

TRANSPORT FOR LONDON

SAFET HEALTH AND ENVIRONMENT ASSURANCE COMMITTEE

SUBJECT: SAFETY ASSURANCE FOR THE EAST LONDON LINE

DATE: 14 SEPTEMBER 2009

1 PURPOSE AND DECISION REQUIRED

- 1.1 The Committee at its meeting in March 2009 requested a report providing assurance on the safe management of the East London Line Project and the plans for the safe management of the commencement of operations on the line. This report provides the requested information and the Committee is asked to NOTE the contents.

2 SUMMARY

- 2.1 The East London Line Project (ELLP) is nearing the completion of the first phase of construction, with the scheduled opening of Phase 1 just over 6 months away. The completed project will see a significant extension of the London Overground network capability, and will provide new rail connections to some key areas of the east of London, with associated support to regeneration of the area. The opening up of any new railway requires a detailed approach to ensure a safe railway, during construction, testing and ultimately for passenger operation.
- 2.2 This paper updates one earlier presented to and accepted by SHEC in early 2006. It covers the assurance of the design, construction, test and trial operations and operating phases of the delivered products (infrastructure (including systems), rolling stock and operations), and documents what has been achieved to date.

3 BACKGROUND

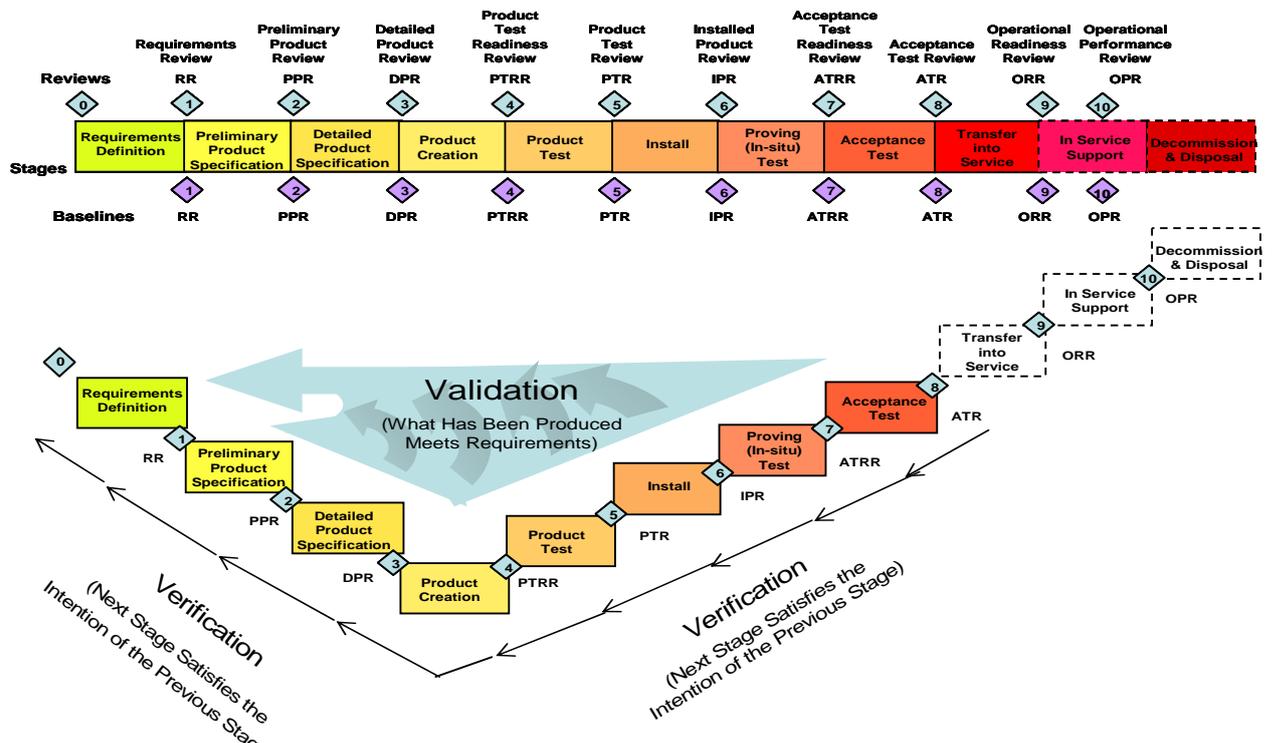
- 3.1 The East London Line Project is in two phases. Phase 1 sees the opening of links from Crystal Palace and West Croydon, through the rebuilt East London Line, and then onto Dalston Junction; this is scheduled to open for passenger service in May 2010. Phase 1a extends the link from Dalston Junction to Highbury and Islington, and this is scheduled for opening in January 2011. This will play an important part in 2012 Olympic transport links. Phase 2 covers the completion of the link from Surrey Quays through to Clapham Junction.
- 3.2 The East London Line Project will be the first new railway that has been brought from design through construction to operation under the stewardship of Transport for London (TfL). The project was begun under the auspices of

the Strategic Rail Authority (SRA), at that time it was expected London Underground would become the Infrastructure Controller. The project was transferred to London Rail in November 2004 with the role (as it became known) of Infrastructure Manager being undertaken by London Overground (from April 2008).

- 3.3 The ELLP project will provide a significant addition to the rail infrastructure covered by the London Overground network. The core route (from New Cross/New Cross Gate to Dalston) adds 14.4 km (28.1 km of track), with 19.6km added in the rest of Phase 1 (running over shared but existing Network Rail tracks) and 11.2 km in Phase 2 (part new/part existing Network Rail tracks). The projected build up of passenger journeys is for 40 million per year from phase 1 and 11 million per year from phase 2, giving 51 million annually by 2016 (some of this will be transfer from existing services such as Southern Railway and some will be modal shift from cars).
- 3.4 It is currently the largest single new construction project in TfL with a budgeted spend of just over £1bn on construction works (track, signals and stations) and £300m on the rolling stock. Phase 1 of the project is nearing the end of the construction work, and entering the test phase, which will run until 18 January 2010. Trial Operations will take place from then until May 2010. London Overground has acted as client for the project.

4 THE APPROACH TO PROJECT ASSURANCE

- 4.1 The ELLP is a complex project. It has therefore been necessary to have very robust procedures to make sure that a safe railway is delivered. At the outset, a conception of the railway was defined, but to turn this into a real running railway required a number of distinct stages. From the concept stage, the next key stage was requirement definition, this entailed reviewing and setting down the requirements to be met for all the components, sub systems and systems that would make up the railway.
- 4.2 From these detailed requirements, detailed design and specification was undertaken to enable construction to commence. Obviously, there is overlap, with some elements in design while others are being constructed. Construction and installation are an obvious focus for attention but they rely on determining the proper requirements and design work. Once installed, the components and system must be tested and system integration assured, before trial operations can commence.
- 4.3 At the time of writing this report, testing has just started. Once trial operations have been successfully completed, the service can begin. There may be further modification but these will occur within the operational railway. Eventually, the railway will be decommissioned and this has been planned for in the design but is not addressed here. The whole approach to validation and verification can be set out in the well known v-cycle diagram, fig 1 below:

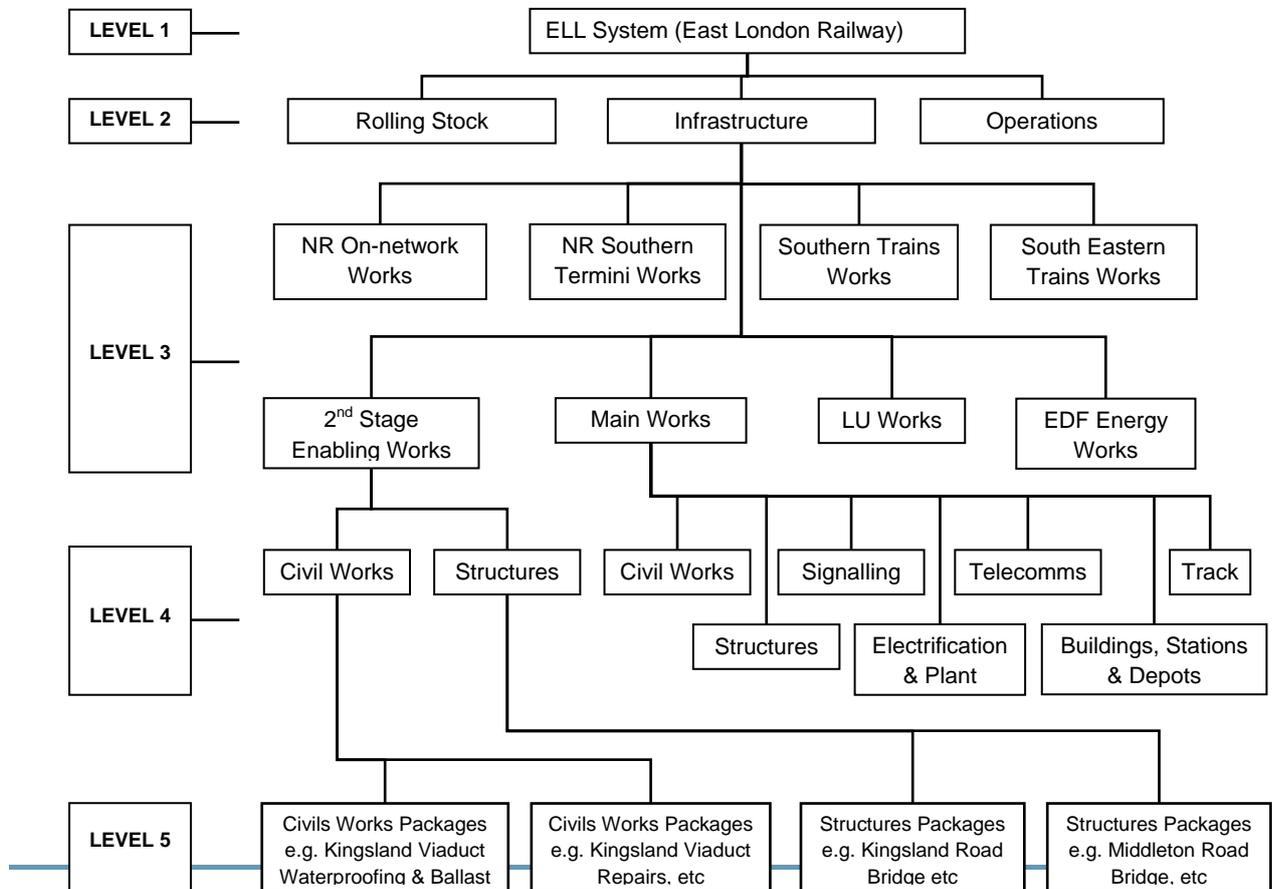


4.4 In the case of the ELLP, while the most significant part for assurance is that covering the new infrastructure, there have been five areas of focus for assurance in all:

- (a) The design and delivery of the new physical railway (that is the track, signals and rolling stock, plus the stations and their associated systems) in accordance with the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS)
- (b) Construction methods and operations
- (c) The methods and successful completion of testing and trial operations to make sure the integrated system operates as intended
- (d) The processes and procedures covering the role of London Overground as Infrastructure Manager in line with ROGS
- (e) The integration of the new railway into the existing service patterns as operated for London Overground by London Overground Rail Operations Limited (LOROL).

4.5 The first element has been assured through the development of a Technical Case. The Technical Case was constructed by aligning a number of sub-cases developed at defined 'levels'. These levels bring together the requirements for the overall system through consideration of sub-systems, modules and components. The overall case was produced by summing these cases. The ELLP has ten stage gates to progress through, to deliver the requirements of Safety, Quality and Environment; Engineering (Functionality, Performance, Reliability, Availability and Maintainability and Operability

(Fitness for Purpose) are delivered in an integrated manner. This approach is called progressive assurance.



4.6 Progressive assurance meant that provided the defined products were assured as built to the requirements, there was no need for a further detailed assurance review at a later stage. There has been risk based reassurance sampling of key elements. Progressive assurance simplifies the overall approach, while maintaining the necessary rigour. This has helped to keep the process both manageable and simple.

4.7 Although the management of safety during construction may not seem as important as the delivery of the final safe system, it was a key part of the approach for ELLP that a safely run site would be a well designed and constructed site; a contractor building something in a safe manner was regarded as more likely to have designed the system to operate safely. Therefore site based assurance of the works was not just of the delivered products but the methods as well.

4.8 The third element was the testing and trial operations. These practical activities confirm that the components and systems operate as intended when all put together and a rigorous test regime has been constructed for this. Once the system has been tested trial operations will be undertaken. At the time of writing, the verification and validation exercises at all levels are well

advanced, with sampling underway as the systems and sub-systems are brought together. Much testing is still required but is on course for trial operations to commence after 18 January 2010.

- 4.9 Turning to the last two elements of the assurance process, a similar approach to requirements capture, standards development and review, process construction and document writing has been required. In this element, there has been the additional focus of the Office of Rail Regulation (ORR), as safety authorisation and safety certification has to be considered by them.
- 4.10 The Safety Authorisation for the role of Infrastructure Manager for London Overground is now well advanced, with the documentation being developed against the ORR guidelines having been submitted and currently awaiting final ORR review. This is expected soon.
- 4.11 Finally, the assurance for the processes, including integration into London Overground Rail Operations Limited's (LOROL) service delivery, has been assured/is being assured through document assessment for the core processes and procedures, table top and trial exercises, including emergency exercises. These activities are at this point still being developed. LOROL of course already have an operator's Safety Certificate.

5 REQUIREMENTS CAPTURE

- 5.1 As noted, the key to the delivery of the progressive assurance model, and in particular the development of the technical case, was the detailing of the legal, regulatory, and standards requirements to be met. The overall approach to the design and construction was as set out in Engineering Safety Management (also known as the Yellow Book) and BS EN 50126 (Railway applications. The specification and demonstration of reliability, availability, maintainability and safety (RAMS)). CENELEC (European Committee for Electro-technical Standardization) and London Underground and Network Rail standards were all referenced. These documents detailed the management system activities, processes and procedures necessary both to manage functional safety in the rail industry and to achieve safety in the delivered product.
- 5.2 The Yellow Book and BS EN 50126 are rail specific, but they essentially prescribe the same types of management systems as standards such as OHSAS 18001 (Occupational health and safety management systems. Specification) and BS 8800 (Occupational health and safety management systems - Guide), which have been used to define the overall safety management systems.
- 5.3 The project has developed safety requirements for all aspects of the project. These have included functional safety targets for the design of the delivered systems, based upon the targets in the Railway Safety Strategic Plan published by the Rail Safety and Standards Board (RSSB), plus operational and process requirements. These requirements have been placed upon the contractors as part of the technical and assurance requirements.

- 5.4 The process documentation, safety authorisation and alignment, and integration with other stakeholders, including LOROL, have made extensive use of the ORR requirements set out in the ORR ROGS guidance and has also included a review of safety authorisations of other related Transport Undertakings. Extensive reference to the operating standards of Network Rail (NR) and London Underground (LU) has also been made.

6 ASSURANCE IN DESIGN AND SPECIFICATION

- 6.1 Once the requirements capture had been completed, design and specification could commence. These elements were assured by ensuring progressively that the design and component specification and proposed methods had been met. This was itself checked by an Independent Technical Adviser.
- 6.2 The project carried out a number of Hazard Identification (HazId) exercises. Any hazards raised have been included in the project's Hazard Log, which linked hazards to the accidents which could arise and the actions which must be undertaken to control and mitigate the hazard and its specific cause. The Hazard Log was actively managed (by a full-time Hazard Log Manager) and was regularly monitored by the Director Overground Infrastructure at both Risk Review meetings and the Project Safety Committee.
- 6.3 Any member of the project team was able to raise hazards for inclusion in the Hazard Log, and still can, as this is another 'living document'. The different stakeholders (The Main Works Contractor (MWC) Balfour Beatty-Carillion Joint Venture (BB-CJV), Bombardier who were providing the new Class 378 rolling stock, LOROL who will drive the trains and manage the stations plus the other contractors) were required to monitor the actions from the Hazard Log which are their responsibility and provide the relevant information to the Hazard Log Manager.
- 6.4 A series of three high level HazId were held and these have recently been updated to cover changes to the project scope. Specific HazId have also been held for the project's control documentation.
- 6.5 Strategy and electromagnetic compatibility workshops have recently been undertaken to look at the interfaces between the two Infrastructure Managers (i.e. London Overground and Network Rail). In addition, the project's contractors have carried out a number of HazId as part of the design process.

7 SAFETY ASSURANCE DURING THE DESIGN AND CONSTRUCTION PHASE

- 7.1 The ELLP adopted the TfL Safety, Health and Environment Policy, signed jointly by Director Overground Operations and Director Overground Infrastructure. This was displayed in all offices and was communicated to all new staff. Following on from the SQE policy the project prepared a Safety Strategy, setting out a co-ordinated approach to safety, treating functional and occupational safety in a single policy, with a single organised safety team.

- 7.2 The Safety Strategy was updated following major changes. Thus, when the project transferred from the Strategic Rail Authority to TfL, and the change from the Railways and Other Transport Systems (Works, Plant and Equipment) Regulations 1994 (ROTS) to the ROGS Regulations occurred, the strategy ensured this was achieved in a planned and effective manner.
- 7.3 Safety assurance during the construction phase was built in from the start. The project prepared a Safety Plan which detailed the activities necessary to ensure safety throughout the project. This 'living document' was regularly updated. It was circulated to major stakeholders for review at each update. In order to support the Safety Plan, the project developed a number of safety procedures which were deployed throughout the project, namely:
- (a) Hazard identification;
 - (b) Hazard management, including the use of a Hazard Log;
 - (c) Safety risk assessment;
 - (d) Control of assumptions;
 - (e) Safety training;
 - (f) Site visits;
 - (g) Competence Management.
- 7.4 The project prepared Pre-tender Health and Safety Plans or Pre-construction Information for each tender, to meet the project's obligations under the Construction (Design and Management) Regulations (CDM). These provide the bidders with all the safety related information known by the project. The project appointed a single CDM Co-ordinator, who oversaw all design, in order to ensure that the different designers were integrated and that hazards were not caused by poor management of interfaces.
- 7.5 Each Contractor prepared a Construction Health and Safety Plan, which was accepted by the ELLP. These 'living documents' were regularly updated. The MWC took overall responsibility for integration of these plans as Principal Contractor.
- 7.6 The competence management system documented the competence held by all staff with safety responsibilities, plus all Engineering staff. This incorporated technical competencies and supplements the TfL competencies and performance management process. The MWC mirrored this in their staff and contractors.
- 7.7 The project measured its performance through Key Performance Indicators (KPIs) which were reported in the project's overall Period End Report and to TfL. BB-CJV has experienced 14 RIDDOR (Reporting of Injuries Diseases and Dangerous Occurrences Regulations) reportable accidents in over 5 million hours to date. Their Accident Frequency Rate is currently 0.19. No

other contractors have experienced RIDDOR reportable accidents. In addition, BB-CJV has experienced two RIDDOR reportable dangerous occurrences, the failure of bridge GE19 end supports and an excavator overturning. Regular Safety Tours and Inspections have been carried out by senior staff of all work sites.

- 7.8 A regular programme of audits was carried out. These have included both internal and supplier audits. All audits were co-ordinated with the project's overall system of audits and results and the progress with completing actions reported to the senior management team. Audits of external suppliers regularly contain reviews of engineering safety, construction safety and CDM as appropriate.
- 7.9 A Security Plan was prepared covering the security of the project team and its offices, the security of the work sites and the security of the designs of stations and trains. Regular liaison has been held between the project and British Transport Police and DfT Transec.
- 7.10 The Safety Management System was regularly reviewed and has been reviewed against the standards as they have been issued, and against the TfL HSE management system and the safety management systems of major stakeholders. Reviews have been held 6-monthly and all such reviews are documented and held in the project's electronic document management system.

8 PRODUCT ASSURANCE UNDER ROGS: OVERGROUND ASSURANCE BOARD

- 8.1 A Safety Approvals Plan was prepared which described how the project was to achieve safety approval from its multiple stakeholders, to ensure the components, sub-systems and systems were delivered and integrated. This was important as during the project some of the key stakeholders changed, and the approach to approvals in the Rail industry also changed. The previous approach (under the Railways and Other Transport Systems (New Works, Plant and Equipment) Regulations 1994 (ROTS) was replaced by the Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS)
- 8.2 The key change under ROGS was that unlike under ROTS, where Her Majesty's Railway Inspectorate (HMRI) would review the new railway prior to bringing it into use, now the responsibility lay with the operator. While this made no difference in the elements of the technical case that needed to be reviewed, it has placed the onus on the project team to provide their own validation and verification process.
- 8.3 The approach adopted has seen the implementation of an independent Overground Assurance Board (OAB), constituted to undertake the role previously adopted by ORR/HMRI. The Safety Approvals Plan detailed how the project would seek acceptance of the infrastructure and rolling stock, and has been developed in consultation with LU, Network Rail, ORR and DfT. The principle is that the OAB will carry out Safety Verification as required by

ROGS and act as the equivalent bodies called up in NR or LU standards and reviews. OAB accepts submissions made to it by the project on behalf of London Overground and London Rail. The OAB has been meeting since January 2009. The terms of reference and membership of the OAB is set out in Annex 1.

8.4 The remit of OAB has been to:

- (a) Review and endorse changes to:
 - (i) Standards;
 - (ii) Operational and Business Management System procedures;
 - (iii) Technical changes to Infrastructure;
 - (iv) LO Infrastructure Manager organisation.
- (b) Carry out Safety Verification as required by the ROGS Regulations;
- (c) Act as the equivalent to Network Rail's Approval Board or LU's DART where called up by Railway Group Standards and Network Rail Company Standards or LU standards adopted by London Overground.

8.5 With respect to assurance of the East London Line Project, the submissions programme for OAB is risk-based, with submissions which provide higher levels of risk to the successful operation of the railway being subjected to higher levels of scrutiny, including independent review where required. The programme is now set in outline and the details are being developed as the products are delivered. To supplement assessment of supporting papers picked on a risk based sample basis, a series of physical track and premises inspections have been undertaken by OAB. These inspections have included HMRI staff, not in their previous role, but as additional eyes and ears.

8.6 The contractors are now in the process of providing the evidence that they have met their safety requirements as part of their Technical Case submissions, and the OAB is undertaking reviews of these.

9 THE ASSURANCE OF THE KEY PROCESS CONTROLS

9.1 London Overground Operations has introduced a Safety Review Panel (SRP) to review and approve all operational rules and procedures for the East London Line. A representative from London Overground Infrastructure attends the SRP to make sure that the appropriate procedures have been developed. Where applicable, existing procedures have been utilised.

9.2 For example, the Class 378 rolling stock has been accepted in accordance with the Railways (Interoperability) Regulations which requires review by an independent Notified Body. Finally, the Class 378 rolling stock has been route accepted onto the infrastructure in accordance with the Network Rail route acceptance process, which included review by an Independent Safety Assessor.

- 9.3 A Safety Risk Model has been developed by the project which builds on the relevant aspects of the RSSB Risk Model and the LU Quantified Risk Assessment model in so far as they relate to the ELL. This model will be used to assess the risks associated with the line going forward, including that safety requirements have been met, and will form the basis for the ongoing safety risk model for the East London Line.

10 THE ASSURANCE OF TESTING AND TRAIL OPERATIONS

- 10.1 The test strategy has been developed over the past year through an integrated team representing Network Rail, LOROL, MWC, Bombardier and the Project. This has meant that the needs of all have been integrated and no issue could become hidden by any party being partial in their delivery. The tests are broken down into Joint Proving Tests, and Stages 1, 2 and 3, culminating in a master test list. This has been independently reviewed by a Test Consultant. The list is now frozen for test but is sufficiently flexible to be amended if these tests show any weakness. The schedule for Trial Operations is still being finalised but follows a similar approach as for testing.
- 10.2 An Emergency Preparedness Plan and Procedure has been developed covering all aspects of Emergency Preparedness on the project. An incident escalation procedure was developed to ensure appropriate members of TfL management will be informed if a major incident occurs. The emergency arrangements will be tested over the next few months, culminating in a live test (Operation Vanguard), which will simulate a derailment on part of the new core route. The emergency services will be fully involved.
- 10.3 The Safety Authorisation submission for London Overground to act as Infrastructure Manager has been submitted to ORR and been commented upon. Safety Authorisation is expected in Quarter 2 2009/10.

11 ENVIRONMENT ASSURANCE

- 11.1 To make sure that the environment was protected as much as possible during construction and is enhanced as the service is brought into operation, an ecology strategy was developed in consultation with key stakeholders. This has assisted in protecting existing habitats and providing new habitats such as the seeded substrate along the Kingsland viaduct to provide foraging areas for species such as the relatively rare Black Redstart. In addition, a colony of commons lizards, a protected species, were also relocated by the Project to prevent them being harmed by the construction works. Ecological enhancements have also been incorporated into the design. These have included, amongst other things, the provision of bird, bat and insect boxes, refugia for reptiles and the development of a sensitive lighting scheme on the bridge carrying the East London Line over the Regent's Canal so that this foraging area for bats was not impacted. As the construction is coming to an end, planting schemes are being developed.
- 11.2 Considerable effort has been made throughout construction to control and reduce noise and while there have been some complaints, the Local Authorities have been positive about our approach. Noise barriers will be

erected in key areas such as the new depot to control operational noise, and specialist track form has been used at sensitive locations to reduce noise and vibration to within the limits agreed with Stakeholders.

- 11.3 The reduction, reuse and re-cycling of construction wastes has seen the MWC divert over 90% of waste from going to landfill.
- 11.4 The project will also see significant regenerative braking, thus further reducing energy take.

12 CONCLUSIONS AND NEXT STEPS

- 12.1 There are still over 6 months to go before the railway can be brought into passenger service. There remains the important period of tests and trial operations yet to be completed. However, the process to date has been well planned and delivered. There are some gaps, for example finalising operating standards, which is being addressed, but these remain in line with the assurance timetables too. We are confident that the delivery into service of a safe and reliable railway will be met to the expected timetable.
- 12.2 It is proposed to provide the Committee with a further update on progress at the Spring meeting.

13 RECOMMENDATIONS

- 13.1 The Committee is asked to NOTE the report.

14 CONTACT

- 14.1 Name: Martin Brown, Director Health, Safety and Environment, London Rail
Email: martinbrown@tfl.gov.uk
Phone: 0207 126 4855

Annex 1: Terms of Reference Overground Assurance Board (OAB)

1. Remit of OAB

The remit of OAB is to endorse decisions and submissions on behalf of Chief Operating Officer (COO) London Rail. Acceptance/approval by OAB will provide Safety Verification on behalf of the Competent Person as required by the Railways and Other Guided Transport Systems (Safety) Regulations (ROGS).

The OAB will review, accept, reject, or give direction as necessary in respect of:

- Assurance submissions from contractors or other third parties proposing, implementing, renewing, upgrading and/or otherwise affecting¹ ELR or other London Overground works²
- Assurance submissions from within London Overground proposing, implementing, renewing upgrading and/or otherwise affecting ELR or other London Overground works
- Safety authorisation or safety certification submissions or updates from relevant Transport Undertakings
- Overdue concession requests against the appropriate Standards
- Proposals for safety significant change including organisational or procedural changes, changes to safety management system³, changes to maintenance regimes⁴ or significant changes to standards or legislation.
- Formal Investigation Reports
- Business plans
- Escalated business critical issues requiring Director level resolution.

In undertaking these functions the members of OAB advise the relevant senior managers present on appropriate actions. The relevant senior managers decide on the action to take.

Detailed reviews will not normally be undertaken by OAB. OAB will receive recommendations for approval/endorsement from other parties in accordance with the Safety Decision Making procedure and the Standards Management procedure.

2. Membership

Given the wide remit of OAB, composition will vary depending on the subject under consideration. The following is the core membership:

- The Director Health, Safety and Environment London Rail as Chair (deputy COO or MD London Rail)
- SQE Manager (or nominated deputy)
- A representative of the IM network operator organisation (Deputy Director of Overground Operations (or empowered deputy))
- A representative of the IM maintenance organisation (Infrastructure Manager Responsible Person (or empowered deputy))

¹ This includes infrastructure protection issues which cannot be resolved via the normal process

² This includes infrastructure, rolling stock and operational changes

³ This includes review of the results of the Management Review process

⁴ This includes review of the Annual Asset Management Plan

- IM Technical Manager (Derek Hill)
- Secretary (Quality Engineer)
- A representative of LOROL (as an observer)
- A representative of the Infrastructure Maintainer (as an observer)

Additional members are included as necessary from the relevant departments. This is determined by the Chair and SQE Manager. The maximum number of members for any meeting shall normally be 12. The meeting is quorate with four members.

3. Chair of Meeting

The meeting will be chaired by the Director Health, Safety and Environment London Rail with COO or MD London Rail as deputies.

4. Secretariat function

Meetings will be held four weekly – with additional meetings as required. The Secretary arranges the dates at the start of the year, will arrange venues as appropriate, and advises all OAB members via e-mail.

The agenda and any associated papers will be issued to all members of the OAB no later than one week prior to the meeting. Papers submitted late will normally not be accepted for inclusion on the agenda unless there are mitigating circumstances (for consideration by the Secretary in discussion with the nominated chair of the meeting). There will be a standard format for OAB papers.

All meeting notes will be published to attendees within one week of the meeting.

Acceptance or approval certificates (where relevant) will be issued within one week of a meeting taking place. These are drafted by the secretary in accordance with the terms agreed at the meeting and signed off by the relevant OAB member.

Items of an urgent nature may be approved by the process of chair review. This typically involves either the Infrastructure Manager Responsible Person or Deputy Director Overground Operations (depending on the subject) reviewing items raised which require urgent action in conjunction with the Chair. Any such decisions will be reviewed and ratified by the next OAB meeting.

5. Action tracking

The Secretary of OAB will maintain records of all meetings and decisions using the data recording and corrective action system (DRACAS) procedure.