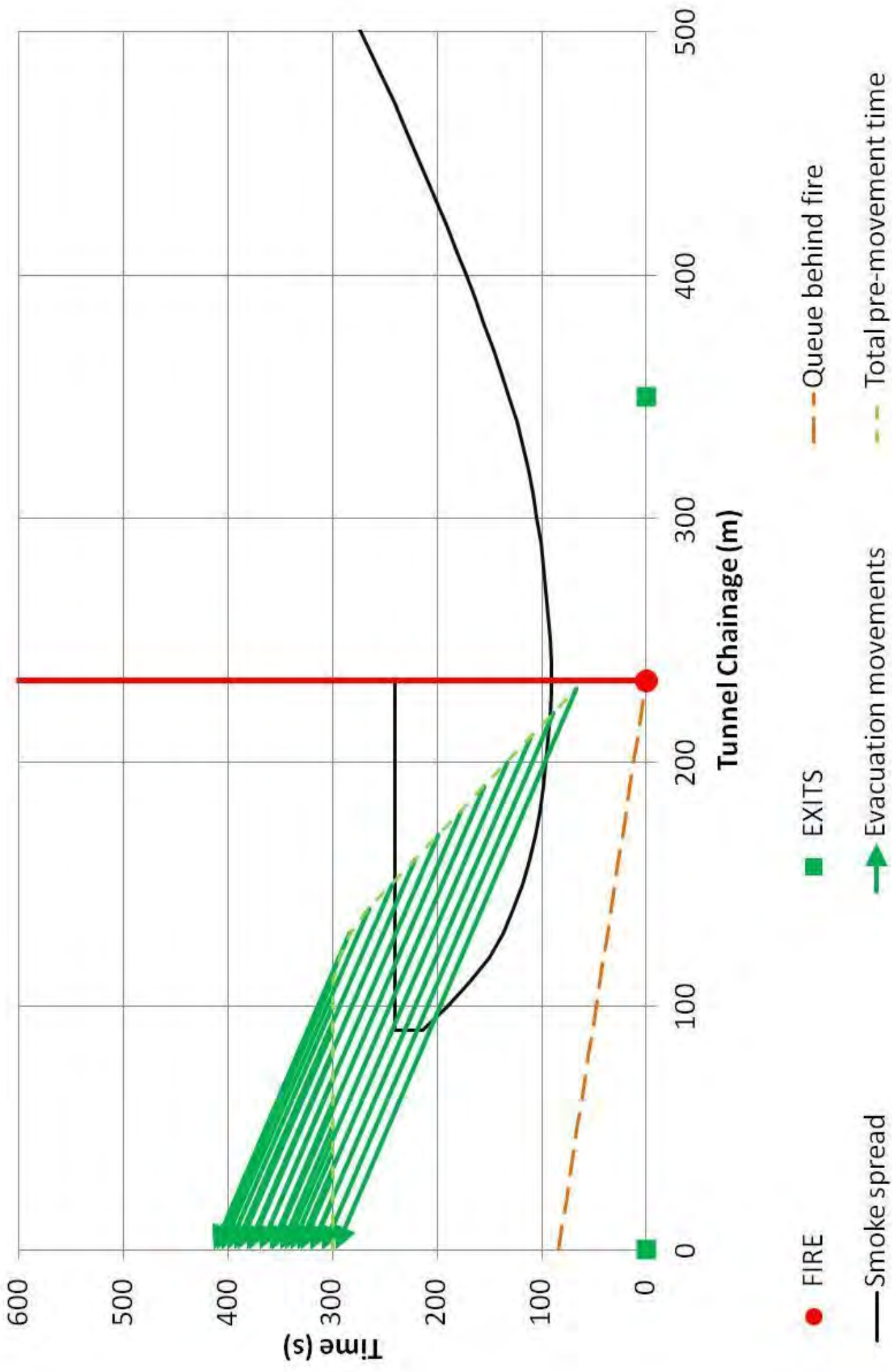
CPs @100m + modern systems



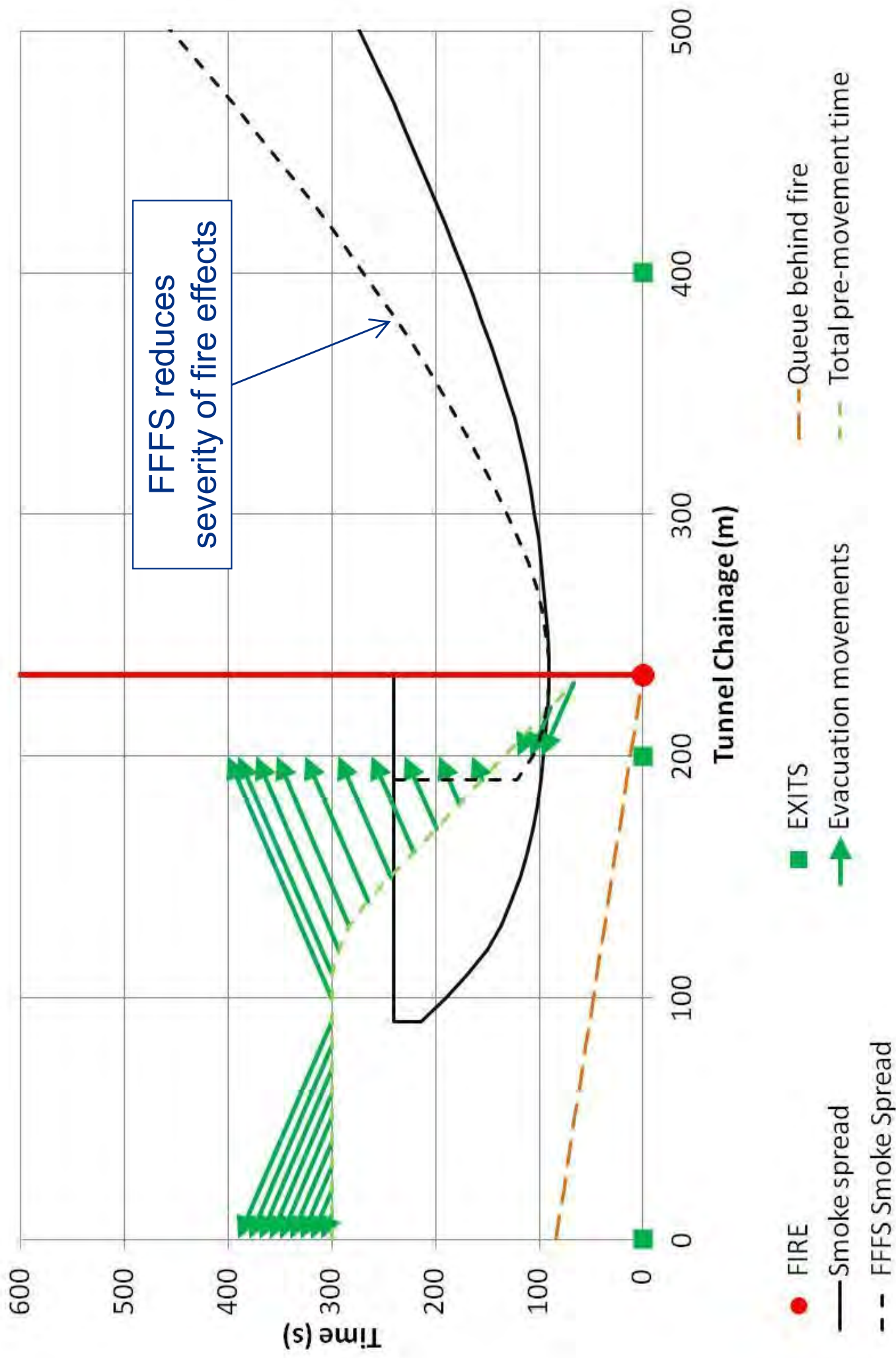
CPs @200m + modern systems



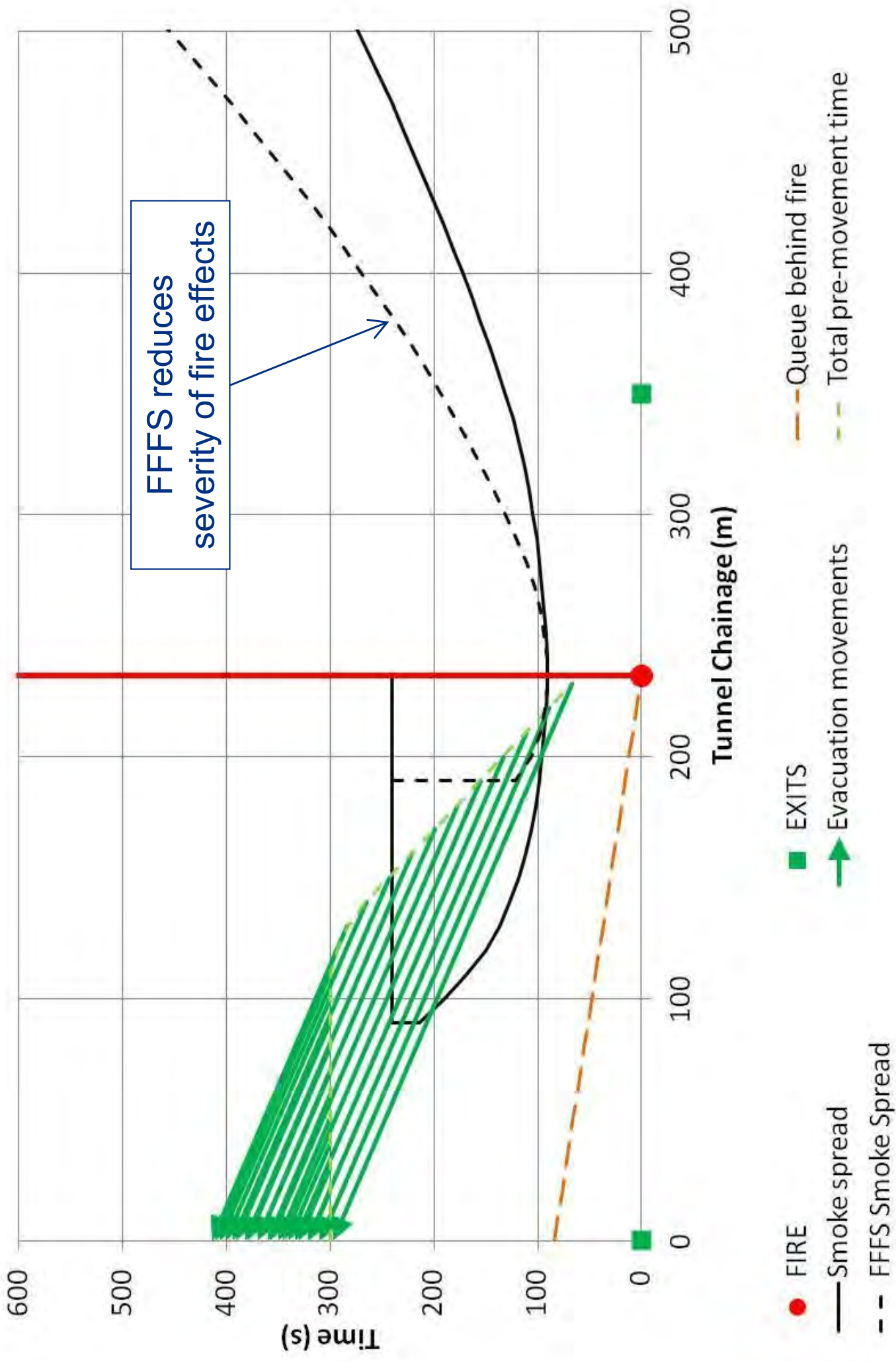
CPs @350m + modern systems



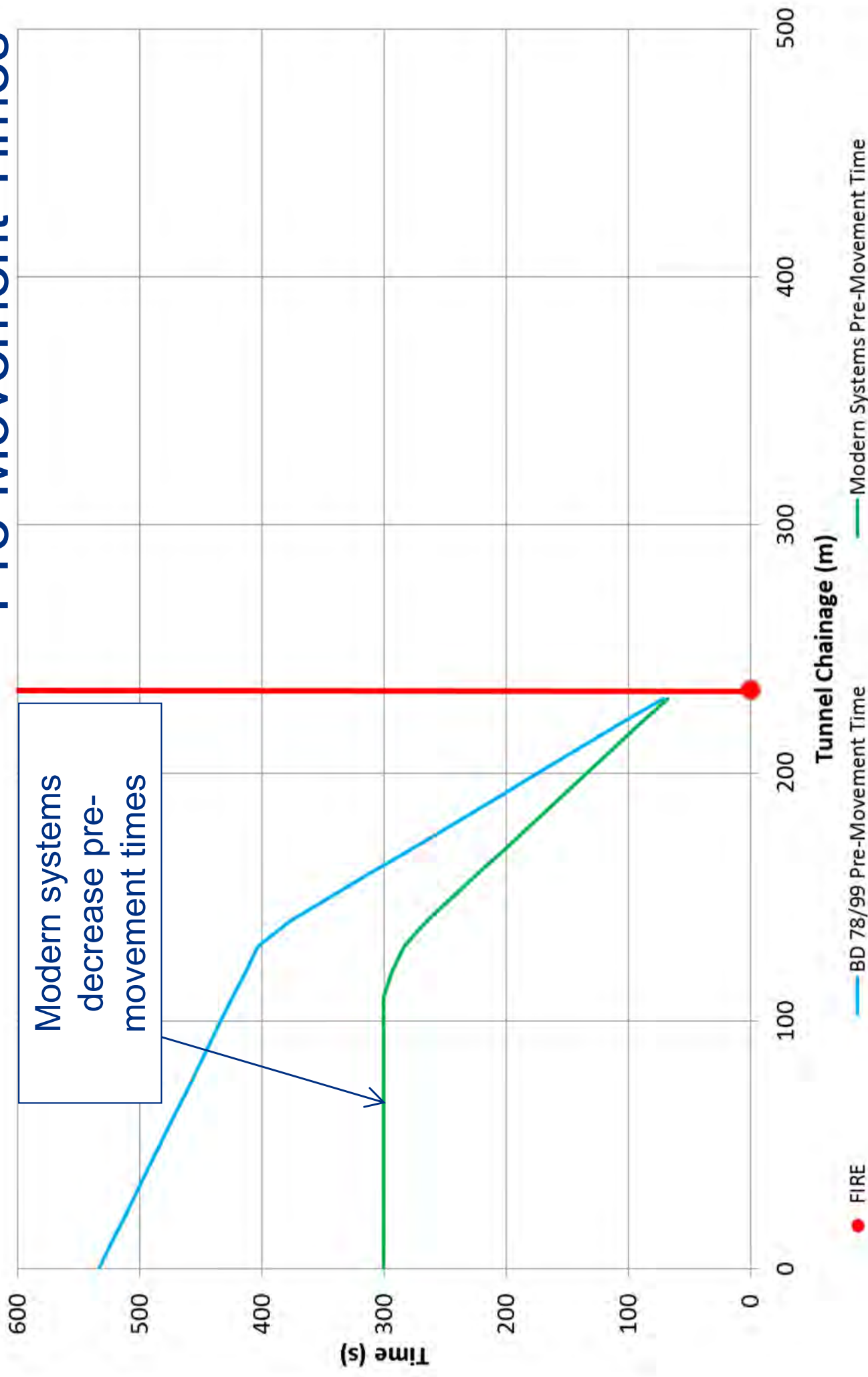
CPs @200m + modern systems ± FFFS



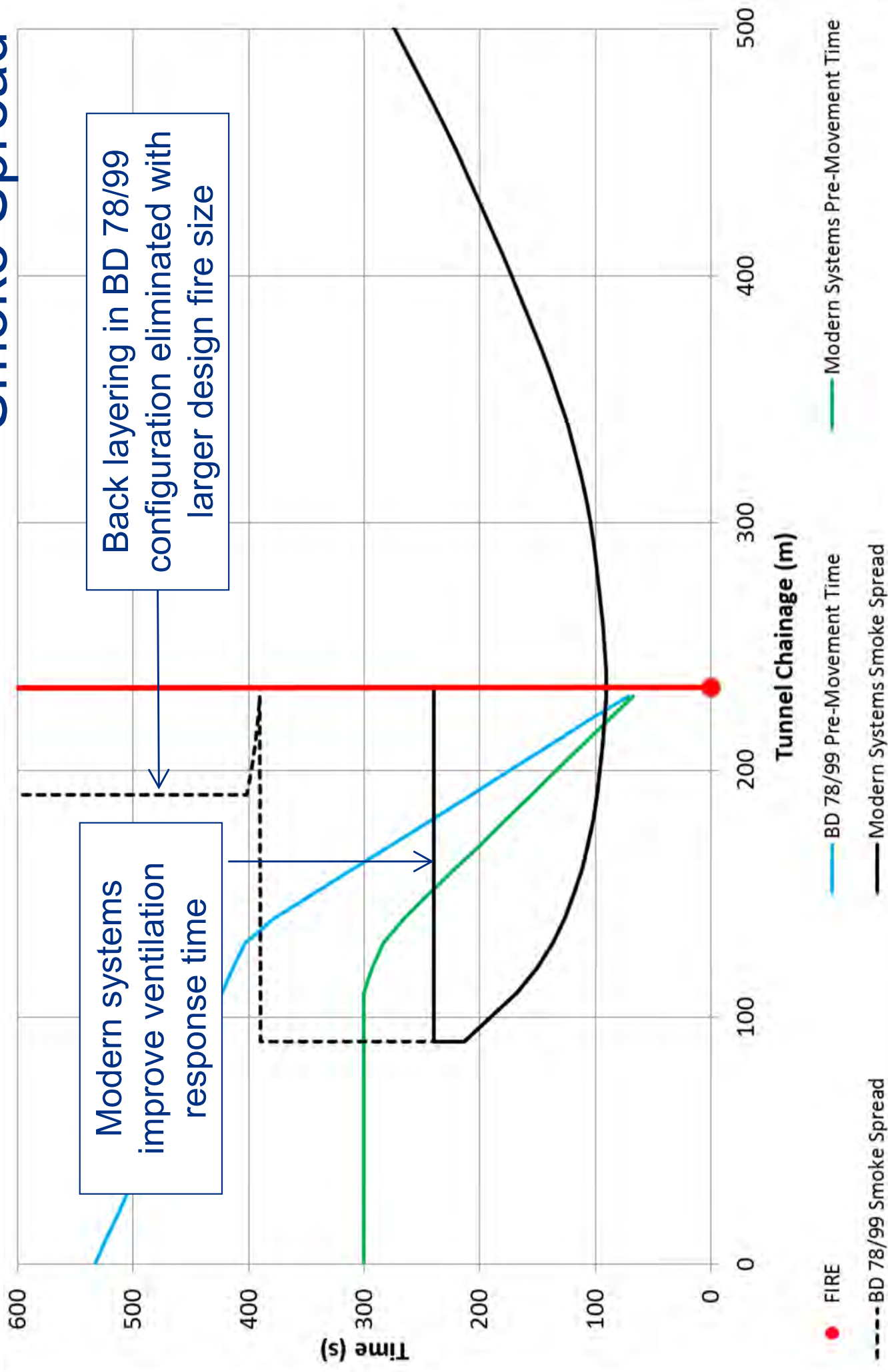
CPs @350m + modern systems + FFFS



Comparison of Tunnel Configurations Pre-Movement Times

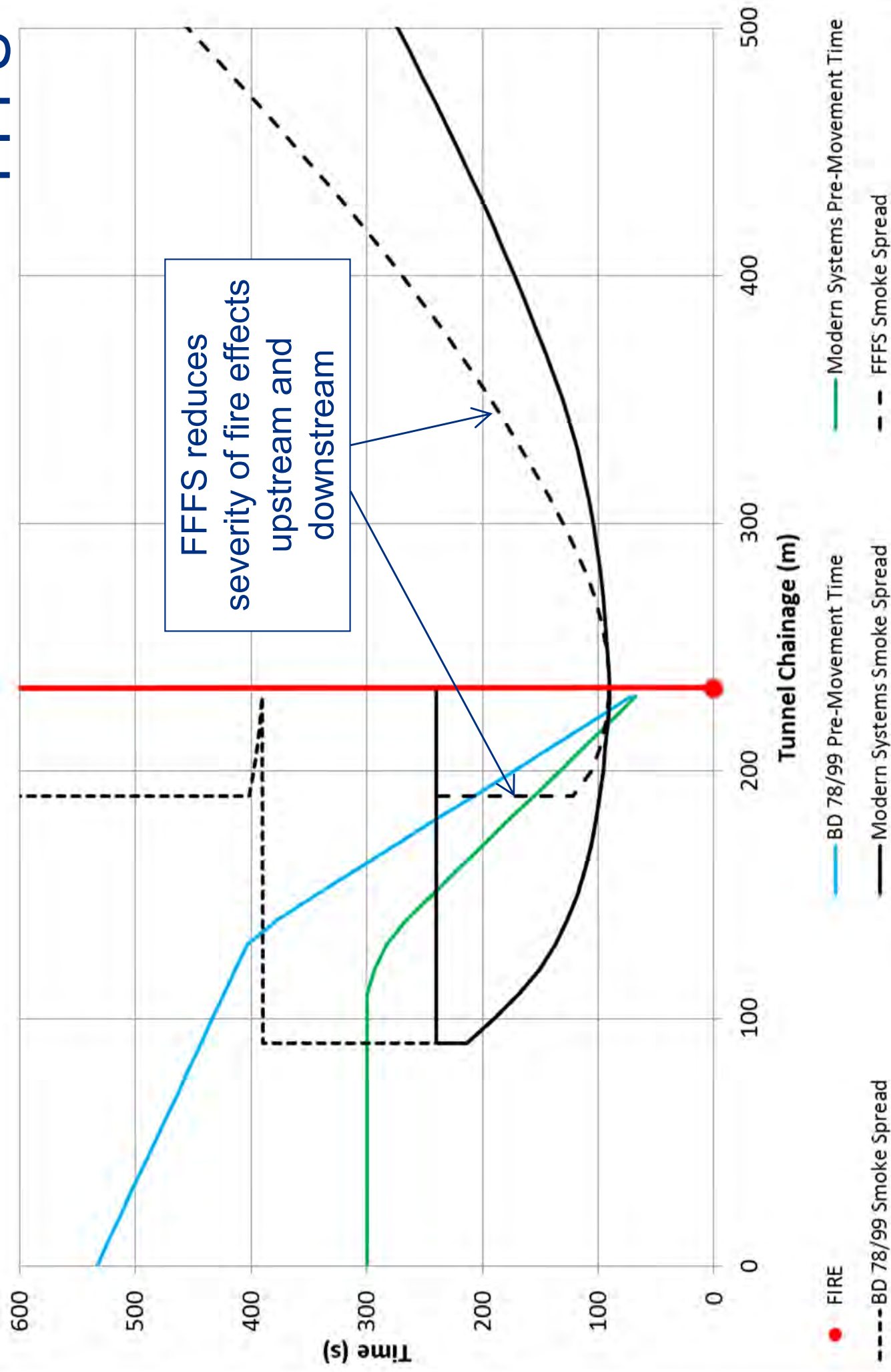


Comparison of Tunnel Configurations Smoke Spread

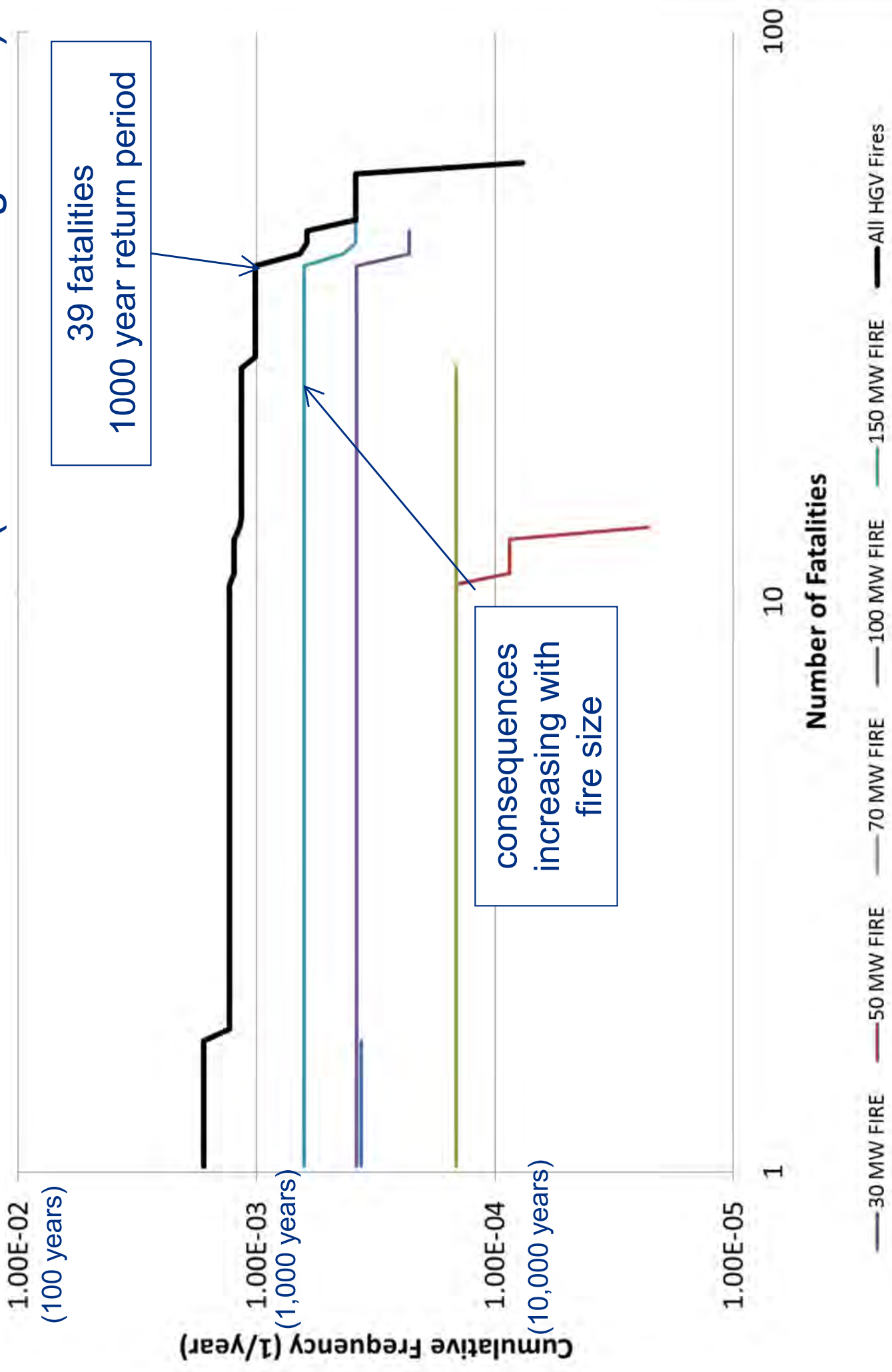


Comparison of Tunnel Configurations

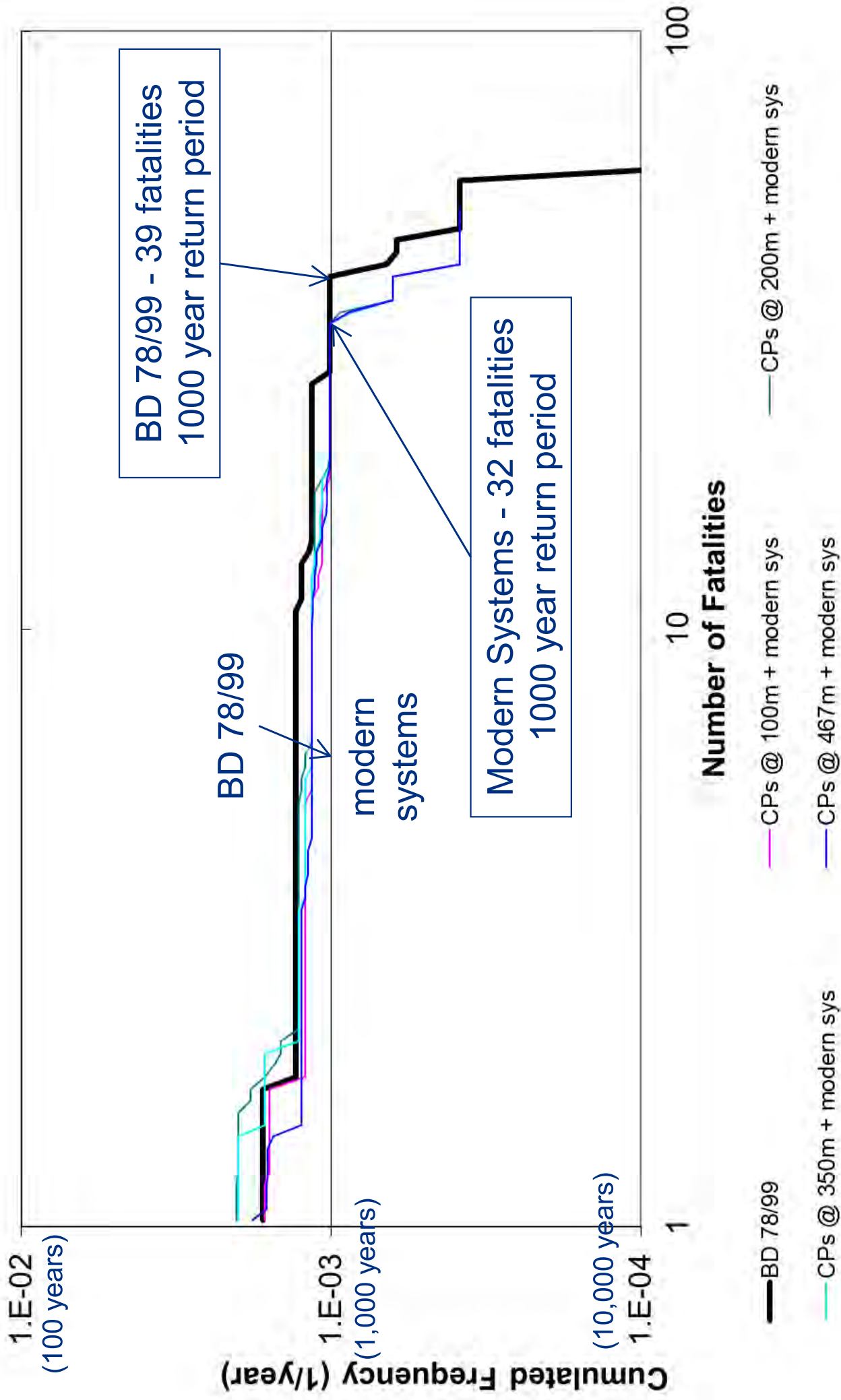
FFFS



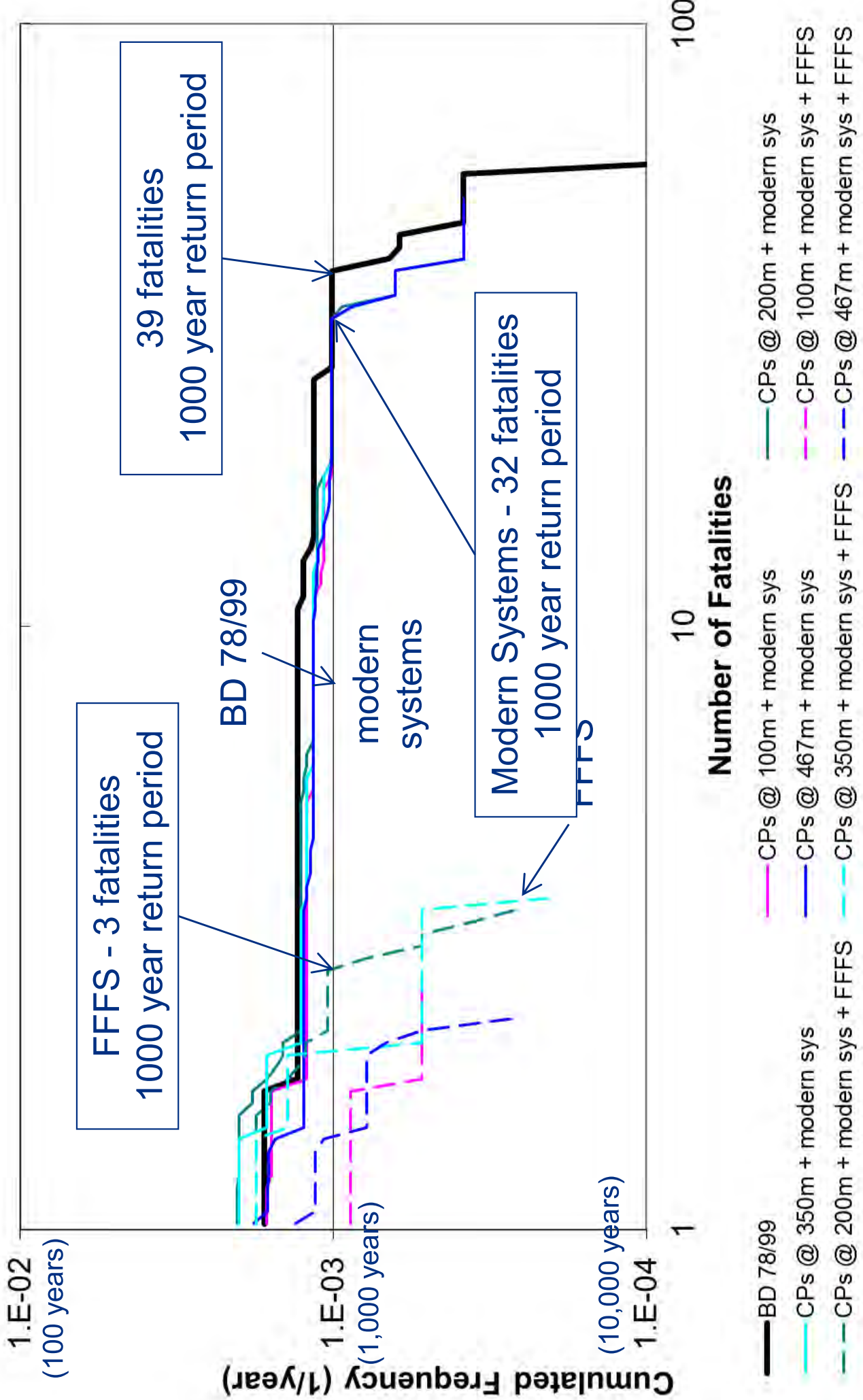
F-N curves for different fire sizes (BD 78/99 configuration)



F-N curves for different configurations



F-N curves for FFFS



Conclusions of comparative assessment

- For people behind incident, exposure to smoke occurs before emergency ventilation regime is established
- ‘Modern systems’ reduce ventilation activation times and so reduce safety risks below BD78/99 benchmark level
- Increasing the cross passage spacing has little effect on level of safety
- FFFS potentially reduces life safety risks by order of magnitude below BD78/99 benchmark level

... but impacts on fire fighter intervention need to be considered

Timeline of fire fighter intervention

- time to notify brigade
 - detection of fire; brigade receives signal
- time to dispatch resources
 - signal reaches fire station; fire fighters leave station
- time to reach tunnel
 - road travel time
- time to reach appropriate cross-passage
 - determine fire location; travel to cross-passage/set up area
- time to access & assess fire
 - don BA & gather initial equipment; walking speed; assess tunnel situation
- time for water set up
 - initial fire fighter protection; water supply requirements
- time for search & rescue tasks
 - BA control procedures; undertake search & rescue
- time to control and extinguish fire
 - set up hose streams; water application

Some tasks may be affected by CP spacing

- Running out lines of hose
- Searching for persons trapped in their vehicles
- Transferring casualties to ambulances in non-incident tube
- Handling heavy hydraulic equipment at collisions, e.g. cutters, spreaders, rams (10-20 kg) and pumps (60+ kg)

	100m	200m	350m	467m
Travel time (mins) in tunnel @ 1 m/s	1.7	3.3	5.8	7.8

... but how often will this be an issue?

General incident rates

- DfT road accident statistics
 - All severities (Urban A roads) $\approx 6.0 \times 10^{-7}$ accidents/veh-km
 - 0.92% of all accidents result in fatalities
- Tunnel fire statistics for HGVs (ref. DARTS, 2004)
 - 80 fires per billion veh-km, of which 1.5% develop into 'serious' fires (assumed > 20 MW)
 - Rate of serious fires $\approx 1.2 \times 10^{-9}$ fires/veh-km
 - 10% of serious fires grow out of control (assumed > 150 MW)

Probability of tunnel incidents

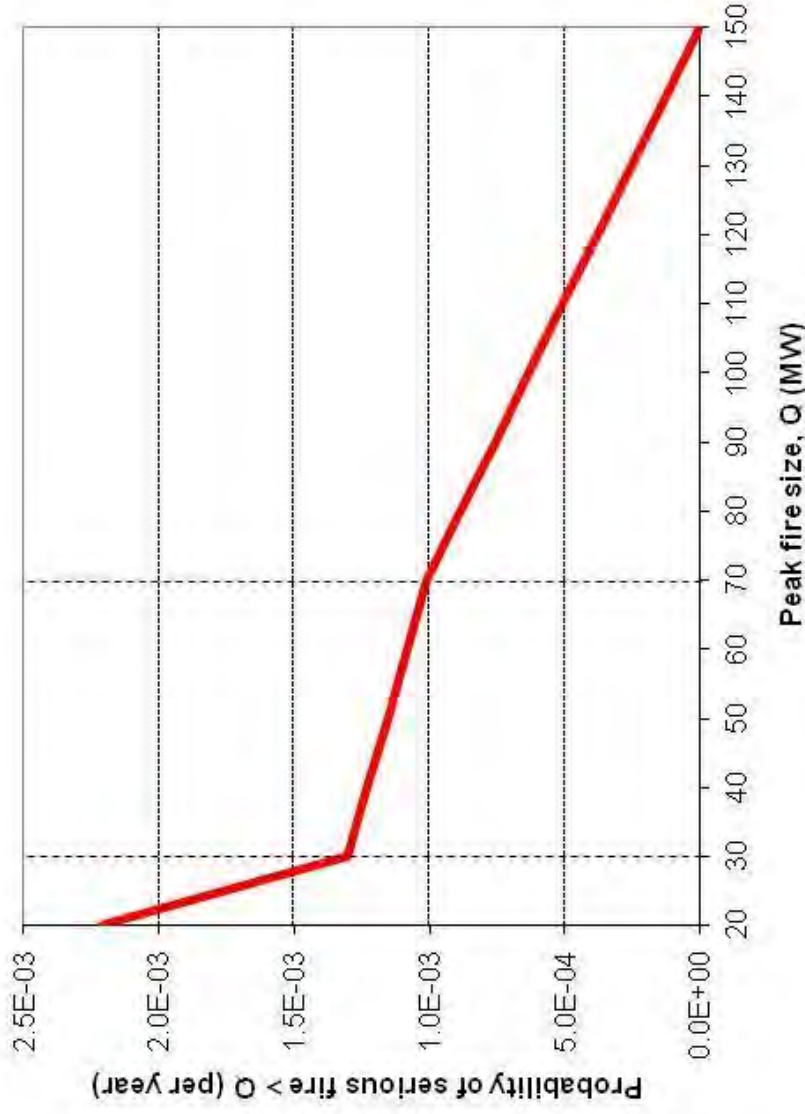
• Traffic volume			
– All vehicles		25.6×10^6 veh-km/yr	
– HGVs, buses/coaches		1.84×10^6 veh-km/yr	
• Accidents			
– Rate of fatal accidents		0.14 accidents/yr	1 per 7 yrs
• Fires			
– Rate of serious fires		2.21×10^{-3} fires/yr	1 per 450 yrs
– Rate of out of control fires		2.21×10^{-4} fires/yr	1 per 4,500 yrs

Possible Incidents for Fire Fighter Intervention

- Road traffic accident with person trapped – no fire
 - Access through all cross passages and incident bore
- Road traffic accident with person trapped – small fire
 - Access through closest cross passage
 - Closest cross passage blocked by fire (furthest walking distance)
- Road traffic accident with person trapped – large fire
 - Closest cross passage blocked by fire, trapped person unlikely to survive due to fire

Probability of different HGV fire sizes

- Probabilities based on following assumptions
 - Typical HGV loads from UK road freight statistics
 - Loads related to fire sizes described by UPTUN



Summary on impacts on intervention

- Some intervention tasks are affected by CP spacing
- Maximum travel times between CP and incident would increase

	100m	200m	350m	467m
Travel time (mins) in tunnel @ 1 m/s	1.7	3.3	5.8	7.8

- Given incidents could occur anywhere between CPs, actual travel times would generally be less than the maximum
- Expected frequencies of incidents are low

Concluding remarks

- With modern 'fast response' systems, 350m or 467m CP spacing would provide better level of safety than BD 78/99
- Intervention timescales would be greater but incidents would be rare, therefore closer CP spacing not justified?
- Addition of FFFS would control fire; increased intervention timescales would be acceptable?

Minutes



Project Title	Silvertown	Division	Tunnels
Subject	GLA / Quintain Co-ordination	Project no.	298348
Location	Greenwich Peninsula Business Centre	Date of meeting	04/04/13
Attendees	David Fielder (TfL) David Naylor (MM)		
Michael (GLA)	Payton	Trevor (GLA)	Massey Julian (Quintain) Tollast
Neil (Quintain)	Smith	David (Quintain)	Ward David Davies (Atkins)

Item	Text	Action
1.0	Meeting began with introductions and overview of purpose of the session. The following notes are issues highlighted by Quintain/GLA as items of note that in terms of interface between the tunnel study and the development proposals at Greenwich.	
2.0	General	
2.1	Joined up co-ordination between highways and tunnels is emphasised as being important by GLA/Quintain given previous project experiences. This will not be an issue with the co-ordination being adopted on this current study	
2.2	OS mapping on tabled WIP drawing was noted as being out of date and shall be resolved for final report	
3.0	Tunnel design	
3.1	Quintain keen to see limits of safeguarding on all drawings as this will form a starting point in any future discussions over any alteration of safeguarding area	
3.2	Worksite drawings requested to be presented for subsequent session	
3.3	DN confirms that tunnel service buildings and ventilation provisions will be situated at the tunnel portal with no additional intervention points proposed.	
3.4	MP would like confirmation in TfL report that the tunnelled sections on the Silvertown section would not preclude any future development	
4.0	Highway design	
	No particular concerns raised with Northern section. Query	

4.1	raised on how northern section would work as a roundabout. DD clarified that this wasn't the case in normal operation.
4.2	Concerns raised on approaches on southern side. GLA /Quintain would like rationale of options that led to preferred option clearly within TfL report.
4.3	Concerns in particular raised on how any new developments in the Peninsula Quay area would access both Blackwall and Silvertown area without significantly travelling to the south of the peninsula. Also lack of redundancy within system in Greenwich area emphasised as an issue to be aware of.
4.4	Situation with integration of TfL buses raised and needs to considered further in development of scheme.
5.0	AOB Agreed another session with Tony Wilson would be worthwhile. Location TBC following consultation within TfL on availability and reviewing calenders

Appendix F. Reference Documents

- [1] UPTUN Research Project 2006. UPTUN stands for: “Cost effective sustainable and innovative Upgrading Methods for Fire Safety in existing Tunnels”.
- [2] PIARC – Design fire characteristics for Road Tunnels 2012
- [3] PIARC Quantitative Risk Assessment Model - http://www.piarc.org/en/knowledge-base/road-tunnels/qram_software/
- [4] New Thames River Crossing – Network Development and Forecasting Report – May 2010
- [5] BD 78/99 – Design manual for Roads and Bridges Part 9 – Design of Road Tunnels – August 1999
- [6] DARTS project – Durable and Reliable Tunnel Structures – May 2004
- [7] PD 7974-1:2003 - Application of fire safety engineering principles to the design of buildings. Initiation and development of fire within the enclosure of origin
- [8] Centre D’Etudes Des Tunnels – Guide to Road Tunnel Safety Documentation Booklet 4 – Specific Hazard Investigations - 2003
- [9] CIBSE Guide E – Fire Safety Engineering - 2010
- [10] NCHRP Synthesis 415 – Design Fire in Road Tunnels – A synthesis of Highway Practice - 2011
- [11] ADR – European Agreement concerning the International Carriage of Dangerous Goods by Road - 2011
- [12] Centre D’Etudes Des Tunnels – Essais Hydrauliques des Systemes de Recueil des Liquides Repandus sur la Chaussee des Tunnels Routiers - 1994
- [13] On the Characteristics of Fires in Tunnels – Doctoral Thesis – Anders Lönnermark - 2005
- [14] Atkins Silvertown Tunnel Highway Infrastructure Conceptual Design Report, April 2013
- [15] CEN/TS 14972:2008 – ‘Fixed fire fighting systems - Watermist systems - Design and Installation
- [16] BS DD 8489:2011; Fixed Fire Protection Systems – Industrial and Commercial Water Mist Systems
- [17] SOLIT - ‘Engineering Guidance for a Comprehensive Evaluation of Tunnels with Fixed Fire Fighting Systems Annex 3
- [18] PIARC - Road Tunnels: An Assessment of Fixed Fire Fighting Systems – 2008

Appendix G. Correspondence with Third Parties

G.1. Thames Water

G.2. UK Power Networks (UKPN)

G.3. National Grid Transco / Scotia Gas Networks (Greenwich Gasholder)

G.1. Thames Water

RE: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

Paul Dabrowski [paul.dabrowski@thameswater.co.uk]

Sent: 17 June 2013 15:57

To: Naylor, David

David –

It would appear that these assets are TW's Tidal Basin rising mains. As such, in theory, there is more scope to divert than if they were sewers but, at 1400mm dia. each, not recommended as a solution. However, the one element that is sacrosanct are the outfalls to the river. Any changes to these will have to be negotiated by yourselves/your client with the EA/PLA and be subject to legal agreements/consents. Again, best to leave alone.

Requests for estimates for diversionary works should be sent via:

Thames Water Utilities Ltd.,
Development Control,
Maple Lodge STW,
Denham Way,
Rickmansworth,
Hertfordshire, WD3 7SQ.

However, you should provide the following minimum information (these would not appear to be NR&SWA works until you/TfL confirm that any land acquired has become (or is intended to become) adopted highway):

Client
Consultant
Agent/Contractor (if any)
Under what Act/Order the work is being requested under
Purpose of Scheme
Scaleable/readable drawings in .pdf and .dgn/.dwg formats

The works will then be allocated to the appropriate group (probably ourselves) and likely to be costly. Timescales are lengthening all the while due to internal governances/approvals and to buy in outside CAD, surveying and other services. For C3s approx. 3-6 months should be allowed after which a design fee will be requested. For C4s, at least 1 year should be allowed from receipt of this design fee to commencement on site due to a current requirement for full tendering.

There may also be seasonal constraints on being able to interrupt flows along these particular pipelines determined at the detailed design stage, a need to replace the pumps at the Royal Victoria Dock end if not able to cope with increased demand due to the additional diversionary routeing and these timescales take no regard of legal agreement/consent/study requirements.

Regards,

Paul Dabrowski

Senior Diversions Engineer

 Thames Water Utilities Ltd. 1st Floor West, Clearwater Court, Vastern Road, Reading, Berkshire, RG1 8DB

0203 577 4342

0118 373 8796

From: Naylor, David [<mailto:David.Naylor@mottmac.com>]**Sent:** 17 June 2013 13:34**To:** Paul Dabrowski**Subject:** RE: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

Paul,

I've been passed your details by your colleague Claire Cable as you may be better placed to help.

I'm working on behalf of TfL on the proposed Silvertown road tunnel crossing.

This is at the very initial stages of planning and design, but one asset that has been identified as being in the proximity to the proposed tunnel alignment is the drainage for the Royal Victoria Dock. We have some initial information on this asset and have proposed a potential diversion route (see scan attached) but we would like the opportunity to discuss this asset with TW, namely to:

- Confirm the asset is indeed a TW asset
- Discuss the operation of this asset to understand its constraints and particular needs
- Discuss the TW AIP process for moving forward with the relocation proposal

Can you / your colleagues assist at all on this matter? Our commission with TfL is shortly coming to an end and so while definite answers may be a struggle at this moment in time, clarifying the process going forward with this asset would be worthwhile information for TfL to capture.

Any assistance you could provide would be greatly appreciated.

Regards,

David Naylor
Engineer
Tunnel Division

Ext: 3686

t: +44 (0)20 8774 3686

f: +44 (0)20 8681 5706

w: www.tunnels.mottmac.come: David.Naylor@mottmac.com

This message is from Mott MacDonald Limited, registered in England number 1243967.

From: Claire Cable [<mailto:claire.cable@thameswater.co.uk>]
Sent: 17 June 2013 10:27
To: Naylor, David
Subject: RE: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

David,

The best person to speak to is in our Developer Services team – Paul Dabrowski on 01183738973. Or Paul.dabrowski@thameswater.co.uk. He may not be directly the person to help but should be able to put you in touch with someone who can.

Claire

From: Naylor, David [<mailto:David.Naylor@mottmac.com>]
Sent: 14 June 2013 11:41
To: Claire Cable
Subject: RE: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

Dear Claire,

Apologies for contacting yourself again on this matter. I've not received any further correspondence on this matter from your colleagues and I need to conclude this piece of work for my client – or at least let them know the correct part of your organisation to contact taking this forward.

Can you let me know if there's any news with this request or the contact details of the people who are looking at this request?

Any help you could provide on this matter would be most appreciated.

Regards,

David Naylor
Engineer
Tunnel Division

Ext: 3686
t: +44 (0)20 8774 3686
f: +44 (0)20 8681 5706
w: www.tunnels.mottmac.com
e: David.Naylor@mottmac.com

This message is from Mott MacDonald Limited, registered in England number 1243967.

From: Claire Cable [claire.cable@thameswater.co.uk]
Sent: 08 April 2013 09:03
To: Naylor, David
Cc: Baber, Jonathan
Subject: RE: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

David,

Yes – I've passed it on internally and someone should get in touch with you shortly.

Claire

From: Naylor, David [<mailto:David.Naylor@mottmac.com>]

Sent: 04 April 2013 17:12
To: Claire Cable
Cc: Baber, Jonathan
Subject: RE: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

Claire,

Is there any news on the below? I'm on leave till the 15th now, if you could let my colleague Jon Baber know the status of this it would be appreciated.

Regards,

David Naylor
Engineer
Tunnel Division

Ext: 3686
t: +44 (0)20 8774 3686
f: +44 (0)20 8681 5706
w: www.tunnels.mottmac.com
e: David.Naylor@mottmac.com

This message is from Mott MacDonald Limited, registered in England number 1243967.

From: Naylor, David
Sent: 27 March 2013 14:32
To: 'Claire Cable'
Subject: RE: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

Claire,

No problem – thanks for letting me know.

I thought you wouldn't be the appropriate person for this – but would know someone who is! If you could pass on the contact as soon as you receive it, it would be greatly appreciated.

Many thanks,

David Naylor
Engineer
Tunnel Division

Ext: 3686
t: +44 (0)20 8774 3686
f: +44 (0)20 8681 5706
w: www.tunnels.mottmac.com
e: David.Naylor@mottmac.com

This message is from Mott MacDonald Limited, registered in England number 1243967.

From: Claire Cable [<mailto:claire.cable@thameswater.co.uk>]
Sent: 27 March 2013 14:13
To: Naylor, David
Subject: RE: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

David,

Sorry I missed this in my inbox until now – I can't help I'm afraid but have asked one of our waste people for a contact for you – will get back to you when I get an answer but if you've sorted already please let me know.

Claire

From: Naylor, David [<mailto:David.Naylor@mottmac.com>]
Sent: 21 March 2013 12:19
To: Claire Cable
Subject: Silvertown - Thames Water interface for the Royal Victoria Dock drainage

Dear Claire,

I'm writing in relation to the proposed Silvertown tunnel crossing – I believe my colleague Matt Dilling has been in contact previously.

I've got a fairly random request, which I'm hoping you will know the most relevant person within TW to deal with. As part of the tunnel crossing there will have to be a number of utilities diverted, but one of the more key utilities that will have to be addressed is the drainage line for the Royal Victoria Dock. We have some initial information on this asset and have proposed a potential diversion route (see scan attached) but we would like the opportunity to discuss this asset with TW, namely to:

- Confirm the asset is indeed a TW asset
- Discuss the operation of this asset to understand its constraints and particular needs
- Discuss the TW AIP process for moving forward with the relocation proposal

The scheme is in very high level design but we would welcome any opportunity to discuss this further with TW. If you could re-direct me in the direction of anyone within TW who is appropriate to be dealing with this request it would be very appreciated.

Regards,

David Naylor
Engineer
Tunnel Division

Ext: 3686
t: +44 (0)20 8774 3686
f: +44 (0)20 8681 5706
w: www.tunnels.mottmac.com
e: David.Naylor@mottmac.com

This message is from Mott MacDonald Limited, registered in England number 1243967.

From: Dilling, Matthew M
Sent: 20 March 2013 17:40
To: Naylor, David; Taylor, Graham R
Subject: RE: Silvertown - Thames Water contact

David

I have just started a project working with Thames Water. My environmental contact is Claire Cable (Claire.cable@thameswater.co.uk). She may be able to put you in contact with the correct person if you explain things

Hope this helps

Matt

From: Naylor, David
Sent: 20 March 2013 17:01
To: Dilling, Matthew M; Taylor, Graham R
Subject: Silvertown - Thames Water contact

Matt, Graham,

Quick question – I'm going to try and set up a session with Thames Water to discuss one of their assets which we're proposing to relocate for Silvertown.

We've not got a contact so I'll have to send a random query in and see if anyone responds in time for this period of the study as it stands. Just wondering with either your environmental or geotechnical works you had a contact with TW that may save some time?

Regards,

David Naylor
Engineer
Tunnel Division

Ext: 3686
t: +44 (0)20 8774 3686
f: +44 (0)20 8681 5706
w: www.tunnels.mottmac.com
e: David.Naylor@mottmac.com

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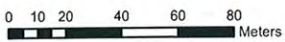
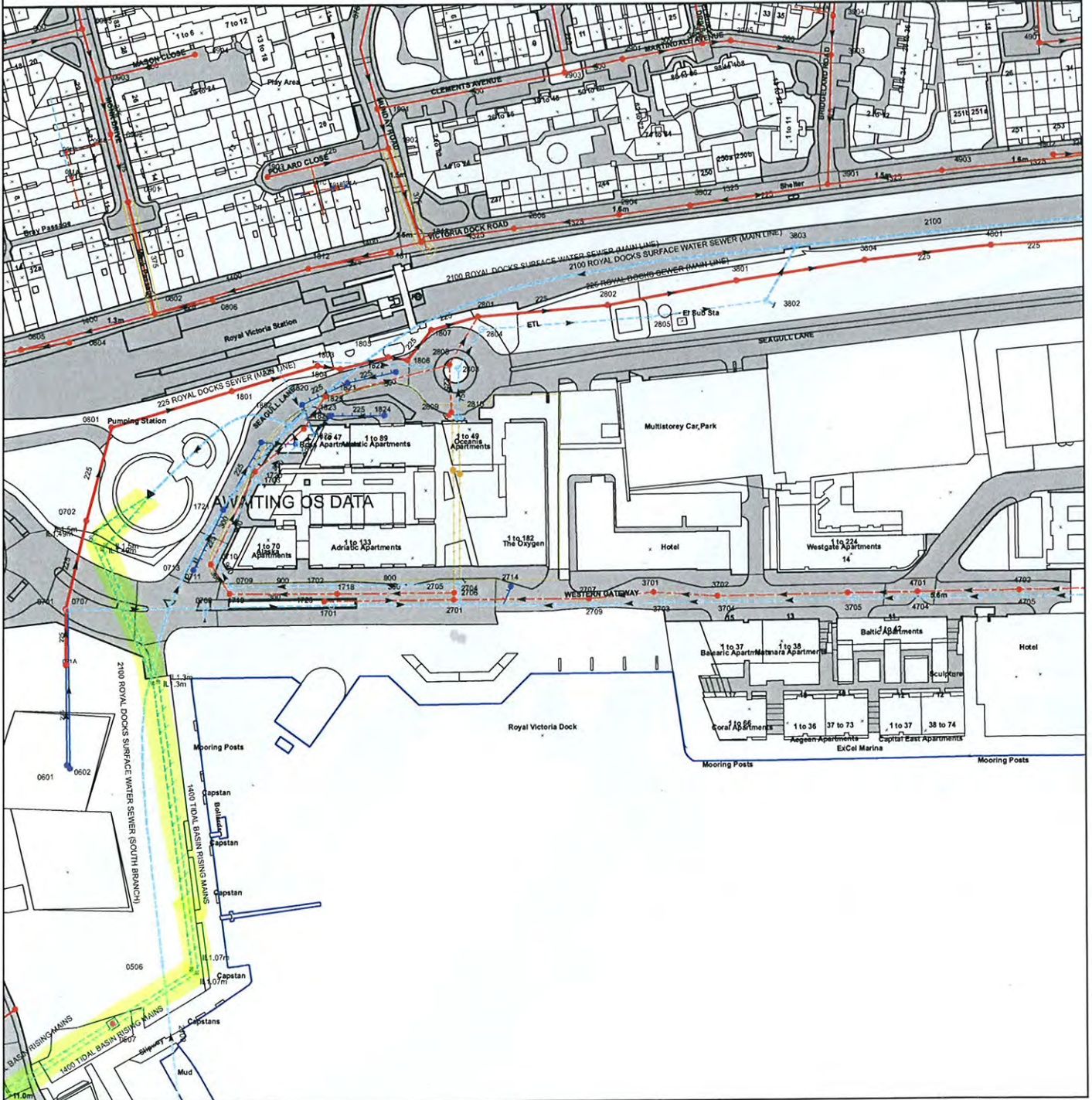
We provide the essential service that's at the heart of daily life, health and enjoyment.



The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

Scale: 1:1791
Width: 500m
Printed By: ajohn
Print Date: 18/01/2013
Map Centre: 539750,180250
Grid Reference: TQ3980SE

Comments:



The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

Scale: 1:1791
Width: 500m
Printed By: ajohn
Print Date: 18/01/2013
Map Centre: 540250,180750
Grid Reference: TQ4080NW

Comments:

G.2. UK Power Networks (UKPN)

Mr R Oza
Mott MacDonald
8-10 Sydenham Road
Croydon
Surrey
CR0 2EE

9th May 2013
Our Ref: 401303379/QID170715

Dear Mr Oza

Site Address: (PTSA) Off Dock Road, London, EE3

Thank you for your recent enquiry regarding the above premises. I am writing to you on behalf of London Power Networks PLC the licensed distributor of electricity for the above address trading as UK Power Networks.

I am pleased to be able to provide you with a budget estimate for the work to provide a 4.5MVA 11kV connection.

It is important to note that this budget estimate is intended as a guide only. It may have been prepared without carrying out a site visit or system studies. No enquiry has been made as to the availability of consents or the existence of any ground conditions that may affect the works. It is not an offer to provide the connection and nor does it reserve any capacity on UK Power Networks' electricity distribution system.

1. Budget estimate

The budget estimate for this work is:

£2,000,000.00 (exclusive of VAT) if the Point Of Connection (POC) is at our Silvertown Primary Substation at Camel Road London. E16 2DD

2. Budget estimate assumptions

This budget estimate is based on the following assumptions:

- The most appropriate Point of Connection (POC) is as described above.
- A viable cable or overhead line route exists along the route we have assumed between the Point of Connection (POC) and your site.
- In cases where the Point of Connection (POC) is to be at High Voltage, that a substation can be located on your premises at or close to the position we have assumed.
- Where electric lines are to be installed in private land UK Power Networks will require an easement in perpetuity for its electric lines and in the case of electrical plant the freehold interest in the substation site, on UK Power Networks terms, without charge and before any work commences.
- You will carry out, at no charge to UK Power Networks, all the civil works within the site boundary, including substation bases, substation buildings where applicable and the excavation/reinstatement of cable trenches.



- Unless stated in your application, all loads are assumed to be of a resistive nature. Should you intend to install equipment that may cause disturbances on UK Power Networks' electricity distribution system (e.g. motors; welders; etc.) this may affect the estimate considerably.
- All UK Power Networks' work is to be carried out as a continuous programme of work that can be completed substantially within 12 months from the acceptance of the formal offer.

Please note that if any of the assumptions prove to be incorrect, this may have a significant impact on the price in any subsequent quotation. You should note also that UK Power Networks' formal connection offer may vary considerably from the budget estimate. If you place reliance upon the budget estimate for budgeting or other planning purposes, you do so at your own risk.

If you would like to proceed to a formal offer of connection then you should apply for a quotation, Please refer to our website http://www.ukpowernetworks.co.uk/internet/en/help-and-advice/documents/the_connection_process.pdf for '**The connection process**' which details our application process. To help us progress any future enquiry as quickly as possible please quote the UK Power Networks Reference Number from this letter on all correspondence.

If you have any questions about your budget estimate or need more information, please do not hesitate to contact me. The best time to call is between the hours of 9am and 4pm, Monday to Friday.

Yours sincerely



Chris Clements
Project Designer(Prelims)
Tel: 020 7055 4082
Email: christopher.clements@ukpowernetworks.co.uk

Mr R Oza
Mott MacDonald
8-10 Sydenham Road
Croydon
Surrey
CRO 2EE

9th May 2013
Our Ref: 401303570/QID170808

Dear Mr Oza

Site Address: (PTSB) Off Millenium Way, London, EE1

Thank you for your recent enquiry regarding the above premises. I am writing to you on behalf of London Power Networks PLC the licensed distributor of electricity for the above address trading as UK Power Networks.

I am pleased to be able to provide you with a budget estimate to provide a 4.5MVA 11kV connection. It is important to note that this budget estimate is intended as a guide only. It may have been prepared without carrying out a site visit or system studies. No enquiry has been made as to the availability of consents or the existence of any ground conditions that may affect the works. It is not an offer to provide the connection and nor does it reserve any capacity on UK Power Networks' electricity distribution system.

1. Budget estimate

The budget estimate for this work is:
£3,750,000.00 (exclusive of VAT) if the Point Of Connection (POC) is at our Farjeon Road Primary Substation, London SE3 8SA.

2. Budget estimate assumptions

This budget estimate is based on the following assumptions:

- The most appropriate Point of Connection (POC) is as described above.
- A viable cable or overhead line route exists along the route we have assumed between the Point of Connection (POC) and your site.
- In cases where the Point of Connection (POC) is to be at High Voltage, that a substation can be located on your premises at or close to the position we have assumed.
- Where electric lines are to be installed in private land UK Power Networks will require an easement in perpetuity for its electric lines and in the case of electrical plant the freehold interest in the substation site, on UK Power Networks terms, without charge and before any work commences.
- You will carry out, at no charge to UK Power Networks, all the civil works within the site boundary, including substation bases, substation buildings where applicable and the excavation/reinstatement of cable trenches.
- Unless stated in your application, all loads are assumed to be of a resistive nature.



Should you intend to install equipment that may cause disturbances on UK Power Networks' electricity distribution system (e.g. motors; welders; etc.) this may affect the estimate considerably.

- All UK Power Networks' work is to be carried out as a continuous programme of work that can be completed substantially within 12 months from the acceptance of the formal offer.

Please note that if any of the assumptions prove to be incorrect, this may have a significant impact on the price in any subsequent quotation. You should note also that UK Power Networks' formal connection offer may vary considerably from the budget estimate. If you place reliance upon the budget estimate for budgeting or other planning purposes, you do so at your own risk.

If you would like to proceed to a formal offer of connection then you should apply for a quotation, Please refer to our website http://www.ukpowernetworks.co.uk/internet/en/help-and-advice/documents/the_connection_process.pdf for '**The connection process**' which details our application process. To help us progress any future enquiry as quickly as possible please quote the UK Power Networks Reference Number from this letter on all correspondence.

If you have any questions about your budget estimate or need more information, please do not hesitate to contact me. The best time to call is between the hours of 9am and 4pm, Monday to Friday.

Yours sincerely



Chris Clements
Project Designer (Prelims)
Tel: 020 7055 4082
Email: christopher.clements@ukpowernetworks.co.uk

APPLICATION FOR AN ELECTRICITY CONNECTION (PROJECTS)

Completing this form accurately will help us deal with your application as quickly as possible. Please complete all sections.

You can complete this form:

Online

- Download or complete the form at www.ukpowernetworks.co.uk (navigate to Connection Services)
- Email it to connections.projectsgateway@ukpowernetworks.co.uk

By post

- Projects Gateway, UK Power Networks, Metropolitan House, Darkes Lane, Potters Bar, Hertfordshire EN6 1AG
- Fax: 0845 650 0248

Safety note: before you allow anyone to start digging or building near to any overhead or underground electricity cables, please get a copy of our cable records for your site from our plan provision team on **0800 056 5866**. Sometimes there's a charge for this service.

Please complete this application form for:

- Any development requiring more than four connections
- Any development with a power requirement of more than 70kVA
- Any commercial development requiring more than one single or three phase connection
- The diversion of existing electricity assets, e.g. cables, substations, overhead lines
- Alterations to an existing electricity connection of more than 70kVA.

For enquiries that involve the connection of generation please visit www.ukpowernetworks.co.uk (navigate to Connection Services) to see our application process.

This isn't the correct application form if you require:

- Alterations to your existing electricity connection including bracket moves and earthing up to 70kVA
- Up to four new domestic electricity connections
- Single commercial supplies including temporary builders supplies up to 70kVA
- Upgrades up to 70kVA.

If any of these apply to your application, please call **0845 234 0040** (select option 3) and ask for a small services application form, or visit www.ukpowernetworks.co.uk (navigate to Connection Services).

Any questions? Call 08701 964 599

Monday to Friday 8.30am to 5pm



Section A: Your details

- A1. **Details of the person making this application and to whom we will issue a budget estimate or quotation** (we will consider you to be the Applicant). The Applicant will also receive any payments due under our guaranteed standards of performance during the 'estimate and quotation' stage of your application. The Applicant **must** also sign and complete Section I.

Title: Mr. Name: Rakesh Oza Company name: Mott MacDonald

Address: 8-10 Sydenham Road
Croydon, Surrey

Postcode: CR0 2EE

Telephone: 0208 774 2598 Mobile: 07817 588 233

Email: Rakesh.Oza@mottmac.com

- A2. Site address (where the work is taking place)

Address: _____

1) Off Millennium Way, London EE1 (Refer attached map)

2) Off Dock Road, London EE3 (Refer attached map) Postcode: _____

- A3. How would you prefer to be contacted by us during the application process? Email Phone Letter

- A4. Your authorised representative's details (to allow someone to act on your behalf during this application). If you complete this, we will deal with this person's instructions as if they are your own

Contact name: _____ Company name: _____

Relationship to you (e.g. developer, consultant): _____

Address: _____

Postcode: _____

Telephone: _____ Mobile: _____

Email: _____

Section B: Quotation requirements

- B1. Did you know you can seek competitive quotations from an Independent Connection Provider for many elements of the work involved in getting an electricity connection? Please indicate if you:

Want UK Power Networks to complete all of the work

Are intending to use or are acting as an Independent Connection Provider (ICP).

Are intending to use or are acting as an Independent Distribution Networks Operator (IDNO).

More information can be found in our helpsheet 'Did you know you have a choice?' found at www.ukpowernetworks.co.uk

Independent Connections Provider (ICP)

is an accredited company that is entitled to build electricity networks to the specification and quality required for them to be owned by UK Power Networks

Independent Distribution Network Operator (IDNO)

an IDNO has a wider scope than an ICP; after building the local network, it will continue to own the local network and provide maintenance and 24 hour fault repairs.

- B2. Please tick which you require (tick only one box):

Budget estimate

This is based on a desktop assessment only without any site specific conditions being taken into account. It may vary considerably from a formal connection offer. It is not capable of acceptance and does not secure any network capacity.

Quotation

This is a connection offer which is made following an assessment of your requirements. It is capable of acceptance and is normally valid for 90 days from the date issued. Please note that by requesting a quotation you are confirming that you are in a position to accept our offer within 90 days of issue. If this is not the case then please request a budget estimate.

- B3. Please confirm that you would like your Budget Estimate or Quotation issued by: Email Letter
(we will use the details provided in A1)

- B4. Have you had a budget estimate or quotation from us before for this site address? Yes No

If yes, please state your previous UK Power Networks reference number (this will be a nine digit number starting with 40 or 30)

Section C: Your requirements

C1. What is your required date for the connection(s) to be provided? (we call this the 'power on' date) March 2018

C2. Does your project require notification under the Construction (Design and Management) (CDM) Regulations 2007?

Yes No

For guidance on CDM please go to www.hse.gov.uk

If yes, please provide contact details below for your CDM Coordinator and Principal Contractor:

CDM Coordinator

Name: To be confirmed (Initial Inquiry only) Company name: _____

Address: _____

Postcode: _____

Telephone: _____ Mobile: _____

Email: _____

Principal Contractor

Name: To be confirmed (Initial Inquiry only) Company name: _____

Address: _____

Postcode: _____

Telephone: _____ Mobile: _____

Email: _____

C3. Please tick which service(s) you require:

Office use only (project ref no):

New connection

Total number of connections required: TWO

Please complete C4.

Upgrade of an existing connection

Existing service capacity: _____ kVA/ kW

Existing 13-digit Meter Point Administration Number (MPAN):
(this can be found on your electricity bill and will start with 19, 10 or 12)

Please complete C4.

Temporary connection

Capacity required for the temporary connection _____ kVA

single phase three phase

Please complete C4.

Diversion work (this is an alteration or diversion of electricity cables, overhead lines or substations)

Please complete section F.

C4. Will any of these connections power any motors or welders?

Yes No

If yes, please note that you will need to provide further details in Section E

Section D: Site and load details

Depending on your project, there may be a requirement to install a substation on your site. Our design team will discuss this with you in more detail but it would be helpful at this stage if you could indicate a preferred location on a plan (explained in section H).

D1. Please complete the section(s) which best match your project:

i. Domestic

a. Please complete this table:

Type of property (e.g. house or flat)	No. of bedrooms	No. of properties	Load required per property
	Please select		kVA
	Please select		kVA
	Please select		kVA
	Please select		kVA
	Please select		kVA

b. How will the property be heated? Gas Electric Other _____

If electric, please provide the space or water heating demand per property

c. Are landlord connections required? Yes No please complete D2

How many landlord's are required? _____ If you require more than one landlord supply please supply full details in section G

Capacity required for the landlord's connection: _____ kVA

The landlord's connection is: single phase three phase

Please complete D2.

ii. Commercial/Industrial

a. Please complete this table:

Type of property (e.g. office, industrial, warehouse unit)	No. of metering points	Load required per metering point
Substation bldgs for new Road Tunnel	Two	4500 (Refer attached sheet for detail)
		kVA
		kVA
		kVA
		kVA
		kVA

b. Maximum power required (after diversity): 4500 kVA _____ kVA/ kW

Please complete D2.

D2. Will any new street lights be required? Yes No

If known, how many? _____

(if yes please mark the proposed location on the plan that you send to us, in section H)

Section E: Motors/welders or other disturbing loads

- E1. Some types of load can disturb our electricity network. Please provide details of any air conditioning, fuel or heat pumps, lifts, motors, refrigeration, welders or other industrial machinery. If the electrical characteristics are unknown please refer to the manufacturer or the equipment installer.

Please use the following conversions as a guide: **4 amps = 1 kilowatt or 1 kilowatt = 1.1kVA**

Type of appliance (e.g. motor, welder, heat pump, wind turbine)	Rating of appliance	How often will the appliance be started in one hour?	Single or three phase?	Starting method (Star Delta, Direct On Line, Soft start)	Starting current
Motors. (20x 45 kW)	900 kW	1	three phase	Star Delta	350 amps
Motors- Fire Pump (4x220)	880 kW	0.1	three phase	Star Delta	715 amps
Motors - HVAC	60 kW	1	three phase	Star Delta	85 amps
	kW		Please select	Please select	amps

Section F: Diversion works

- F1. If applying for diversion work please provide a full description of the work that you propose to carry out.
- Please detail whether you require the diversion of electricity cables, overhead lines or substations.
 - Please send us detailed plans of your works to allow us to identify the impact on our electricity assets.

- F2. What is the planned start date for your work? _____

Section G: Additional information

Please provide any additional information that you think will help us process your application. For example, any details of land ownership, planning constraints, site hazards or areas of contamination.

The project is a new road tunnel in the East London, called Silvertown tunnel with two bores each with two lanes and 1.4 km long tunnel.

Inside the tunnel main equipment will be Tunnel ventilation fans, drainage pumps, tunnel lighting and various other communication equipment such as CCTV, Lane control signs etc. The equipment inside the tunnel will be served by a substation at each end where 11 kV power supplies would be required.

In accordance with the power supply standards for the road tunnels and critical nature of a tunnel, 11 kV supplies at both locations shall be derived from an independent 132 kV grids, however both the substations will be interlinked to improve reliability of power supplies and shall be capable to supply the whole tunnel. The Substation building also house other equipment which will be built by the Owner. Refer attached Load Schedule and Electrical Schematic drawing for further detail.

As these substations are new built, the post code is not available but attached map shows the location of both the sites.

Section H: Checklist of what to send us

Before you submit your application, please ensure that you have enclosed the following information which will allow us to process your application as quickly as possible:

- 1. Plan showing the site location (an example is shown on page 7)
- 2. Plan showing the site layout (an example is shown on page 7)

Section I: Signature of the Applicant

The applicant must sign this section (the person named in A1).

Signature of applicant:

PROZE

Date: 16/04/2013

Print name: RAKESH OZA

Acting on behalf of company name (from section A1): _____

1. Plan showing the site location

What is this?

A map showing us where your site is so we can accurately assess your requirements.

What should the map show?

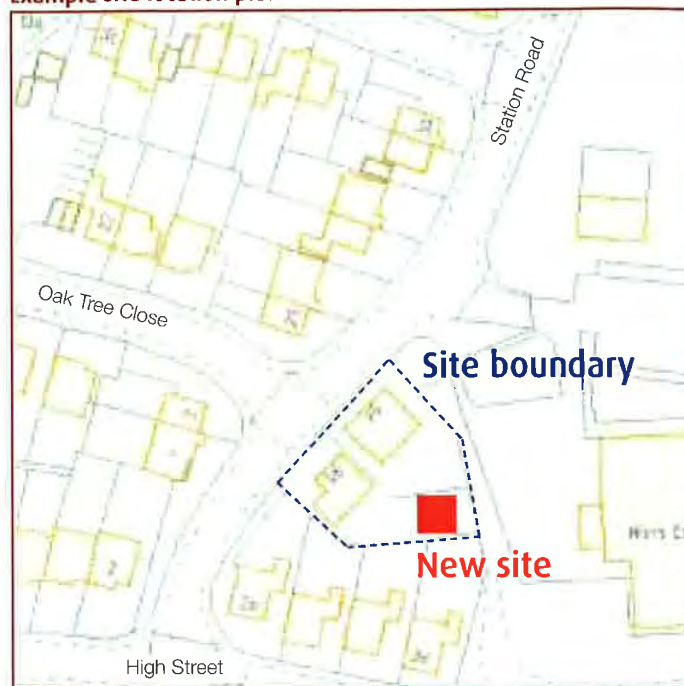
- the site location in relation to the surrounding area
- which roads are closest to the site
- the site boundary

Where to find one

Location plans can be found by using street maps or via internet sites such as:

- Googlemaps
- Ordnance Survey
- Multimap

Example site location plan



2. Plan showing the site layout

What is this?

A scaled plan showing us the layout of the site and the ground floor layout of any buildings. Please make sure you provide us with an appropriate sized plan.

The size we require will depend on the size of your development but it should be no smaller than A3.

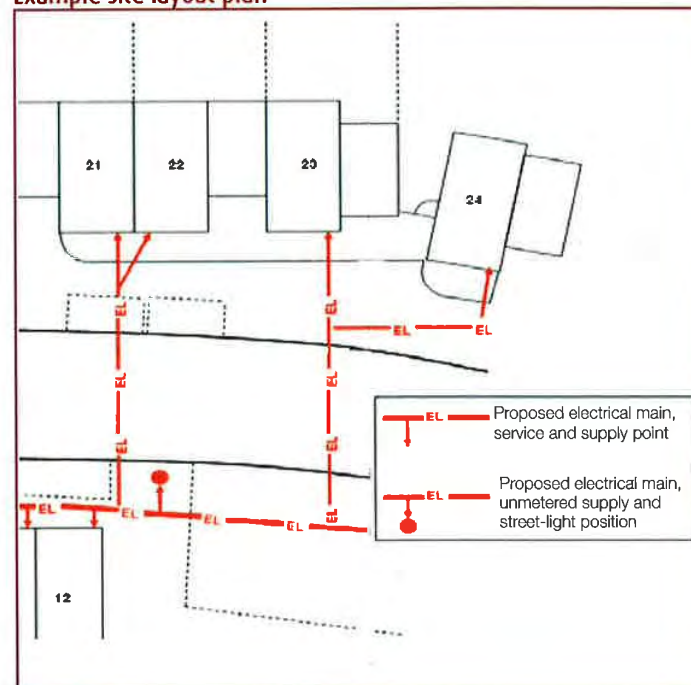
Where to find one

If you have an architect working on your project, they will be able to provide this. If you haven't an architect please send a detailed location plan showing the details (below).

What should the plan show?

- the layout of the development
- any footpaths, roads or access routes
- where you'd prefer the electricity cable entering the building
- your proposed duct and cable route
- any existing service routes (if known)
- where you'd like the electricity meter positioned (internal or external)
- the site boundary
- any buildings that will be demolished
- proposed location of any new street-lights
- depending on your project, there may be a requirement to install a substation on your site. Our design team will discuss this with you in more detail but it would be helpful at this stage if you could indicate a preferred location on a plan.

Example site layout plan



Completing this form accurately will help us deal with your application as quickly as possible. Please complete all sections.

Email the form to us

Clicking this will create a new email and automatically attach your completed form. Please remember to attach the maps asked for in section H.

You can complete this form:

Online

- Download or complete the form at www.ukpowernetworks.co.uk (navigate to Connection Services)
- Email it to connections.projectsgateway@ukpowernetworks.co.uk

By post

- Projects Gateway, UK Power Networks, Metropolitan House, Darkes Lane, Potters Bar, Hertfordshire EN6 1AG
- Fax: 0845 650 0248

Any questions? Call 08701 964 599

Monday to Friday 8.30am to 5pm

UK Power Networks (Operations) Limited
Registered office: Newington House, 237 Southwark Bridge Road, London SE1 6NP
Registered number: 3870728 registered in England and Wales



To see all the details that are visible on the screen, use the Print link next to the map.



Preliminary Tunnel Service Building (PTSB)

To see all the details that are visible on the screen, use the Print link next to the map.



Secondary Tunnel Service Building (STSB).

Calculation – Electrical Load

Silvertown Road Tunnel - Summary of Electrical Load		Connected Load (kW)	Maximum Demand (kVA)	Operating Load (Amps)	25% Spare capacity (kVA)	Proposed Equipment Rating (kVA)
LV Switchboards						
Primary unnel Service Building (PTSB)		3368.50	2497	3604	3121.35	
Secondary Tunnel Service Building (NTSB)		3129.50	1069	1543	1336.36	
UPS - (PTSB)		142.31	142	205	177.89	220
UPS - (STSB)		111.05	111	160	138.82	220
Transformer at STSB South Portal		3511	2639	3810	3299.24	3500
Transformer at NTSB North Portal		3241	1180	1703	1475.18	1500
DG Set (PTSB)			677	978	846.73	1000
DG Set (STSB)			573	827	716.18	1000
Total BSP Load		6751	3820	5513		

400 V., 50Hz. 3 phase & neutral, 4 wire
 TN-C-S Earthing System assumed.
 External Impedance (Ze) to be advised by DNO

Consumer	Location	Qty	Unit Load (kW)	Connected Load (kW) (STSB)	Connected Load (kW) (PTSB)	Diversity	PF	Efficiency (%)	Total load at PTSB (kVA)	Total load at STSB (kVA)	PTSB UPS (kVA)	STSB UPS (kVA)	DG Sizing PTSB	DG Sizing STSB
Jet Fans														
South Tunnel Jet Fans	Tunnel	20.00	45.00	900.00		0.60	0.90	85.00	705.88				352.94	
North Tunnel Jet Fans	Tunnel	20.00	45.00		900.00	0.60	0.90	85.00		705.88				352.94
North Portal Vent Fans	Tunnel	4.00	130.00	520.00			0.90	85.00						
South Portal Vent Fans	Tunnel	4.00	130.00		520.00		0.90	85.00						
Fire Suppression System - Estimated Load														
STSB - Intensifier pumps		1.00	5.50	5.50	5.50	0.90	0.90	89.00	6.18					
STSB - Supply pump 1 & 2		2.00	18.50	37.00	37.00	0.90	0.90	89.00	41.57					
STSB - Sprinkler pump set 1		3.00	216.00	648.00	648.00	0.90	0.90	89.00	728.09					
STSB - Sprinkler pump set 2		2.00	216.00	432.00	432.00	0.90	0.90	89.00	485.39					
STSB Control panels		4.00	0.70	2.80	2.80	0.90	0.90	89.00	3.15					
STSB Control valves		2.00	0.70	1.40	1.40	0.90	0.90	89.00	1.57					
STSB Trace Heating (m)		180.00	0.03	4.50	4.50	0.90	0.90	89.00	5.06					
PTSB - Intensifier pumps		1.00	5.50	5.50	5.50	0.90	0.90	89.00	6.18					
PTSB - Supply pump 3		1.00	18.50	18.50	18.50	0.90	0.90	89.00	20.79					
PTSB Control panels		3.00	0.70	2.10	2.10	0.90	0.90	89.00	2.36					
PTSB Control valves		1.00	0.70	0.70	0.70	0.90	0.90	89.00	0.79					
PTSB Trace Heating (m)		180.00	0.03	4.50	4.50	0.90	0.90	89.00	5.06					
Tunnel Lighting														
EDP01-A/A	CP-16	1.00	50.00		50.00	0.90	0.95	100.00		47.37				
EDP01-A/B	CP-16	1.00	50.00		50.00	0.90	0.95	100.00		47.37				
EDP02-A/A	CP-15	1.00	50.00		50.00	0.90	0.95	100.00		47.37				
EDP02-A/B	CP-15	1.00	40.00		40.00	0.90	0.95	100.00		37.89				
EDP03-A/A	CP-14	1.00	40.00		40.00	0.90	0.95	100.00		37.89				
EDP03-A/B	CP-14	1.00	20.00		20.00	0.90	0.95	100.00		18.95				
EDP04-A/A	CP-13	1.00	20.00		20.00	0.90	0.95	100.00		18.95				
EDP04-A/B	CP-13	1.00	10.00		10.00	0.90	0.95	100.00		9.47				
EDP05-A/A	CP-12	1.00	15.00		15.00	0.90	0.95	100.00		14.21				
EDP05-A/B	CP-12	1.00	15.00		15.00	0.90	0.95	100.00		14.21				
EDP01-B/A	CP-01	1.00	50.00	50.00		0.90	0.95	100.00	47.37					
EDP01-B/B	CP-01	1.00	50.00	50.00		0.90	0.95	100.00	47.37					
EDP02-B/A	CP-02	1.00	50.00	50.00		0.90	0.95	100.00	47.37					
EDP02-B/B	CP-02	1.00	40.00	40.00		0.90	0.95	100.00	37.89					
EDP03-B/A	CP-03	1.00	40.00	40.00		0.90	0.95	100.00	37.89					
EDP03-B/B	CP-03	1.00	20.00	20.00		0.90	0.95	100.00	18.95					
EDP04-B/A	CP-04	1.00	20.00	20.00		0.90	0.95	100.00	18.95					
EDP04-B/B	CP-04	1.00	10.00	10.00		0.90	0.95	100.00	9.47					
EDP05-B/A	CP-05	1.00	15.00	15.00		0.90	0.95	100.00	14.21					
EDP05-B/B	CP-05	1.00	15.00	15.00		0.90	0.95	100.00	14.21					

Mott MacDonald
Mott MacDonald House
8-10 Sydenham Road
Croydon
CR0 2EE

Alison Ashby
Tel: 0870 1964599

Our Ref / LPN / 401303379
Your Ref: 1517606
For Attention Of: Mr Rakesh Oza

Date 19/04/2013

Dear Mr Oza

Re: Silvertown Tunnel Project, Off Dock Road, London, CR0 2EE
Project Reference Number: 401303379

Thank you for your recent enquiry regarding the above project.

Your enquiry has been allocated to our Prelims Team who will work with you to arrange for the development of your electrical design requirements. If you have requested a budget estimate this will normally be provided to you free of charge.

Safety reminder

I would like to take this opportunity to remind you of an important safety issue if you have already started, or intend to start work on site in the near future.

In the interest of safety to personnel, equipment, and UK Power Networks apparatus, it is imperative that the approximate position of the underground cables is established before any excavation is commenced. The positions are to be obtained by the use of electronic cable locators and to then be confirmed by careful trial holing, using hand held tools. UK Power Networks CANNOT UNDERTAKE THIS WORK FOR CONTRACTORS. UK Power Networks Plan Provision team will be able to advise you in this respect and they can be contacted on free phone 0800 056 5866

It will be helpful if you can quote your project reference number on any future correspondence.

If you are applying for a formal offer for a new or upgraded connection, UK Power Networks has an obligation to issue you with a quotation as soon as is reasonably practicable and certainly within three months. This measurement begins as soon as we receive from you all the information necessary to provide you with a formal quotation. It may be reset on the receipt of updated information from you which is likely to affect the quotation. For all other types of enquiry (for example budget estimates) the same obligation does not apply, but we are still committed to providing a high level of service & will respond to your request as quickly as possible.

Yours sincerely

Alison Ashby

Business Support Assistant

G.3. National Grid Transco / Southern Gas Networks (Greenwich Gasholder)

Record of telephone conversation



Project Title Thames River Crossings

Project No 320530

Between	Date	Time
Matthew Hogg	02/05/201	10.40

And (name)	Organisation	Phone No.
Helen	National Grid	0800 688 588

Subject

East Greenwich Gas Holder

Summary

Initial follow up phone call placed to National Grid to enquire about the status and future development plans for the East Greenwich Gas Holder on Blackwall Lane. It was advised that a written response to any emails sent could take up to 20 days to receive.

Action

To	A	I	C	Sign	Date
				MA	02/05/13
Return to					

Record of telephone conversation



Project Title Thames River Crossings

Project No 320530

Between	Date	Time
Matthew Hogg	18/05/2013	13.03

And (name)	Organisation	Phone No.
Lucy Harrison	National Grid	0800 688 588

Subject
East Greenwich Gas Holder

Summary

Follow up phone call placed to National Grid to enquire about the status and future development plans for the East Greenwich Gas Holder on Blackwall Lane. It was agreed that further to a previous email issued on 30.04.2013 Mott MacDonald's query would be fast tracked and information forthcoming shortly.

Action	To	A	I	C	Sign	Date
					M/H	18/05/13
Return to						

Record of telephone conversation



Project Title Thames River Crossings

Project No 320530

Between	Date	Time
Matthew Hogg	24/05/2013	11.00

And (name)	Organisation	Phone No.
Jez Taylor	Jez Taylor	0800 688 588

Subject
East Greenwich Gas Holder

Summary
Follow up phone call placed to National Grid to enquire about the status and future development plans for the East Greenwich Gas Holder on Blackwall Lane. It was agreed that further to previous emails issued on 30.04.2013 and 21.05.2013 Mott MacDonald's query would be fast tracked and information forthcoming shortly.

Action	To	A	I	C	Sign	Date
						MA
Return to						

Record of telephone conversation



Project Title Thames River Crossings

Project No 320530

Between	Date	Time
Matthew Hogg	21/06/201	16.20

And (name)	Organisation	Phone No.
Daniel Clark	SGN	07770730562

Subject
East Greenwich Gas Holder

Summary

Phone call received from Southern Gas Networks local plant engineers regarding the East Greenwich Gas Holder on Blackwall Lane. The local plant engineer and his colleague (Les Phillips) stated that the East Greenwich Gas Holder had recently (since May 2013) been decommissioned and is no longer active. Due to reasons of confidentiality it was explained that the date for dismantling of the gas holder was not freely available at this time although it was of the opinion of the local plant engineers that this would not be occurring until some years ahead.

Action

To	A	I	C	Sign	Date
				<i>MH</i>	21/06/13
Return to					

Hogg, Matthew T

From: Hogg, Matthew T
Sent: 30 April 2013 13:46
To: 'plantprotection@nationalgrid.com'
Subject: BG Transco East Greenwich gas holder station, Blackwall Lane, SE10 OPH
Attachments: Figure 1.pdf

To whom it may concern,

I am currently one of a team undertaking a Phase 1 contaminated land assessment for the Greenwich Peninsula as part of a package of works, on behalf of Transport for London (TfL). In proximity to our study area, an existing gasholder is located, which is recorded under the company name of BG Transco Plc. Although at this stage I am unavailable to provide further details in the way of plans or the nature of any proposed works I have attached a location plan of the gas holder in question to this email.

Could you please provide me with a contact number for a department/member of staff who could answer some questions regarding the gas holder? Ideally, I would like to know the status of the holder (i.e. whether it is still operational) and additionally whether there are any plans to decommission the structure within the coming three years.

Any help you could provide will be much appreciated.

Kind Regards

=====

Matthew Hogg
Contaminated Land Consultant | Environmental Engineering Services

Mott MacDonald Limited

T +44 (0)20 8774 2000
DD + 44 (0)20 8774 2723

This message is from Mott MacDonald Limited, registered in England number 1243967.
Registered office: Mott MacDonald House, 8-10 Sydenham Road, Croydon, Surrey, CR0 2EE, UK

Hogg, Matthew T

From: .box.plantprotection <plantprotection@nationalgrid.com>
Sent: 30 April 2013 13:48
To: Hogg, Matthew T
Subject: *** National Grid Plant Protection - Automated Response ***

Thank you for your email,

Please be assured that your enquiry is very important to us and we will endeavour to contact you within the next 7 working days.

Similarly, if you already know that your planned excavation is within the vicinity of one of our **High or Intermediate Pressure Pipelines** please contact us immediately on 0800 688 588

To help us process your response efficiently please ensure this and future enquires contain all of the below:

- A Clearly Identifiable Plan
- Site Grid Reference or Post Code
- Works Start Date
- Contact Details
- Nature of the Planned Works

Please be aware our e-mail address has now changed to plantprotection@nationalgrid.com

***** This e-mail and any files transmitted with it, are confidential and are intended solely for the use of the individual or entity to whom they are addressed. If you have received this e-mail in error, please reply to this message and let the sender know.

Hogg, Matthew T

From: .box.plantprotection <plantprotection@nationalgrid.com>
Sent: 24 May 2013 09:07
To: Hogg, Matthew T
Cc: Plantlocation@sgn.co.uk
Subject: FW: For the attention of Roy - FW: BG Transco East Greenwich gas holder station, Blackwall Lane, SE10 OPH

Dear Matthew,

Thank you for your enquiry.

The Gas Holder you are enquiring about falls under the jurisdiction of Scotia Gas Networks.

SGN have been copied into this email. For your information their contact details are Plantlocation@sgn.co.uk and 0141 418 4093.

Thanks & Kind Regards

Jez Taylor

Plant Protection Team
plantprotection@nationalgrid.com
Tel: 0800 688 588
National Grid Plant Protection
National Grid, Block 1
Brick Kiln Street
Hinckley
LE10 0NA
One Number One Address (Distribution & Transmission)
For National Grid Transmission Assets Search Free at www.linsearch.org

From: Hogg, Matthew T [<mailto:Matthew.Hogg@mottmac.com>]
Sent: Tuesday, May 21, 2013 10:28 AM
To: .box.plantprotection
Cc: Giordanelli, Dino P
Subject: For the attention of Roy - FW: BG Transco East Greenwich gas holder station, Blackwall Lane, SE10 OPH

Hi Roy,

As discussed, here is the email previously sent regarding East Greenwich Gasholder.

Regards,

=====
Matthew Hogg
Graduate Contaminated Land Consultant | Environmental Engineering Services

Mott MacDonald Limited

T +44 (0)20 8774 2000
DD + 44 (0)20 8774 2723

Hogg, Matthew T

From: DoNotReply <DoNotReply@sgn.co.uk>
Sent: 29 May 2013 08:22
To: Hogg, Matthew T
Subject: Re: East Greenwich gas holder station, Blackwall Lane, SE10 0PH

Please note this is an Auto Reply
(Please do not reply to this e-mail)

Dear Customer

Thank you for your enquiry to Plant Location. Your response will be issued within approximately 20 working days.

To help us provide you with all the information you need to work safely and remove the risk of damage, please ensure you include all the following mandatory information in any enquiry:

- 1 Full contact details (name, company name, address, telephone number and e-mail address).
- 2 Full site address, postcode and easting/northing grid references (eg.E261060/N663363.
- 3 Plan showing a clearly marked site boundary.
- 4 Details of the work to be carried out.
- 5 The proposed start date (please specify if work is at the planning stage).
- 6 If you are a search company, we also require your client's contact information.

If the above information is not supplied we will return your enquiry and ask you to provide all additional details.

Thank you for your cooperation and if you have any questions, please do not hesitate to contact us on 0845 070 3497.

If your enquiry relates to a new connection, an alteration to an existing pipe or meter position, or a disconnection, please email customer.service@sgn.co.uk or call 0845 070 1431 if the work is in Southern England or 0845 070 1432 if the work is in Scotland.

Kind regards

Plant Location Team

The information in this E-Mail is confidential and may be legally privileged. It may not represent the views of the Scotia Gas Networks Group.

It is intended solely for the addressees. Access to this E-Mail by anyone else is unauthorised. If you are not the intended recipient, any disclosure, copying, distribution or any action taken or omitted to be taken in reliance on it, is prohibited and may be unlawful.

Any unauthorised recipient should advise the sender immediately of the error in transmission. Unless specifically stated otherwise, this email (or any attachments to it) is not an offer capable of acceptance or acceptance of an offer and it does not form part of a binding contractual agreement.

Appendix H. Cost Estimate

TfL River Crossings - Engineering Design Proposals Cost Estimating Framework

Guidance Notes

The following notes are provided to assist in the preparation of the various Cost estimates which are to be presented in support of the Engineering Design proposals

The attached Cost Estimate proforma is to be used to present all costs estimates

The format and Work Breakdown structure (WBS) of the Cost Estimate production follows that of the Method of Measurement for Highways Work - published by the Highways Agency

The Consultant should follow the guidelines contained within this document when preparing each cost estimate.

The supporting Tabs for Roadworks and Structures measure are for guidance only. They are not complete and the Consultant should complete to the detail appropriate with the design.

Additional supporting measurement Tabs, for each element of Work, should be added as appropriate for the estimate and its detail. See also below.

The detail and level of measurement should be commensurate with the level of design detail provided. The Client and Consultant shall agree to what level the design and commensurate cost estimate shall be developed.

The Level of Accuracy - commensurate with the level of design - should be stated within the cost estimate
Where different elements may be subject to differing tolerances, this should be stated.

The cost estimate will contain (as a minimum)
- Estimate Summary
- Basis of Estimate (Notes & Information)
- Qualifications, Exclusions & Assumptions.

The cost estimate shall be priced at current day prices - 1st Quarter 2013 - with No Allowance for inflation.

The Cost Estimate Summary shall include items for
- Contractor's Overheads & Profit
- Contractor's Preliminaries
- Engineering & Design Fees - upto and including RIBA Stage G (Tender Documentation)

Items H to M on the Main Summary are for guidance.
The Consultant may suggest allowances for these items for consideration by the Client.

Items N to U will be completed by the Client

The cost estimate Summary shall Exclude any Allowance for Project Risk Contingency - including Price and Design Risks
However the Consultant should advise a recommended Percentage Allowance for Project Risk Contingency

At Feasibility and Optioneering Stages the Client will add an Optimism Bias (OB) to the Project Cost Estimate.
In preparing the cost estimate the Consultant may advise any specific issues which may impact the OB addition.

ESTIMATE SUMMARY SHEET					
Estimate No.	DGG-4	Revision		Level	GRIP 3
Estimate Date	3rd June 2013	Anticipated Start Date	01-Mar-16	Anticipated Finish Date	01-Jul-21
Project /Contract No.					
Project Title / Location	SILVERTOWN CROSSING				
					TOTAL

Section	Code of Account Headings		VALUE	%age of Sub-total D	VALUE
	1	2	£		£
A	Roadworks	General	13,156,194		
		Main carriageways	5,662,821		
		Interchanges			
		Signage & Communication			
		Landscaping			
B	Structures - Bridges, Viaducts, etc	Piling			
		Substructure - Cut and cover and open cut section	95,644,965		
		Substructure - Main & Approach Spans			
		Superstructure			
		Finishings			
C	Structures - Retaining Walls, Culvert, Subways, etc	Main Construction			
		Finishings			
D	Structures - Tunnels	Special prelims			
		Cut & Cover - Main Construction			
		Bored - Main Construction	187,711,709		
		Immersed Tube - Main Construction			
E	Other Works (Inc Utilities)	General			
		Including Utilities	10,527,740		
Base Construction Cost : Sub-Total A			312,703,429	0.00%	-
Other Costs - e.g:			% SAY		
F	Preliminaries & General Items		60,626,017		
G	Design (Assessed as 4% of Base Cost plus prelims and general items)		14,933,178		
H	Testing & Commissioning				
J	Consultancy Charges				
K	Training				
L	Spares				
M	Other				
M1	Contractor's OH&P	10% 10% of Sub-Total A plus F	37,332,945		
M2	Contractors Risk	10% of M1+F+Sub-Total A	41,066,239		
Sub - Total B			153,958,378	0.00%	-
Total Construction Cost C			466,661,807	0.00%	-
OTHER	Client Costs	% SAY			
N	Project Management				
P	Possession / Isolation Management				
R	Compensation charges				
S	TWA Charges				
T	Land / Property Costs				
	Escalation on Contractor's cost plus profit(Excludes Atkin's costs) (As per TIL e-mail dated 29052013)		371,984,525		
U		-1.00%	-		3,719,845
V	Other (State)				
Client Costs			-	0.00%	-
Sub - Total D			462,941,962	0.00%	-
X01	Mean cost from QRA				
PROJECT BUDGET			462,941,962		
X02	Plus contingency @	0%			
FIXED PRICE (If Applicable)					
X03	QRA @ P80	0% as advised by TIL			
AUTHORITY VALUE			462,941,962		

A ROADWORKS					
A1 General					
Series	Section	Qty	Unit	Rate	Amount
200	Site Clearance				
	North				
	Site clearance		item		32,950.00
	South				
	Site clearance		item		51,185.00
	Footbridge Demolition	1	no	531,000.00	531,000.00
300	Fencing				
	None				
400	Road Restraint systems				
	North				
	Safety fencing		item		79,365.00
	Pedestrian guardrail	200	m	238.35	47,670.00
	South				
	Safety fencing		item		118,935.00
	Pedestrian guardrail	200	m	238.35	47,670.00
600	Earthworks				
	North				
	Roadway				
	Excavation of unacceptable material	16,834	m3	8.10	136,355.40
	Excavation of contaminated material	33,077	m3	8.10	267,923.70
	Extra over excavation for excavation in hard material	1,874	m3	67.00	125,558.00
	Deposition of fill material	4,695	m3	2.90	13,615.50
	Compaction of fill material	4,695	m3	2.15	10,094.25
	Disposal of unacceptable material off site	12,139	m3	60.00	728,340.00
	Disposal of contaminated material off site	33,077	m3	120.00	3,969,240.00
	South				
	Roadway				
	Excavation of unacceptable material	39,171	m3	8.10	317,285.10
	Excavation of contaminated material	32,915	m3	8.10	266,611.50
	Extra over excavation for excavation in hard material	1,140	m3	67.00	76,380.00
	Deposition of fill material	7,120	m3	2.90	20,648.00
	Compaction of fill material	7,120	m3	2.15	15,308.00
	Disposal of unacceptable material off site	39,171	m3	60.00	2,350,260.00
	Disposal of contaminated material off site	32,915	m3	120.00	3,949,800.00
Total - Carried to Summary					13,156,194.45

A ROADWORKS					
A2 Carriageways					
Series	Section	Qty	Unit	Rate	Amount
500	<u>Drainage and Service Ducts</u>				
	North				
	Drainage		item		343,330.00
	Ducting		item		34,030.00
	Narrow filter drains		item		61,260.00
	Pumping station package		item		11,800.00
	1200 mm Ø pipes for storage, ave 6 m deep	300	m	605.00	181,500.00
	South				
	Drainage		item		581,280.00
	Ducting		item		67,210.00
	<u>Narrow filter drains</u>		item		61,300.00
	<u>Pumping station package</u>		item		11,800.00
	<u>1200 mm Ø pipes for storage, ave 6 m deep</u>	530	m	605.00	320,650.00
700	Pavements				
	North				
	Type 1 sub-base, 300 mm thick	2,811	m3	39.10	109,910.10
	Bituminous materials		item		541,776.00
	Cold milling, 100 mm deep	2,530	m2	16.60	41,998.00
	Resin bonded HFS in various colours	2,750	m2	21.20	58,300.00
	Carriageway reinstatement		sum		10,000.00
	South				
	Type 1 sub-base, 300 mm thick	1,590	m3	39.10	62,169.00
	Bituminous materials		item		732,250.00
	Cold milling, 100 mm deep	10,880	m2	16.60	180,608.00
	Carriageway reinstatement		sum		20,000.00
	Reinstatement of Millenium Way / Edmund Halley Way		sum		1,960,000.00
1,100	Kerbs, footpaths, edgings				
	North				
	Kerbs and edgings		item		67,700.00
	Footways		item		131,320.00
	<u>South</u>				
	Kerbs		item		72,630.00
Total - Carried to Summary					5,662,821.10

B STRUCTURES - BRIDGES, ETC					
B2 Substructure - End Supports					
Series	Section	Qty	Unit	Rate	Amount
	South				
	Two-lane Overbridge (abutment & deck)	1	item	2,079,650.00	2,079,650.00
	Pedestrian footbridge (all-inclusive)	1	item	2,500,000.00	2,500,000.00
	Retaining Walls		See Tunnelling Section		
1,800	Structural Steelwork				
	North				
	Gantry, 20 - 30 m	1	no	325,110.00	325,110.00
	South				
	Gantry, 10 - 20 m	1	no	235,230.00	235,230.00
	Gantry, 20 - 30 m	1	no	325,110.00	325,110.00
	Gantry, 30 - 40 m	2	no	440,155.00	880,310.00
	Cut and Cover section Silvertown	1	sum	20,644,884	20,644,884
	Retained cut section Silvertown	1	sum	11,273,095	11,273,095
	Cut and Cover section Greenwich	1	sum	28,018,057	28,018,057
	Retained cut section Greenwich	1	sum	10,003,518	10,003,518
	Secondary sub-station	1	sum	2,875,000	2,875,000
	Primary sub-station	1	sum	5,625,000	5,625,000
	Fire Tanks and Pump Room	1	sum	5,860,000	5,860,000
	Vent Station Greenwich	1	sum	2,500,000	2,500,000
	Vent Station Silvertown	1	sum	2,500,000	2,500,000
Total - Carried to Summary					95,644,965

D STRUCTURES - TUNNELS					
D2 Bored - Main Construction					
<u>Series</u>	<u>Section</u>	<u>Qty</u>	<u>Unit</u>	<u>Rate</u>	<u>Amount</u>
6000	TBM Provision	1	sum	30,387,500	30,387,500
	Crane mat and hardstanding for TBM construction.	1	sum	250,000	250,000
6100	TBM Driving Costs				
	<u>METHOD RELATED CHARGES</u>	1	sum	22,492,850	22,492,850
	TBM Driving costs	1	sum	51,607,556	51,607,556
6200	Tunnel Launch & Reception Chambers				
	<u>Secant Pile Launch Chamber</u>	1	sum	6,836,415	6,836,415
	<u>TBM Reception Centre</u>	1	sum	7,336,415	7,336,415
	Earthworks				
	Drainage				
	Concrete work				
	Steelwork				
	Miscellaneous - Retaining Walls		sum		755,000
6300	Tunnel Portal & Head Costs	1	sum	1,482,471	1,482,471
	Earthworks				
	Drainage				
	Concrete work				
	Steelwork				
	Miscellaneous				
6400	Cross Passages	1	sum	5,688,132	5,688,132
	Earthworks				
	Drainage				
	Concrete work				
	Steelwork				
	Miscellaneous sump in cross passage	1	sum	250,000	250,000
6500	Mechanical & Electrical Services	1	sum	49,164,015	49,164,015
	Tunnel infill and road construction	1	sum	12,781,783	12,781,783
	Savings for in-situ concrete walls in lieu of VE panels	1	sum	-1,320,429	-1,320,429
Total - Carried to Summary					187,711,709

E	OTHER WORKS (INCL UTILITIES)					
Series	Section	Qty	Unit	Rate	Amount	
1200	Traffic Signs & Road Markings					
	North					
	Traffic signs and road markings		item		48,255.00	
	Toucan crossing	4	no	30,030.00	120,120.00	
	Traffic signal installation; 3-way with ped phase	2	no	63,700.00	127,400.00	
	South					
	Traffic signs and road markings		item		54,585.00	
1300	Street Lighting					
	North					
	10 m high non-passive lighting column	46	no	2,310.00	106,260.00	
	South					
	10 m high non-passive lighting column	31	no	2,520.00	78,120.00	
3000	Landscaping					
	North					
	Lump sum				45,000.00	
	South					
	Lump sum				45,000.00	
	Utility diversions					
	North					
	Lump sum				2,367,000.00	
	South					
	Lump sum				6,651,000.00	
	Allowance for Accomodation & Facilitation Works					
	Lump sum				885,000.00	
Total - Carried to Summary						10,527,740.00

F Prelims				
	<u>Qty</u>	<u>Unit</u>	<u>Rate</u>	<u>Amount</u>
Series 100: Preliminaries				
<i>General Items Build up or Percentage</i>				
Insurances.bonds	1	sum	17,777,593	17,777,593
Specified requirements	1	sum	1,481,124	1,481,124
Allowance for structural surveys	1	sum	135,000	135,000
Allowance for instrumentation installation.	1	sum	1,000,000	1,000,000
Supervision	1	sum	28,011,600	28,011,600
ALLOWANCE FOR DIVERTING DRAIN	1	sum	10,000,000	10,000,000
North				
Traffic management		item		435,100.00
South				
Traffic management		item		1,185,600.00
Traffic diversion		item		600,000.00
Total - Carried to Summary				60,626,016.69