Construction Code
(Annex 1 to the EMR)
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Custodian

Simon Phillips

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NOTE

This document is for consultation purposes only and should not be taken to represent the views of any party until such time as it has been finalised.

Notify the Custodian of all errors, omissions and suggested improvements.

This document is approved and authorised for application within Cross London Rail Links Ltd.

Notify the Custodian of all errors, omissions and suggested improvements.

Cross London Rail Links Limited
Portland House
Bressenden Place
LONDON SW1E 5BH

Tel: 020 3023 9100
Fax: 020 3023 9101

www.crossrail.co.uk

Contents

1 INTRODUCTION

1.1 GENERAL

1.1.1 Crossrail will provide a railway system from Maidenhead and Heathrow in the west through central London to Shenfield and Abbey Wood in the east. The project consists of new tunnels and stations on an east-west alignment under central London and the modification of existing National Rail infrastructure to the east and west of central London.

1.1.2 In order for the project to proceed it is expected that one or more nominated undertakers will be appointed to implement Crossrail. Subsequent references to the nominated undertaker will be deemed to cover one or more organisations in this role. The nominated undertaker will be responsible for ensuring that the relevant provisions of this Code are observed by bodies exercising its functions, including any of its contractors and sub-contractors.

1.1.3 The Secretary of State will require the nominated undertaker to adhere to the arrangements provided in the Environmental Minimum Requirements in designing and constructing the Crossrail Works. Accordingly, it is expected that the Secretary of State will take steps to ensure that any nominated undertaker complies with this Code and is responsible for ensuring that the relevant provisions of this Code are observed by bodies exercising its functions, including any of its contractors and sub-contractors. The following provisions of this Code should be read accordingly.

1.1.4 The Code forms part of the Environmental Minimum Requirements for the Crossrail Works. The Environmental Minimum Requirements cover a number of issues related to the design and construction of Crossrail and its environmental impacts.

1.1.5 "Construction" in the Code includes all site preparation (including site investigation and remediation, where appropriate), demolition, material delivery, excavated material disposal, waste removal and all related engineering and construction activities.

1.1.6 The nominated undertaker will hold discussions with local authorities and other statutory agencies in advance of submissions for approval.

1.1.7 Changes in industry standards will be regularly reviewed during the development of Crossrail and the principles of BS EN ISO14001 will be adopted for the management review of changing standards.

1.1.8 Unless a piece of legislation will be expressly or impliedly disapplied or modified by the Crossrail Act it will continue to apply as normal to the

design and construction of Crossrail. For example, waste management licences or discharge consents will still be required.

1.1.9 Where necessary, generic construction mitigation measures identified within the Environmental Statement have been transferred into the Construction Code to ensure environmental impacts are controlled.

1.2 GENERAL REFERENCES

Crossrail Act
Crossrail Construction Mitigation Measures- Appendix B1 to Environment Statement (Volume 6a)
BS EN ISO14001 - Environmental Management Systems

2 GENERAL PRINCIPLES

2.1 CONSTRUCTION STRATEGY

2.1.1 A construction strategy has been developed with the following objectives:

(a) to meet the requirements of all relevant statutory legislation, codes of practice and standards;
(b) to limit adverse impacts upon local communities and the environment so far as reasonably practicable;
(c) to carry out the planning and delivery of the project in the most cost effective manner;
(d) to limit impacts on the operations of Network Rail, London Underground and other rail companies;
(e) to implement a community liaison plan including a complaints help-line and an independently appointed Complaints Commissioner;
(f) to remove, where reasonably practicable, excavated material by rail and water transport and import construction materials by rail;
(g) to implement a green travel plan for construction workers; and
(h) to co-operate with adjacent projects as far as practicable to reduce the combined impacts.

2.2 ENVIRONMENTAL PRINCIPLES

2.2.1 The nominated undertaker will develop and implement an environmental policy and an Environmental Management System (EMS) for the project.

2.2.2 The Secretary of State or the nominated undertaker (as relevant) will review environmental performance in the selection process for tenderers and will require tenderers for the main construction contracts to have an EMS which is consistent with the principles of BS EN ISO14001 before being included on tender lists.

2.3 HEALTH AND SAFETY PRINCIPLES

2.3.1 The nominated undertaker will be committed to ensuring the health, safety and welfare of its employees and people who may be affected by the conduct of its undertaking.

2.3.2 The nominated undertaker will establish appropriate industry standards for health and safety and will seek continuous improvement in safety performance, in accordance with the principles of HSG65 "Successful health and safety management", published by the Health & Safety Executive.

2.3.3 The nominated undertaker will ensure that adequate arrangements are in place for the discharge of its duties as client and designer under the Construction (Design & Management) Regulations 2007 (CDM). The nominated undertaker will assess the competence and resources for

health and safety of organisations appointed as other dutyholders under CDM, and will monitor compliance with discharge of its own and others' CDM duties throughout the project.

2.3.4 The nominated undertaker will develop a health and safety management system in accordance with the principles of OHSAS 18001 "Occupational health and safety management systems". This system will include documentation defining the nominated undertaker's internal arrangements for managing health and safety on the project and the specific requirements for health and safety applying to all designers and contractors appointed to work on the project.

2.3.5 The nominated undertaker will require that all contractors, appointed to carry out design or construction work on the Crossrail project, produce a Health and Safety Plan, defining how their work and associated risks to health and safety will be managed.

2.3.6 The nominated undertaker's arrangements for health and safety will include a system for management of risks. This will require all hazards to be identified, and suitable and sufficient assessments made of the risk, followed by adoption of appropriate measures to eliminate the risk or to control the risk, so far as is reasonably practicable. Where risks to the public are involved, these will be reduced to as low as reasonably practicable, and will be managed in accordance with the guidance in HSG151 "Protecting the Public" published by the Health & Safety Executive.

2.3.7 The nominated undertaker will continuously monitor the work of contractors and will conduct a programme of audits and inspections to ensure compliance with the requirements of this Code and other project health and safety requirements.

2.4 ENVIRONMENTAL MANAGEMENT PLAN

2.4.1 This Code requires the production of a number of Environmental Management Plans (EMPs). These plans will set out how the project will deliver the environmental requirements and how environmental issues that arise are handled to ensure compliance with relevant legislation and regulations and in accordance with the nominated undertaker's environmental policies. The EMPs will be discussed with relevant qualifying local planning authorities (or highway and traffic authorities for Traffic Management Plans) and in preparing the EMPs the nominated undertaker will take into account their observations.

2.4.2 The plans will define the approach to address all environmental issues. The plans will set out how the nominated undertaker intends to operate the construction and work sites and will set out the specific control measures necessary to deliver the requirements of the Code.

2.4.3 The nominated undertaker will produce EMPs to cover the works authorised by the Crossrail Act and they will be appropriate to the scale and nature of work along the route of Crossrail. Where appropriate an EMP will be produced as a single document covering all of the environmental issues for a particular worksite or worksites and also, where appropriate, grouping a number of worksites together within a single EMP.

2.4.4 The range of issues which will be covered by the EMPs, as appropriate for the various locations/worksites, is as follows:

(a) area management plan, providing general details of implementation, including working hours, site layout and site appearance;
(b) emergency plan, including pollution incident controls;
(c) community liaison plan;
(d) lorry and traffic management plans;
(e) green travel plan;
(f) noise and vibration management plan;
(g) dust management plan;
(h) lighting management plan;
(i) site waste management plan;
(j) ecological management plan; and
(k) water management plan.

Health & safety plans will also be produced and they would be issued to the local authorities for information on request.

2.4.5 It is envisaged that some or all of the Environmental Management Plans may need to be updated, in consultation with any relevant qualifying authorities, as the detailed design of the works is developed.

2.4.6 In addition, the Environmental Memorandum identifies a number of environmentally sensitive sites. Environmental Management Plans for these sensitive sites will be produced in accordance with the provisions set out in that document.

2.5 SITE MANAGEMENT

General

2.5.1 It is expected that contractual arrangements will require all Crossrail contractors to provide suitably qualified staff to manage and execute works in which they are involved.

2.5.2 The nominated undertaker will require that all contractors have an appropriate awareness and working knowledge of the legislation, codes of practice and guidance relevant to the various construction activities. Contractors should have an awareness and working knowledge of

environmental legislation relevant to the construction activities in which they are engaged.

Training and Competence

2.5.3 The nominated undertaker will require contractors to employ an appropriately qualified workforce, which may include holding a card from an appropriate recognised competence scheme, such as the Construction Skills Certification Scheme or the Personal Track Safety scheme for railways. The nominated undertaker will require Contractors to operate induction schemes for all personnel to ensure that they are aware of their individual responsibility to comply with the Code.

2.5.4 The Contractor will be responsible for identifying the training needs of his personnel to ensure that appropriate training is provided. The training will include "toolbox talks" for site operatives to maintain an appropriate level of awareness on health, safety, community relations and environmental topics and to advise employees of changing circumstances as work progresses. Records will be kept of attendance.

2.6 COMMUNITY RELATIONS

2.6.1 The nominated undertaker and contractors will be committed to providing community relations personnel, who will be focussed on engaging with the community to provide appropriate information and to be the first line of response to resolve issues of concern. The nominated undertaker will take reasonable steps to engage with residents of ethnic minority backgrounds and residents with disabilities (or other priority groups as appropriate), who may be differentially affected by construction impacts.

2.6.2 A Complaints Commissioner will be appointed for Crossrail. He will be employed by the Secretary of State on behalf of the High Level Forum. The High Level Forum will determine the precise terms of reference.

2.6.3 The nominated undertaker will ensure that occupiers of nearby properties will be informed in advance of works taking place, including the estimated duration. In the case of work required in response to an emergency, the LA and local residents shall be advised as soon as reasonably practicable that emergency work is taking place. Potentially affected occupiers will also be notified of the Helpline number, which will operate 24 hours per day, 7 days per week. One or more information centres will be provided at appropriate locations along the route.

2.6.4 The nominated undertaker will develop a Community Relations Strategy which will include the following responsibilities:

(a) monitor contractor and subcontractor compliance with undertakings and performance against commitments, local

agreements and specific community requirements throughout the project;

(b) maintain regular communication to ensure that the community and other stakeholders and affected parties are kept well informed. The contractors will be required to produce information sheets of the works to be carried out, detailing expected disruptions and the measures being taken to minimise or mitigate adverse impacts of these works, as far as reasonably practicable at least two weeks prior to construction activity taking place. A liaison plan will be issued in advance to local authorities detailing the information to be supplied;

(c) as far as tunnel boring is concerned, the nominated undertaker will be required to establish a website that will provide information on the forecast and actual passage of the tunnel boring machines. In addition, the nominated undertaker will be required to distribute leaflets along the route of the tunnel drives giving notice of the forecast passage of the tunnel boring machines;

(d) respond quickly to emergencies, complaints or other contacts made via the helpdesk or any other recognised means;

(e) liaise closely with the emergency services, local authority officers and other agencies (based on established contacts) who may be involved in incidents or emergency situations;

(f) liaise with appropriate local community projects, employment and educational initiatives;

(g) ensure that a comprehensive community emergency plan is put in place for each section of the work. This will ensure that in the case of a major emergency, the community can be kept fully informed and will ensure that adequate arrangements are in place for the evacuation of an affected area if necessary;

(h) provide a point of contact for a small claims procedure, relating to claims of physical damage to property, or minor injuries. The nominated undertaker would assist in enabling claims to be progressed promptly in liaison with an administrator appointed by them; and

(i) co-ordinate the carrying out of pre-construction defect surveys in properties which have been identified as potentially being affected by tunnelling operations and other identified works. Liaise with the independent building surveyor employed to carry out the surveys to maintain a dialogue between the nominated undertaker and property owners throughout the duration of the works.

2.6.5 The nominated undertaker will contractually require all contractors to comply with the obligations to be placed on contractors under the Construction Community Relations Strategy Framework as finally formulated by the Promoter.

2.6.6 The nominated undertaker will maintain and advertise a telephone helpline staffed 24 hours per day to handle enquiries regarding construction activities from the general public. It will also act as a first

point of contact and information in the case of any emergency. All calls will be logged, together with the responses given and the callers' concerns actioned and a response provided promptly. The helpline will be widely advertised and displayed on site signboards. It will also be possible to contact the helpline service via the Crossrail website. Statistical information on complaints would be sent to local authorities and the Planning Forum on a regular basis.

2.7 APPROVALS PROCESS

2.7.1 The Crossrail Act sets out the mechanism by which approval for specific consents relating to Crossrail will be obtained from the local planning authorities. The nominated undertaker will establish a project approval process to ensure that all appropriate approvals and clearances are obtained before a specific element of the works is started.

2.8 WORKS TO THE NATIONAL RAIL NETWORK

2.8.1 Access to the national rail network for maintenance, renewals and other construction activities is subject to a detailed regime (set out in the Network Code) which is administered by Network Rail. These restrictions of access are referred as possessions or, in the case with very long durations, blockades. Except in emergencies, these possessions and blockades must be planned and booked well in advance, and normally take place at times which limit disruption to railway users. Accordingly, these works usually take place at weekends, public holidays and overnight. Network Rail also has requirements regarding the manner in which works are carried out. Crossrail Works on the national rail network will be carried out in accordance with the detailed requirements of the Network Code (including working hours) which limit disruption. The environmental statement was completed on this basis.

2.8.2 Network Rail may decide to combine works required for Crossrail with their own enhancement, renewal and maintenance activities to use railway possessions and blockades efficiently.

For works being carried out at existing stations where no possession of the network is required, a separate access regime would apply (the Stations Code). It is possible that some of these can be carried out during core working hours provided that these do not prejudice ongoing safe operations and operational requirements.

2.8.3 Similarly, works undertaken in respect of utilities on the national rail network or at stations would be subject to the Network Rail's normal processes as described above.

2.9 REFERENCES

Construction (Design & Management) Regulations 2007 (CDM).
OHSAS 18001: Occupational health and safety management systems.

HSG151: Protecting the Public - published by the Health & Safety Executive. HSG65: Successful health and safety management, published by the Health & Safety Executive.
BS EN ISO14001 - Environmental Management Systems.

3 GENERAL SITE OPERATIONS

3.1 CONSTRUCTION PROCESS

3.1.1 The construction of Crossrail will extend across London and beyond and require works at about 100 work sites. Crossrail is a major construction project and will involve many different types of construction activities. These activities will include: demolition; site clearance; site investigation; remediation; tunnelling; piling; excavation; services diversion and new installations; bridge works; highway works; below ground and surface building works; new and alteration of railway track works; railway signalling, electrification and communication works; fit out; and provision of new trains and train maintenance facilities.

3.2 WORKING HOURS

3.2.1 The nominated undertaker will obtain consents from the relevant local authority under the Control of Pollution Act 1974, Section 61 (which will include noise limits and vibration limits where relevant) for the proposed construction works, as set out in section 5.1 below. The applications for consent will include details of the work to be undertaken, including proposed hours of work. All construction activities carried out on site, whether in core hours or on a 24 hour basis, will be agreed with the local authorities through the Section 61 process. All of the arrangements for working hours may be varied by agreement with the relevant local authority. The right to appeal against a withholding of consent or against conditions subject to which it is given is retained, and references to agreement are to be so construed.

3.2.2 Core working hours will be from 0800 to 1800 on weekdays and 0800 to 1300 on Saturday. Only non-disturbing preparatory work, repairs or maintenance will normally be carried out on Saturday afternoons or Sundays between 0900 and 1700. The nominated undertaker will adhere to these core working hours for each site as far as reasonably practicable and where feasible, operations anticipated to cause disturbance would be limited to these hours. Except in the case of emergency, any work required to be undertaken on a Sunday on sites without 24 hour activity will be agreed with the local authority in advance. There are certain exceptions to the core working hours, which are described below.

3.2.3 In order to maintain the above working hours, the nominated undertaker will require a period of up to one hour before and up to one hour after core working hours for start up and close down of activities. The activities to be undertaken during this period may include: deliveries to and from site; loading; unloading; arrival and departure of workforce and staff at site and movement to and from place of work; general refuelling; site inspections and safety checks prior to commencing work; site meetings; site clean up; site maintenance; and maintenance and checking

of plant and machinery, but not including operation of plant or machinery giving rise to noise likely to exceed the noise trigger levels for the periods either side of the agreed core working hours as set out in the Crossrail Noise and Vibration Mitigation Scheme. The start up and close down periods are not to be considered an extension of core working hours, and particular care will be taken to limit and control disturbance to local residents during such periods. The nominated undertaker will, as far as reasonably practicable, arrange for deliveries in the start up period to take place close to the end of that period and in the close down period close to the start of that period.

3.2.4 All construction related traffic serving the Crossrail work sites will abide by the agreed hours of working for each specific location. These hours will cover the timing of deliveries, off-loading and loading from the public highway. Deliveries, other than abnormal loads, will not take place outside the core working hours and the start up and close down periods without the prior agreement of the local authority, specifically through the Environment Health Department, or as otherwise advised by the local authority. Vehicles awaiting loading or offloading will not leave engines running when not directly in use unless prior agreement has been sought.

3.2.5 From sites where works are not undertaken on a 24 hour basis, excavated material will only be removed by road during core working hours.

3.2.6 The following activities will normally be undertaken on a 24 hour per day, 7 day per week basis:

a) tunnelling works together with directly associated activities (such as maintenance of tunnelling equipment, construction of cross passages and installation of tunnel linings);
b) delivery of materials, consumables and plant to the tunnel face from the drive portal or access shaft and for tunnel fit out by train from tunnel logistics sites at Aldersbrook and Old Oak Common.
c) transportation, storage and removal of excavated material by conveyor, barge and rail;
d) track laying and internal fit out works within the stations, shafts and tunnels (including construction of the track bed and cable laying).
e) operation and maintenance of items of plant and equipment needed in order to safeguard and support the works, such as fans, compressors, generators and batching plant. Any such equipment will be shielded in order to provide appropriate noise attenuation (this is covered further in section 5.3);
f) Staff may also be required to collect data and samples outside normal working hours; and
g) surface support to the underground work, including welfare facilities, cranage, workshops and stores.

3.2.7 Where the nominated undertaker can demonstrate that overall progress would be significantly affected by not being able to remove excavated

material outside of the core working hours, then additional hours for the removal of excavated material would be agreed with the local authority. The nominated undertaker would expect the agreement of the local authority not to be unreasonably withheld.

3.2.8 In order to safeguard the works it may be necessary for certain items of plant and equipment to be kept running 24 hours per day, which would include pumps and generators. Any such equipment will be shielded in order to provide appropriate noise attenuation. Staff may be required to collect data and samples outside core working hours at times.

3.2.9 Certain works requiring temporary possession of roads and railways for safety or operational requirements, to limit disruption to road and railway users and the travelling public, and works in connection with utilities when demand is low will need to be undertaken outside core working hours. This will include Saturday afternoon, night-time, Sunday and/or bank holiday working from time to time. On occasion longer term possessions (in excess of one week) will be required for more major works.

3.2.10 In the case of work required in response to an emergency or which if not completed would be unsafe or harmful to the permanent works, the relevant local authority will be informed as soon as reasonably practicable of the reasons for, and likely duration of, the works. The local authority will provide a telephone number and nominate an office to receive such notification, which will be reviewed regularly. Examples of the type of work envisaged would include where pouring concrete takes longer than planned due to equipment failure or where unexpected poor ground conditions, encountered whist excavating, require immediate stabilisation.

3.2.11 Where work has to be rescheduled for reasons not envisaged and is expected to extend beyond the agreed or core working hours or exceed the agreed limits and dispensation to the Section 61 consent, the nominated undertaker will apply for a variation to the section 61 consent to the relevant local authority at least 14 days in advance of the start of those works.

3.2.12 Where rescheduling relates to work of a critical nature for reasons not envisaged and beyond the control of the nominated undertaker (such as key activities likely to delay other key activities) applications will be made where practicable at least 48 hours in advance and at least 7 days in advance if the work is expected to last for a period of 5 days or more. The variation will be sought by means of an application setting out the revised construction programme or method and the relevant noise calculations.

3.2.13 Where such working outside core hours has been discussed and accepted (as in 3.2.12 above) nearby occupiers who are likely to be affected by the

works will be informed as soon as reasonably practicable by the nominated undertaker about the nature and likely duration of the works.

3.2.14 Deliveries will be arranged to minimise impacts on the road system so far as reasonably practicable. Abnormal and special loads may be delivered outside core working hours subject to the requirements and approval of the relevant authorities.

3.2.15 Where reference is made above to seeking local authority agreement then an application will be made under the Control of Pollution Act 1974, Section 61, as detailed in 3.2.1 above.

3.2.16 In relation to works on the national rail network and existing stations, please also refer to section 2.7.

3.3 SITE LAYOUT AND FACILITIES

3.3.1 The nominated undertaker will ensure, as far as reasonably practicable and appropriate, that the site layout and appearance will be designed using the following principles:

(a) sites at prominent locations will be screened;
(b) all sites will be fully secured;
(c) existing features will screen the sites where appropriate;
(d) storage sites, fixed plant and machinery equipment and temporary offices will be located to limit environmental impacts, as far as reasonably practicable, and having due regard to neighbouring accommodation, as far as allowed by the constraints of each site;
(e) site lighting will be located and directed so as not to intrude into occupied residential properties, on sensitive areas or constitute a road or rail hazard;
(f) security cameras will be sited and directed so that they do not intrude into occupied residential properties; and
(g) site plant and facilities will be powered from mains electrical sources.

3.3.2 The nominated undertaker will ensure, as far as reasonably practicable, that the visual intrusion of construction sites on nearby residents and users of local facilities and amenities is contained and limited. The nominated undertaker will ensure that, where appropriate, construction activities will be screened to protect nature conservation sites and the amenity value of recreational facilities.

3.3.3 The nominated undertaker will display a contact name, telephone number and address, and the Helpline number at appropriate locations on the boundaries of the sites.

3.3.4 The type of hoarding or fencing used will vary from location to location but will accord with the following principles:

(a) the standard hoarding will be 2.4 m minimum height, plywood faced, timber framed hoarding suitably painted;
(b) the hoarding will be increased in height and possibly altered in form to enhance acoustic performance for specific locations ;
(c) a 1.8 m high chainlink fencing may be used at more remote locations;
(d) suitable measures will be used for tree protection (see Chapter 10);
(e) where reasonably practicable existing walls, fences, hedges and earth banks will be retained;
(f) notices will be displayed on all site boundaries, where appropriate, to warn of hazards on site such as deep excavations, construction access, etc;
(g) appropriate sight lines/visibility splays will be maintained to ensure safety of both vehicles and pedestrians is preserved; and
(h) temporary fences may be used in certain areas, such as for short term occupation of sites or at more remote locations.

3.3.5 The extent and height of hoarding or fencing at a particular location will be selected to maintain effective security and achieve appropriate noise attenuation and visual screening.

3.3.6 Hoarding will be painted and may include a Crossrail Logo and/or that of the nominated undertaker. Hoarding will be maintained in good condition.

3.3.7 All vehicle access and egress points will have gates positioned such that no gate will be permitted to open out onto the highway. As far as reasonably practicable, gates will be located to allow vehicles to drive clear of any public highway. Where provided for noise control, gates will be of a similar material and construction to the boundary in which they are situated and will be closed except when being used for access.

3.3.8 The nominated undertaker will promote and enforce a "good housekeeping" policy on all the construction sites to ensure that clean, tidy and safe sites are provided. Arrangements will be implemented to provide effective preventative pest control and prompt treatment of any pest infestation.

3.3.9 The nominated undertaker will ensure that appropriate welfare facilities are provided at all major sites. The facilities will include canteens, toilets, showers, locker rooms and first aid posts. The facilities will be connected to mains services and drainage, where reasonably practicable.

3.4 SITE LIGHTING

3.4.1 Site lighting and signage will be provided to ensure the safety and security of the construction sites and will be at the minimum luminosity necessary. Where appropriate, lighting to site boundaries will be provided and illumination will be sufficient to provide a safe route for the passing public. In particular, precautions will be taken to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas.

3.4.2 Appropriate industry standard procedures will be implemented at all construction sites for site lighting. Lighting will also be designed, positioned and directed so as not to unnecessarily intrude on adjacent buildings, wildlife sites and land uses and so as to prevent unnecessary interference with local residents, railway operations, passing motorists, or the navigation lights for air or water traffic. This provision will apply particularly to sites where night working will be required. In addition, at construction sites where potentially significant impacts are identified, a lighting management plan will be prepared and implemented.

3.4.3 The lighting will be designed to comply with the provisions of BS5489, Code of Practice for the Design of Road Lighting, where applicable. Further guidance is contained within Guidance Notes for the Reduction of Light Pollution, 2000, published by the Institute of Lighting Engineers.

3.5 EMERGENCY PLANNING AND RESPONSE

Emergency Procedures

3.5.1 The nominated undertaker will ensure that emergency procedures for each work site are developed. The procedures will be standardised as far as practicable across the various work sites and will be appropriate to the anticipated hazards and the specific layout. The emergency procedure will include emergency pollution control measures that will take into account Environment Agency (EA) guidelines. The emergency procedures will be produced in consultation with the emergency services and for works on the existing railway network will be produced in accordance with established industry procedures. Further guidance is contained within Guidance on Development of a Site Clearance Capability in England and Wales, published by ODPM in October 2005 and BS6164 2001, Code of practice for tunnelling in the construction industry.

3.5.2 The emergency procedure will contain emergency phone numbers and the method of notifying local authorities and statutory authorities. Contact numbers for the key staff of the nominated undertaker will also be included.

Emergency Access

3.5.3 The nominated undertaker will ensure that the requirements of the London Fire and Emergency Planning Authority (LFEPA) or other relevant fire authority will be followed for the provision of site access points. Where appropriate, the accesses will be designed to the requirements of LFEPA Publication: Fire Safety Guidance Note Number 29 "Access for Fire Appliances". The accesses may vary over time and will also be suitable for ambulances.

3.6 FIRE PREVENTION AND CONTROL

3.6.1 All construction sites & associated accommodation or welfare facilities will have in place appropriate plans and management controls to prevent fires. The site fire plans will be prepared and will have due regard to the following documents:

(a) Fire Prevention on Construction Sites (Joint Code of Practice on the Protection from Fire of Construction Sites & Buildings Undergoing Renovation)
(b) Fire Safety in Construction Work (HSG 168)

3.6.2 During project planning and design development, the nominated undertaker will look to reduce fire risk and potential fire load during construction, operation and subsequently during maintenance or repair. The specification of non-combustible materials, products and packaging will be pursued wherever reasonably practicable. The project will also have to comply with any third party requirements as may be appropriate at specific sites, such as those of London Underground or Network Rail.

3.7 WORKSITE SECURITY

3.7.1 The nominated undertaker will maintain a 24-hour helpline during construction. Signage will be provided on site hoardings to inform the public of the helpline number for reporting security incidents or concerns. The nominated undertaker will follow up security incidents and concerns reported and will arrange implementation of further measures required.

3.7.2 Construction worksites will be under the control of a principal contractor who has a statutory duty to prevent unauthorized access to the site. The nominated undertaker will require its principal contractors to carry out site specific assessments of the security and trespass risk at each site and implement appropriate control measures.

3.7.3 Control measures may include:

(a) use of high plywood hoardings at site perimeters, with any hoarded pedestrian routes designed to avoid creating hiding places (temporary fences may be used in certain areas, such as for short term occupation of sites or at more remote locations);
(b) site lighting at site perimeters where required to provide a well-lit route for the passing public, eg to avoid shadows cast by the site hoarding on surrounding footpaths, roads and amenity areas;
(c) 24-hour security guard coverage to main worksites, with patrols of site and perimeter areas, and site gates manned at all times during work hours and closed and locked when there is no site activity;
(d) closed-circuit television (CCTV) and infrared surveillance and alarm systems where required;
(e) special security measures for worksites at risk of trespass by children, including communications initiatives to local schools to

warn of dangers, and involving schools in response to incidents involving their pupils;

(f) consultation with local crime prevention officers to agree security proposals for each site and to identify any security problems at particular sites (for eg security-sensitive central London sites), with regular liaison to review security effectiveness and response to incidents; and

(g) immobilization of plant out of hours, removing or securing hazardous materials from site, securing fuel storage containers and preventing unauthorised use of scaffolding by enclosing base of scaffolding and removing ladders when work is not in progress, and locking access equipment.

3.7.4 Where construction work is carried out within operational railway stations or infrastructure, security arrangements will be discussed and agreed with the organization in control of the premises, being London Underground, Network Rail, the Docklands Light Railway or the train operating company as appropriate. Security surveillance, monitoring and incident reporting will be managed in conjunction with the station or infrastructure control organization concerned.

3.7.5 Security control measures within operational railway property will be established in accordance with established rail industry procedures and in consultation with the emergency services.

3.8 CRANES

3.8.1 Crane arcs will be confined within the site boundary unless agreed otherwise with the local authority and property owners/occupiers whose air space is affected. The nominated undertaker will obtain the relevant permissions from the appropriate authority for cranes located adjacent to railways, roads or rivers. Cranes will be operated in accordance with the requirements of BS 7171, Code of Practice for Safe Use of Cranes.

3.8.2 Any necessary approvals for cranes located at sites close to airports will be obtained from the CAA or the airport operator, as appropriate, before installation.

3.9 PUBLIC UTILITIES

3.9.1 Where changes in utility infrastructure cannot reasonably be avoided, the nominated undertaker will agree arrangements with the owner of the equipment to be relocated either temporarily or permanently outside the area of the Crossrail works. In some instances the apparatus may be surplus to requirements and can be decommissioned.

3.9.2 Wherever practicable, when the work is carried out the new equipment will be installed and commissioned before the existing infrastructure is disconnected but there may be circumstances where a period of disconnection will be essential to allow safe completion of the work. In

these circumstances, the nominated undertaken would agree appropriate arrangements (such as planned night-time or weekend closures) with the relevant utility operator.

3.9.3 The nominated undertaker will endeavour to identify and protect all utility plant and equipment reasonably expected to be materially adversely affected by the Crossrail works. On a site specific basis, this will include preliminary site investigations during the design phase to confirm the extent and exact location of underground infrastructure to confirm the accuracy of existing records. Even with these precautions, there is a risk that unrecorded infrastructure will be encountered unexpectedly, in a city as densely developed as London. Before starting construction the nominated undertaking will establish procedures with the utility operators for the management and mitigation of unforeseen events.

3.10 UNEXPLODED ORDNANCE

3.10.1 Where appropriate a risk assessment will be completed by the nominated undertaker for the possibility of unexploded ordnance being found on the various sites and a response process will be included in the emergency procedures. An emergency response procedure will be prepared and implemented to respond to unexploded ordnance

3.11 ELECTROMAGNETIC INTERFERENCE

3.11.1 The nominated undertaker will consider the impacts of electromagnetic interference on wireless telecommunication systems during the design and construction of Crossrail, which will include site specific impacts from the demolition of buildings and the installation of tower cranes, and where appropriate will employ best practice technology to ensure that levels of RFI associated with Crossrail are low and at acceptable levels.

3.12 GREEN TRAVEL PLAN

3.12.1 The nominated undertaker will produce a green travel plan for the project. The plan will be developed to encourage the use of public transport by project staff. Means to control nuisance "fly-parking" will also be included as part of the scheme.

3.13 CONSTRUCTION CAMPS

3.13.1 The nominated undertaker will ensure that where workers temporary living accommodation is provided, it is confined to specific areas approved by the local authority and managed in accordance with a scheme to be agreed with them. Such temporary living accommodation should comply with the standards adopted by the local environmental health authority as if the site required a license under the Caravan Sites and Control of Development Act 1960.

3.14 REINSTATEMENT

3.14.1 Crossrail worksites will be reinstated to pre-existing conditions or as otherwise agreed with the landowner and in accordance with the requirements of the Crossrail Act. For planting on railway land, all vegetation removed will, as far as reasonably practicable, be replaced with equivalent planting in line with operational requirements and Network Rail standards. See section 4.5 for highway reinstatement.

3.15 REFERENCES

BS5489-1: 2003 – Code of practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas.
Guidance Notes for the Reduction of Light Pollution, 2000, published by the Institute of Lighting Engineers.
BS 7171, Code of Practice for Safe Use of Cranes.
LFEPA Fire Safety Guidance Note Number 29 – Access for Fire Appliances
Fire Prevention on Construction Sites – Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation published by the Construction Federation and the Fire Protection Association.
HSG 168: Fire Safety in Construction Work published by the Health & Safety Executive.
Guidance on Development of a Site Clearance Capability in England and Wales, published by ODPM in October 2005.
BS6164 2001, Code of practice for tunnelling in the construction industry.

4 PUBLIC ACCESS AND HIGHWAY

4.1 GENERAL REQUIREMENTS

4.1.1 The nominated undertaker will ensure that legal requirements (including any modified by or arising under the Crossrail Act) for works affecting highways are implemented and undertake the works in such a way as to maintain, as far as reasonably practicable, existing public access routes and rights of way during construction. Alternative signposted routeing will be provided where required and feasible.

4.1.2 The nominated undertaker will endeavour to carry out the works to limit undue inconvenience to the public arising from increased traffic flows and disruptive impacts of construction traffic, as far as reasonably practicable.

4.1.3 The Crossrail Act will include provisions for stopping up and diversion of highways, together with protective provisions for highway authorities.

4.2 TRAFFIC MANAGEMENT PLAN & LORRY MANAGEMENT PLAN

4.2.1 Lorry Management Plans (LMP) will be produced in support of request for approvals to qualifying local planning authorities covering lorry routeing under Schedule 7 to the Crossrail Act. These will include as appropriate:

- local routes to be used by lorries generated by construction activity;
- lorry holding areas;
- lorry route signing strategy;
- means of monitoring lorry use and any routes prohibited from use.

4.2.2 Prior to the commencement of the works, Traffic Management Plans (TMPs) will be produced in consultation with highway and traffic authorities and the emergency services and in accordance with section 2.4 covering EMPs.

The TMP(s) will include, as appropriate:

- site boundaries and the main access/egress points for the worksites;
- temporary and permanent closures and diversions of highways and public rights of way;
- the proposed traffic management strategy.

Other authorities which are qualifying local planning authorities for the purposes of Schedule 7 to the Act will be consulted on LMPs and TMPs and would be invited to traffic liaison meetings relating to their areas.

4.2.3 Once contractors have been appointed, regular traffic liaison meetings will be arranged with highway authorities and the Police, bus operators (taxi trade representation as appropriate) and other emergency services as

appropriate. These meetings will provide an opportunity for contractors to present proposals for future works affecting the highway including methods of construction and proposed programme and for a review of the associated traffic management requirements. The objective will be to achieve concurrence on a scheme prior to a formal submission to the relevant highway authority under the Act.

4.2.4 The planning of the works will include consideration of the access and servicing requirements of affected residential and commercial premises. The nominated undertaker will require the contractor to undertake regular communication with parties affected by the works. Local residents and businesses will be informed in advance of the dates and durations of closures and will be provided with details of diversion routes at least two weeks in advance or when final details are available. Access and servicing will be maintained as far as reasonably practicable, within the constraints of the works and the need to ensure the safety of the public.

4.2.5 Some traffic management proposals may require Traffic Regulation Orders under the Road Traffic Regulation Act 1984 to cover measures such as the introduction of one-way streets, banned turns, temporary speed limits and the suspension of parking places. These will be discussed at the liaison meetings and applications for these Orders will be made to the relevant traffic authority.

4.3 WORKS AFFECTING HIGHWAYS AND PUBLIC RIGHTS OF WAY

4.3.1 The nominated undertaker or any contractor will comply with the requirements detailed in Schedule 3 and Part 1 of Schedule 17 of the Crossrail Act before commencing works that will involve interference with a highway or public right of way. All necessary consents and licences will be obtained in advance.

4.3.2 All temporary closures of highways and public rights of way will be for as short a time as reasonably practicable. Pedestrian access to premises will be maintained.

4.3.3 As far as reasonably practicable, diverted rights of way will be provided prior to the commencement of the relevant parts of the works and will be maintained to a comparable standard of those that they replace. Suitable signage and barriers will be provided.

4.3.4 Local residents and businesses will be informed in advance of the dates and durations of closures and will be provided with details of diversion routes a minimum of two weeks in advance, or when final details are available.

4.4 ROAD CLEANLINESS

4.4.1 All reasonably practicable measures will be put in place to avoid/limit and mitigate the deposition of mud and other debris on the highway.

These measures will have regard to the nature and the use of the site and could include:

a) hardstanding at the access and egress points which will be cleaned at appropriate intervals;

b) vehicle wash down points to clean vehicle wheels at each exit point on to the highway;

c) the correct loading of vehicles and sheeting of loads where necessary to avoid spillage during their journeys;

d) the use of mechanical road sweepers combined with water sprays for the suppression of dust to clean site hardstandings, roads and footpaths in the vicinity of the site; and

e) the flushing of gullies in the vicinity of the site.

4.4.2 After completion of any works affecting a highway, all surplus materials arising from the works will be cleared from the highway, leaving it in a clean and tidy condition in accordance with the reasonable requirements of the highway authority.

4.5 HIGHWAY REINSTATEMENT

4.5.1 Where temporary alterations to the highway are required, the highway will be restored to the reasonable satisfaction of the local highway authority.

4.5.2 Surveys will be used to establish the condition of the highway prior to the commencement and after the completion of Crossrail's works, in consultation with the highway authority. The locations where surveys will be undertaken will be identified in the Traffic Management Plan. The highway authority will be notified of surveys and may send a representative if they wish.

4.6 LORRY CONTROLS

4.6.1 Approval of local routes to be used by construction lorries will be sought in accordance with the requirements of any Act and associated procedures resulting from the Act (refer to Schedule 7 of the Act).

4.6.2 As far as reasonably practicable, there will be no parking of lorries on the highway in the vicinity of any worksite except in specified holding areas for lorries waiting to deliver or remove materials from the site.

4.6.3 An appropriate control system will be implemented for the dispatch of all vehicles containing excavated material, demolition materials or other waste material. Waste will be controlled and deposited in accordance with relevant legislation.

4.6.4 Signs will be displayed in a prominent position on vehicles on public roads which are dedicated to the Crossrail project. The signs will uniquely identify the vehicle to Crossrail.

4.7 ACCESS FOR PEOPLE WITH REDUCED MOBILITY DURING CONSTRUCTION

4.7.1 The nominated undertaker will, where reasonably practicable, ensure that people with reduced mobility (PRM) and those with other forms of disability as specified in the Disability Discrimination Act 1995, continue to have access to services and buildings where existing access and services are temporarily disrupted during the Crossrail construction works.

4.7.2 Where the normal means of access has to be diverted or blocked off, alternative safe routes for persons with restricted mobility will be identified, taking into account existing hazards and obstructions such as pavement kerbs and street lighting standards (poles).

4.7.3 Where particular difficulties are identified, arrangements will be made on a site by site basis.

4.8 REFERENCES

Transport Act 1968
Highways Act 1980
Road Traffic Regulation Act 1984
Road Traffic Act 1988
New Roads and Street Works Act 1991
Traffic Management Act 2004
Disability Discrimination Act 1995
BS 7121: Code of Practice for the Safe Use of Cranes.

5 NOISE AND VIBRATION

5.1 GENERAL

5.1.1 The nominated undertaker will, as far as reasonably practicable, seek to control and limit noise and vibration levels so that affected properties and other sensitive receptors are protected from excessive noise and vibration levels associated with construction activities. The nominated undertaker will apply Best Practicable Means (BPM), as defined under Section 72 of the Control of Pollution Act (CoPA) 1974, to all activities.

5.1.2 The nominated undertaker will obtain consents under the Control of Pollution Act 1974, Section 61 (which will include noise limits and vibration limits where relevant) for the proposed construction works. Site specific management and mitigation requirements for noise and vibration, both on and off-site, will be defined in the Section 61 consents. The nominated undertaker may agree with the local authority that, for certain activities not anticipated to be noise sensitive such as site investigation and site set up, a Section 61 will not be necessary.

5.1.3 The Crossrail Noise and Vibration Mitigation Scheme has been published which defines trigger levels for noise insulation and temporary rehousing. The requirements of this scheme form part of the register of undertakings and assurances and hence are enforceable as part of the Environmental Minimum Requirements (see section 3 of the general principles).

5.2 PROCEDURES

Monitoring

5.2.1 The nominated undertaker will undertake appropriate monitoring as agreed in advance with the relevant local authority.

5.2.2 The results of any noise and vibration monitoring will be made available, as required, to relevant local authorities. Access to the sites will be facilitated at all reasonable times for inspection and/or noise measurements by the local authority environmental health personnel, following appropriate site specific induction and/or health and safety training.

5.3 SPECIFIC PROVISIONS

Selection and Use of Equipment

5.3.1 The nominated undertaker will require that that each item of plant used on the project complies with the noise limits quoted in the relevant European Commission Directive 2000/14/EC/United Kingdom Statutory Instrument (SI) 2001/1701.

5.3.2 The nominated undertaker will adopt the recommendations set out in Annex B of Part 1 of BS 5228 and Sections 7.3 and 9.2 of Part 4 of BS 5228 with regard to noise and vibration mitigation options. Where alternative authoritative guidance and procedures are thought to be more reasonable and have been agreed in advance with the relevant local authority, these may be adopted in place of the aforementioned.

5.3.3 Plant and equipment liable to create noise and/or vibration whilst in operation will, as far as reasonably practicable, be located away from sensitive receptors. The use of barriers to absorb and/or deflect noise away from noise sensitive areas will be employed where required and reasonably practicable.

5.3.4 All plant, equipment and noise control measures applied to plant and equipment shall be maintained in good and efficient working order and operated such that noise emissions are minimised as far as reasonably practicable. As far as reasonably practicable, any plant, equipment or items fitted with noise control equipment found to be defective will not be operated until repaired.

5.3.5 Where reasonably practicable, fixed items of construction plant should be electrically powered in preference to diesel or petrol driven.

5.3.6 Vehicles and mechanical plant employed for any activity associated with the construction works will, where reasonably practicable, be fitted with effective exhaust silencers and shall be maintained in good working order and operated in a manner such that noise emissions are controlled and limited as far as reasonably practicable.

5.3.7 Machines in intermittent use should be shut down or throttled down to a minimum during periods between work. Static noise emitting equipment operating continuously will be housed within suitable acoustic enclosure, where appropriate.

5.3.8 For underground activities, the following measures will be adopted, where reasonably practicable and appropriate:

Conveyor

(a) The mounting for conveyors used to remove excavated material from the tunnel face will be designed and installed so as to mitigate the transmission of groundborne noise and vibration to buildings above the tunnel.;
(b) A maintenance programme will be implemented to ensure that the noise generation of the conveyor does not deteriorate over time.
(c) The surface conveyor systems will be of a similar standard to underground conveyors and will be acoustically enclosed where they run through or adjacent to noise sensitive areas. They too will be the subject of a maintenance programme. (Note: the conveyor will be covered throughout its length to prevent material spillage.)

Temporary Construction Railway

(a) The alignment, jointing and mounting of the temporary construction railway will be installed, maintained and operated in a manner so as to minimise the transmission of vibration and groundborne noise from the passage of rail vehicles.
(b) All diesel locomotives will be fitted with efficient exhaust silencers.

Temporary Tunnel Ventilation

(a) All tunnel ventilation plant with connections to the atmosphere in any noise-sensitive location will be subject to mitigation measures appropriate to its local environment.

Notifications

5.3.9 Occupiers of nearby properties shall be informed in advance of the works taking place, including the duration and likely noise and vibration impacts. In the case of work required in response to an emergency, the LA and local residents shall be advised as soon as reasonably practicable that emergency work is taking place. Potentially affected residents will also be notified of the Helpline number.

Provision of Noise Insulation or Temporary Rehousing

5.3.10 The nominated undertaker will comply with the Crossrail Noise and Vibration Scheme for the provision of noise insulation or temporary rehousing.

5.4 REVERSING ALARMS

5.4.1 The nominated undertaker will, as far as reasonably practicable, ensure that the noise from reversing alarms is controlled and limited. This will be managed through the following hierarchy of techniques:

(a) the site layout will be designed to limit and where reasonably practicable, avoid the need for the reversing of vehicles. The nominated undertaker will seek to ensure that drivers are familiar with the worksite layout;
(b) banksmen will be utilised to avoid, as far as reasonably practicable, the use of reversing alarms;
(c) reversing alarms incorporating one of more of the features listed below or any other comparable system will be used where reasonably practicable;
    i) highly directional sounders;
    ii) use of broadband signals;
    iii) self adjusting output sounders; and
    iv) flashing warning lights
(d) reversing alarms will be set to the minimum output noise level required for health and safety compliance.

5.5 REFERENCES

Control of Pollution Act 1974
BS5228: Noise control on construction and open sites:
Part 1 (1997) Code of Practice for basic information and procedures for noise control.
Part 2 (1997) Guide to legislation for noise control applicable to construction and demolition, including road construction and maintenance.
Part 4 (1992) Code of Practice for noise and vibration control applicable to piling operations.
BS6472: 1992 Evaluation of human exposure of vibration in buildings (1Hz to 80 Hz)
BS7385 Evaluation and measurement for vibration in buildings:
Part 1: 1990 Guide for measurements of vibrations and evaluation of their effects on buildings.
Part 2: 1993 Guide to damage levels from groundborne vibration.
SI 2001/1701: The Noise Emission in the Environment by Equipment for use Outdoors Regulations 2001 (EC Directive 2000/14/EC)
SI 1985/1968: The Construction Plant and Equipment (Harmonisation of Noise Emission Standards) Regulations.
The Crossrail Noise and Vibration Mitigation Scheme (Information Paper D9, Noise and Vibration Mitigation Scheme).

6 AIR QUALITY

6.1 BACKGROUND

6.1.1 The nominated undertaker will, as far as reasonably practicable, seek to control and limit emissions to the atmosphere in terms of gaseous and particulate pollutants from vehicles and plant used on the site and dust from construction activities. The nominated undertaker will identify potential sources and apply appropriate control techniques.

6.2 *VEHICLE AND PLANT EMISSIONS*

6.2.1 The nominated undertaker will ensure that the adverse impacts of vehicle and plant emissions are controlled. Measures to be considered for limiting emissions and avoiding nuisance will include one or more of the following as appropriate and as far as reasonably practicable:

(a) ensuring that the engines of all vehicles and plant on site are not left running unnecessarily;
(b) using low emission vehicles and plant fitted with catalysts, diesel particulate filters or similar devices;
(c) using ultra low sulphur fuels in plant and vehicles;
(d) requiring that plant will be well maintained, with routine servicing of plant and vehicles to be completed in accordance with the manufacturers recommendations and records maintained for the work undertaken;
(e) requiring that all project vehicle, including off-road vehicles, will hold current MOT certificates, where required due to the age of the vehicle, (or to be tested to an equivalent standard) and that they will comply with exhaust emission regulations for their class;
(f) siting haul routes and operate plant away from potential receptors such as houses, schools and hospitals;
(g) avoiding the use of diesel or petrol powered generators and using mains electricity or battery powered equipment;
(h) maximising energy efficiency (this may include using alternative modes of transport, maximising vehicle utilisation by ensuring full loading and efficient routing); and
(i) all commercial road vehicles used in construction must meet the European Emission Standards pursuant to the EC Directive 98/69/EC (commonly known as Euro standards) of Euro 3 during any works.

6.3 DUST

General

6.3.1 The nominated undertaker will comply with the provisions of the Health and Safety at Work Act 1974, the Environmental Protection Act 1990, the

Environment Act 1995 and the Clean Air Act 1993, and the regulations made thereunder, including the Control of Substances Hazardous to Health Regulations (SI 2002/2677).

6.3.2 The nominated undertaker will recognise that the duration of operations and the proximity of receptors cannot be significantly altered since the location and other site criteria will be dictated by issues such as availability of land, spatial requirements of the project and techniques available for specific construction activities. The nominated undertaker will require that measures to reduce the impact of dust are designed and implemented in an appropriate and timely manner.

Dust Control

6.3.3 The nominated undertaker will ensure that dust management plans will be prepared and implemented for each worksite, including controls to limit dust emissions. Three levels of control for dust impacts are planned, with the standard level, Tier 1, as the minimum that will be implemented on any site. A risk-based approach will be used to identify construction sites with potential to generate significant quantities of dust near sensitive receptors and which require additional levels of control, Tier 2 or 3. The nominated undertaker will employ techniques detailed in the following paragraphs. The techniques are cumulative, which means that for Tier 3 control, all of the techniques from Tiers 1 to 3 will be required. These techniques are in line with the Greater London Authority 'The Control of Dust and Emissions from Construction and Demolition; Best Practice Guidance (2006) and the Building Research Establishments publication 'Controlling particles, vapour and noise pollution from construction sites' (2003), which will be used as a references for dust control on site.

6.3.4 Emergency control arrangements will be adopted in the event of a pollution incident arising from dust. This will include appropriate liaison with the Local Authority EHO.

Standard Dust Control Procedures on Sites with a Low Risk of Dust Emissions (Tier 1)

6.3.5 The standard dust control procedures, Tier 1, will include, as appropriate, site controls to:

(a) ensure no burning of waste materials takes place on site;
(b) ensure an adequate water supply on the site;
(c) ensure disposal of run-off water from dust suppression activities, in accordance with the appropriate legal requirements;
(d) maintain all dust control equipment in good condition and record maintenance activities;
(e) keep site fencing, barriers and scaffolding clean using wet methods;
(f) provide easily cleaned hardstanding for vehicles;
(g) ensure regular cleaning of hardstandings using wet sweeping methods;

(h) not allow dry sweeping of large areas;
(i) provide and ensure the use of wheel-wash facilities near the site exit wherever there is a potential for carrying dust or mud off the site;
(j) fit wheel-washes with rumble grids to dislodge accumulated dust and mud prior to leaving the site wherever there is a potential for carrying dust or mud off the site and where reasonably practicable;
(k) ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits;
(l) install hard surfaced long term haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned;
(m) inspect haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable;
(n) record all inspections of haul routes and any subsequent action in a site log book which may be in hard or electronic format;
(o) ensure that un-surfaced haul routes and work areas are regularly damped down in dry conditions;
(p) routinely clean public roads and access routes using wet sweeping methods;
(q) ensure vehicles working on site have exhausts positioned such that the risk of re-suspension of ground dust is minimised (exhausts should preferably point upwards), where reasonably practicable;
(r) impose and signpost maximum speed limits of 5 mph on un-surfaced haul routes and work areas and 10 mph on surfaced haul routes and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
(s) ensure all vehicles carrying loose or potentially dusty material to or from the site are fully sheeted;
(t) ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery;
(u) mix large quantities of cement, bentonite, grouts and other similar materials in designated areas which will be enclosed or shielded;
(v) store materials with the potential to produce dust away from site boundaries where reasonably practicable;
(w) ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out;
(x) minimise the amount of excavated material held on site;
(y) sheet, seal or damp down unavoidable stockpiles of excavated material held on site, where required;
(z) avoid double handling of material wherever reasonably practicable;
(aa) ensure water suppression is used during demolition operations;
(bb) ensure that any crushing or grinding plant used on the site, which falls within the definition in Section 3.5 Chapter 3 of the Pollution Prevention and Control (England and Wales) Regulations 2000 SI

1973, has an appropriate permit issued and is maintained according to the procedures set out in the Pollution, Prevention and Control Act 1999;

(cc) ensure that any plant, identified above, is operated in accordance with the conditions set out in the permit and a copy of the permit is held on site;

(dd) use enclosed rubble chutes and conveyors where reasonably practicable or use water to suppress dust emissions from such equipment;

(ee) always use enclosed conveyors where crossing roads, other public areas and property which is not in the ownership or control of the nominated undertaker;

(ff) sheet or otherwise enclose loaded bins and skips;

(gg) minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate;

(hh) seal or re-vegetate completed earthworks as soon as reasonably practicable after completion;

(ii) use design/prefabrication to reduce the need for grinding, sawing and cutting on site wherever reasonably practicable;

(jj) only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction;

(kk) carry out site inspections regularly to monitor compliance with dust control procedures set out above and record the results of the inspections, including nil returns, in the log book detailed;

(ll) increase the frequency of site inspections when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; and

(mm) record any exceptional incidents causing dust episodes on or off the site and the action taken to resolve the situation in the log book detailed in above.

Enhanced Dust Control Procedures on Sites with a Medium or High Risk of Dust Emissions (Tier 2)

6.3.6 Where a site has been identified as having a medium or high risk of emissions of dust due to the proximity of receptors, the type of activity on site or the duration of operations, a higher standard of dust control will be required. The dust control procedures adopted for Tier 2 will include the appropriate controls listed under Tier 1 in addition to those set out below for Tier 2. Alternatives may be proposed to suit specific circumstance providing the resulting control is at least as effective as that arrived at using the specified measures.

6.3.7 The enhanced dust control procedures, Tier 2, will include, as appropriate, site controls to:

(a) strip insides of buildings, as far as reasonably practicable, before demolition;

(b) bag and remove biological debris (such as birds nests and droppings) or damp down such material prior to demolition;
(c) wherever reasonably practicable, retain walls and windows while the rest of the building is demolished to provide a screen against dust;
(d) screen buildings, where dust producing activities are taking place, with debris screens or sheeting;
(e) avoid carrying out earthworks during dry weather if reasonably practicable having regard to programme and contracting arrangements for the relevant works or provide and ensure appropriate use of water sprays to control dust;
(f) seed or seal medium or long term excavated material and soil stockpiles;
(g) ensure slopes on stockpiles are no steeper than the natural angle of repose of the material and maintain a smooth profile;
(h) ensure equipment is readily available on site to clean any spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods;
(i) ensure mixing of cement, bentonite, grout and other similar materials takes place in enclosed areas remote from site boundaries and potential receptors;
(j) where appropriate use increased hoarding height to protect receptors; and
(k) consider full enclosure of sites or specific operations where there is a high potential for dust production and the site is active for an extensive period.

Advanced Dust Control Procedures on Sites with a High Risk of Dust Emissions (Tier 3)

6.3.8 Where a site has been identified as having a high risk of dust emissions due to the proximity of receptors, the type of activity on site or the duration of operations, the highest standard of dust control reasonably achievable will be adopted. In these cases all the techniques set out above will be employed and will include additional measures to control the high risk. This will include having personnel on site to monitor and manage dust emissions. Techniques such as total enclosure of certain operations to protect vulnerable receptors would be implemented where appropriate. The measures will be proportionate to the risk and will be site specific.

Dust Monitoring Strategy

6.3.9 The nominated undertaker will ensure that where appropriate dust monitoring will be carried out on Crossrail construction sites, during construction, at medium and high-risk sites. A risk-based approach will be used to identify the type of dust monitoring to be used at each worksite by looking at the details of the specific packages of work within the site boundaries. The assessment will look at the dust raising potential of construction activities (as defined in Table 2-4, Volume 1, Crossrail

Assessment of Atmospheric Emissions and Air Quality Impacts; Technical Report), proximity to potential receptors and the duration of construction activities at each location.

6.3.10 Where sites have a risk score that assigns them to the low risk category no dust monitoring will be carried out. Where sites have a risk score that is in the medium risk category passive deposition monitoring techniques (glass slides/Frisbee gauges / sticky pads) will be adopted at appropriate locations (site boundaries/local receptors) according to specific site conditions.

6.3.11 At high risk sites a baseline will be established prior to construction. This will be determined, where reasonably practicable, for a twelve month period derived from data sourced from local background PM_{10} concentrations measured by the Automatic Urban and Rural Network (AURN) monitoring sites and appropriate local authority automatic monitoring sites. By establishing a baseline the nominated undertaker will ensure, as far as reasonably practicable, that:

(a) Monitoring data will be readily available for appropriate periods prior to construction.
(b) Data will be collected as PM_{10} $\mu g.m^{-3}$, the same units as is suggested for the site action level in the London BPG.
(c) Localised unidentified sources creating a false baseline are avoided (eg local construction activity: local monitoring site operators should note any unusual activity in the vicinity of monitoring sites that may affect monitoring results).

6.3.12 The nominated undertaker will require contractors to begin dust monitoring as soon as reasonably practicable after obtaining possession of high risk sites in order to provide localised data to augment the data obtained from the AURN/Local Authority sites.

6.3.13 During construction particulate monitoring will be undertaken using appropriate survey instruments such as Osiris, Topaz, DustScan or similar devices. Two instruments will be deployed at each high risk site and will be sited at locations such as site boundaries, potential receptors or in a transect orientated to the prevailing wind, as appropriate to specific site characteristics.

6.3.14 Instruments will be set-up at high risk sites to operate an alarm (PC based or mobile phone) when a predetermined site action level is reached. If the alarm is triggered the following actions will be taken:

(a) The nominated person or someone delegated by the nominated person will as quickly as reasonably practicable investigate activities on the site to ascertain if any visible dust is emanating from the site or activities are occurring that are not in line with dust control procedures.

(b) Any identified causes will be rectified where practicable. Actions will be recorded in the site logbook and the relevant local authority notified of the incident and actions by telephone or e-mail as soon as practicable after or during the incident.
(c) If no source of the incident is identified other Crossrail sites and local authority or AURN monitoring sites will be contacted to establish if there is a wider area increase in particulate concentrations.
(d) If the cause of the alarm is not related to site operations the outcome of any investigation will be recorded in the site logbook and reported to the relevant local authority at an appropriate time.

6.3.15 At high risk sites, a site action level will be established by reference to local authority and AURN PM_{10} monitoring data in consultation with the relevant local authority. Subject to consultation, a preliminary site action level of 250$\mu g.m^{-3}$ (15 minute average) will be adopted.

6.3.16 Dust monitoring will be continued at a medium or high-risk site until the site has a risk score that assigns it to the low risk category. The cessation of monitoring when a site no longer represents a high or medium risk is subject to consultation with and the agreement of the local authority in whose area the worksite is situated that high or medium risk no longer applies, provided that such agreement is not unreasonably withheld, and the local authority is a qualifying authority for the purposes of Schedule 7 to the Crossrail Bill.

6.4 ASBESTOS

6.4.1 A management system will be established, which will adopt measures complying with the Regulations and Code of Practices, to manage the risk from release of asbestos during alteration and demolition works and excavation work. This system will ensure compliance with the Control of Asbestos at Work Regulations 2002 (SI/2002/2675) and associated Approved Codes of Practice, and will provide for inspection, survey sampling and analysis in accordance with HSE guidance MDHS100 "Surveying, sampling and assessment of asbestos-containing materials".

6.4.2 Measures for managing asbestos in alteration, demolition and excavation works will include:

(a) employing competent contractors to carry out alteration and demolition works;
(b) contractors implementing a procedure for dealing with potentially suspect materials exposed requiring sampling and analysis by an independent specialist consultant;
(c) formal exchange of information before start of work, including relevant information from the Asbestos Register to clearly identify location of asbestos-containing materials; and
(d) method statements for any works in the vicinity of asbestos-containing materials to avoid any disturbance to such materials which are not to be removed.

6.4.3 Measures for managing work involving asbestos-containing materials encountered in construction will include:

(a) appointment of a specialist consultant independent of the asbestos treatment contractor;
(b) ensuring any work with asbestos-containing materials is notified to the Health & Safety Executive;
(c) ensuring any work with asbestos-containing materials is carried out by licensed specialist asbestos treatment contractors in accordance with Asbestos (Licensing) Regulations 1983 (SI 1983/1649) as amended in 1998 (SI 1998/3233);
(d) requiring method statement defining detailed control measures to be produced by the specialist asbestos treatment contractor and approved by the independent specialist consultant;
(e) air sample monitoring by the independent specialist consultant of work to ensure required air quality standards are achieved; and
(f) disposal of asbestos-containing materials to licensed waste sites in accordance with Special Wastes Regulations 1996 (SI 1976/972).

6.5 ODOUR

6.5.1 The nominated undertaker will adopt appropriate measures so as to avoid the creation of statutory nuisance from odours.

6.6 REFERENCES

Buildings Research Establishment. Controlling particles, vapour and noise pollution from construction sites, Parts 1 to 5, 2003.

Department for the Environment Food and Rural Affairs: Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2000.

Environmental Protection Act 1990.

Clean Air Act 1993.

Pollution, Prevention and Control Act 1999.

Pollution Prevention and Control (England and Wales) Regulations 2000 SI 1973.

SI 2002/2677: Control of Substances Hazardous to Health Regulations.

Asbestos

Control of Asbestos at Work Regulations 2002 (SI/2002/2675).

Asbestos (Licensing) Regulations 1983 and their amendments.

HSE guidance MDHS100: Surveying, sampling and assessment of asbestos-containing materials.

Asbestos (Licensing) Regulations 1983 (SI 1983/1649) as amended in 1998 (SI 1998/3233).

Special Wastes Regulations 1996 (SI 1976/972).

7 WATER RESOURCES

7.1 GENERAL

7.1.1 The nominated undertaker will undertake the works and implement working methods which will be developed to protect surface and groundwater from pollution and other adverse impacts including change to flow volume, water levels and quality. This will be completed in accordance with relevant legislative requirements and appropriate industry guidance.

7.1.2 The Crossrail Act sets out protective provisions for the Environment Agency, under which the nominated undertaker will be required to obtain Agency approval for works, which would be likely to affect any surface or groundwater resource. The nominated undertaker will prepare a strategy for handling water resources issues in consultation with the Environment Agency (EA) and will be based on accepted industry practice. The process for agreeing the strategy will include liaison and consultation with key stakeholders.

7.1.3 Water Management Plans will be produced by the nominated undertaker for each of the construction sites including water courses, and will take account of the guidance contained within the relevant Pollution Prevention Guides issued by the EA and other Construction Industry Research and Information Association (CIRIA) documents. Specific receptors in the water environment will be listed in the plans. Where appropriate, integrated aquatic ecology and water quality plans will be developed.

7.1.4 Contingency plans to deal with major pollution incidents at the work sites will be included within the overall emergency planning. EA guidance on pollution incident response planning will be reflected in the emergency plans.

7.2 PROCEDURES

Site Drainage

7.2.1 Site drainage, including surface runoff and dewatering effluents, will be discharged to sewers where reasonably practicable and relevant permissions will be obtained from the sewerage or statutory undertaker. Discharge to watercourses will only be permitted where discharge consent or other relevant approval has been obtained.

7.2.2 The nominated undertaker will ensure that the site drainage meets the effluent and flood risk standards required by the sewerage undertaker or EA as appropriate in accordance with the relevant discharge consent or the protective provisions in the Crossrail Act, and will provide and

maintain holding or settling tanks, separators and other measures as may be required. The nominated undertaker will ensure that access is provided to the undertaker so that samples of discharge can be obtained and analysed and the flows verified as required.

7.2.3 The relevant sections of BS6031: Code of Practice for Earthworks for the general control of site drainage will be followed.

7.3 PROTECTION OF WATERCOURSES

7.3.1 The nominated undertaker will seek to control flood risk to appropriate levels set by the Environment Agency, using mitigation, compensation and/or monitoring where required. Approval will be obtained in advance for all crossings of, diversions to, and work affecting watercourses from the EA as set out in the protective provisions.

7.3.2 Protection measures for works in or adjacent to watercourses will be provided in accordance with appropriate requirements.

7.3.3 Watercourses, including land and/or road drainage, within the construction sites will be maintained to provide effective working conditions at all times.

7.3.4 All reasonably practicable measures will be taken to prevent the deposition of silt or other material in, and the pollution by sediment of, any existing watercourse, canal, lake, reservoir, borehole, aquifer or catchment area, arising from work operations. The measures will accord with the principles set out in industry guidelines including as the EA's note 'PPG05: Works in near or liable to affect water courses' and CIRIA's report 'C532: Control of water pollution from construction sites'. Measures may include use and maintenance of temporary lagoons, tanks, bunds and silt fences or silt screens as well as consideration of the type of plant used and the time of the year for working in watercourses.

7.3.5 Other than in water bodies where the Port of London Authority guidelines will be applied, sediment plumes from dredging in inland waterways, including those under control of British Waterways, will be controlled by measures in accordance with the principles set out in industry guidelines such as the CIRIA's Report 169 'Inland Dredging – guidance on good practice' and Section 6 of CIRIA's Report C547 'Scoping the assessment of sediment plumes from dredging'. Contaminated dredged material will be managed as described for other contaminated land materials.

7.4 CONTROL OF POLLUTION OF SURFACE WATER

7.4.1 The nominated undertaker will ensure that protection measures to control the risk of pollution to surface water will be adopted and will include, where appropriate and reasonably practicable:

(a) any containers of contaminating substances on site will be leakproof and kept in a safe and secure building or compound from which they cannot leak, spill or be open to vandalism. The containers will be protected by temporary impermeable bunds with a capacity of 110% of the maximum stored volume. Areas for transfer of contaminating substances will be similarly protected;

(b) all refuelling, oiling and greasing will take place above drip trays or on an impermeable surface which provides protection to underground strata and watercourses and away from drains as far as reasonably practicable. Vehicles will not be left unattended during refuelling;

(c) only construction equipment and vehicles free of oil/fuel leaks which could cause material contamination will be permitted on site. Drip trays will be placed below static mechanical plant;

(d) all wash down of vehicles and equipment will take place in designated areas and washwater will be prevented from passing untreated into watercourses and will comply with EA's Pollution Prevention Guidance (PPG)note PPG13;

(e) EA note PPG 23 will be followed when carrying out maintenance of structures over water. As far as reasonably practicable, only biodegradable hydraulic oils will be used in equipment working in or over watercourses; and

(f) appropriate measures to be taken to protect erodable earthwork surfaces.

7.5 CONTROL OF POLLUTION OF GROUNDWATER

7.5.1 The nominated undertaker will ensure that protection measures to control the risk of pollution to groundwater will be included within the overall strategy; these will in particular be consistent with the Groundwater Regulations 1998.

7.5.2 Where reasonably practicable, the nominated undertaker will avoid using materials in the permanent or temporary works that could pollute groundwater, this will include special consideration for the use of substances contained within List I and II of the Groundwater Regulations SI 1998/2746 (Groundwater Directive: 80/68/EEC).

Hygiene Requirements to Protect Groundwater

7.5.3 Personnel employed on hand excavation work of aquifer materials within a zone designated as an Inner Source Protection Zone or 50 Day Time of Travel Zone will be required to undergo prestart and ongoing health screening. Inductions for these personnel will include the need for personal hygiene and the dangers of contamination to groundwater.

7.6 MITIGATION OF IMPACTS AT ABSTRACTION BOREHOLES

7.6.1 The foregoing sections describe the measures used to minimise the risk of groundwater pollution. However at any particular abstraction, there will

be a residual risk that the water quality may become unusable by an abstractor. The following precautionary actions will be applied, where applicable and reasonably practicable, to limit and manage the residual risks:

(a) where agreed by the nominated undertaker and well owners, some routine water quality monitoring may be undertaken at abstraction sources. The period of monitoring will be appropriate to the timing and type of work undertaken. The need for intermediate monitoring holes and procedures for water and contaminant testing during construction and operation will be discussed with the owners;
(b) the nominated undertaker will arrange any necessary monitoring of water levels in areas where dewatering of the deep aquifer is planned; and
(c) where the water quality monitoring shows an adverse impact on water quality, then the nominated undertaker will contact the relevant abstractor as soon as practicable and the nominated undertaker will, as far as reasonably practicable, put in place appropriate emergency measures to overcome the adverse impact, where this adverse impact has resulted form the Crossrail works.

The nominated undertaker will so far as reasonably practicable recognise the rights of existing abstractors, and will consult them on measures to avoid or minimise loss or interruption of supply or provision of alternative supplies, so far as such measures or provision are reasonably practicable. The EA will also be consulted through the water resources strategy and will have an approval mechanism through the provisions in the Act.

7.7 DEWATERING

7.7.1 The foregoing provisions will also apply to dewatering, in addition to the following:

(a) records of water pumped will be kept at all major dewatering sites where wells are constructed in the deep aquifer or where required under the terms of a discharge consent; and
(b) water quality at all major dewatering sites will be monitored weekly for the first 4 weeks of pumping and monthly thereafter. Monitoring will comprise a laboratory test of major ions and a field test of temperature and electrical conductivity as well as other parameters required under the conditions of a discharge consent or under the protective provisions.

7.7.2 Monitoring arrangements for dewatering will be developed in liaison with the Environment Agency, through the water resources strategy referred to in paragraph 7.1.2 above.

7.7.3 Any site specific monitoring arrangements outside of limits will be dealt with by consent with relevant parties.

7.8 MONITORING AND MITIGATION OF WATER LEVELS IN THE SHALLOW AQUIFER

7.8.1 Additional site investigation (SI) will take place and some SI boreholes will be converted to standpipes where significant changes in water levels in the shallow aquifer are expected as a result of temporary dewatering or construction of major structures which cut off the shallow aquifer and could cause water levels to rise. Selected water levels will be monitored for a maximum of twelve months after dewatering or construction of the cut off is completed. The monitoring data will be analysed in relation to data on elevations of nearby basements and existing drains. Additional drainage will be provided as mitigation where necessary.

7.9 DREDGING

7.9.1 The nominated undertaker will follow Port of London Authority guidance for dredging in the tidal Thames and its tributaries. So far as is practicable, the critical period of June to August for dredging will be avoided. This will be achieved through programming capital dredging outside this period, and implementing a monitoring program to identify future maintenance dredging. Where practicable, the nominated undertaker will undertake a single maintenance dredge prior to the critical period.

7.9.2 The nominated undertaker reserves the right to undertake emergency dredging within the critical period of June to August should there be a requirement to do so. Dredging in response to an unforeseen event or occurrence which could not be reasonably expected or planned and which jeopardises the operation of the barge loading facilities constitutes an emergency.

7.9.3 So far as is practicable, to assist with minimising water quality and aquatic ecology impacts, the nominated undertaker will undertake capital and maintenance dredging using techniques that limit the dispersal of inter-tidal sediments.

7.10 REFERENCES

Water Resources Act 1991.
Land Drainage Act 1991.
Water Act 2003.
BS 6031: Code of Practice for Earthworks.
EA Pollution Prevention Guidance Notes.
CIRIA, Control of water pollution from construction sites: Guidance for consultants and contractors (C532).
CIRIA/Environment Agency Joint Guidelines: Concrete Bunds for Oil Storage Tanks.

CIRIA/Environment Agency Joint Guidelines: Masonry Bunds for Oil Storage Tanks.
EA Guidance Note: Piling into Contaminated Sites.
SI1998/2746: The Groundwater Regulations (EC Groundwater Directive: 80/68/EEC).
SI 2001/2954: Control of Pollution (Oil Storage) Regulations 2001.
SI 2002/2677: Control of Substances Hazardous to Health Regulations.

8 *CONTAMINATED LAND*

8.1 *INTRODUCTION*

8.1.1 The nominated undertaker will assess contaminated land under guidance contained within the Environmental Protection Act 1990 (Part IIA). This guidance, referred to as the Part IIA regime, came into force in England in April 2000 by enactment of Section 57 of the Environment Act 1995. The accompanying Contaminated Land (England) Regulations 2000 (SI 2000/227) state the conditions under which land is defined as contaminated. The nominated undertaker will develop mitigation measures in accordance with these regulations.

8.1.2 The main objective of Part IIA is to provide a system for the identification of land where contamination is causing unacceptable risks to human health or the wider environment, with respect to the current use and setting of the land. If contaminated land is identified, the guidance contained within Part IIA is intended to ensure that where it is reasonable to do so, mitigation is carried out so that the land no longer presents an unacceptable risk.

8.2 SITE ASSESSMENT AND REMEDIAL PRACTICE

8.2.1 The nominated undertaker will carry out site assessments, investigations and/or risk assessments wherever construction work is planned in order to assess the potential for contamination in both soil and groundwater in accordance with standard industry guidelines such as CLR11. Any necessary measures will be agreed with the Environment Agency and local authorities as part of the construction planning process in accordance with relevant legislation.

8.2.2 A set of criteria for site investigation will be developed prior to the commencement of any intrusive works. Where site investigation reveals the presence of contamination an appropriate remedial strategy will be developed to identify the most appropriate option for dealing with the presence of contamination. This strategy would include the following:

(a) the nominated undertaker will liaise with the local authority, the Environment Agency and other relevant statutory bodies with a view to addressing their requirements and will agree control or protection measures necessary to provide appropriate mitigation. This may involve the sealing, excavation and disposal of soil or on-site remedial works;

(b) the Consolidated European Waste Catalogue (EWC) lists those wastes that are 'absolute entries' (hazardous waste regardless of their concentration) and 'mirror entries' (hazardous waste only if 'dangerous substances' are present above threshold concentrations). Contaminated soils are 'mirror entries' in the EWC. This means that contaminated soils may be classified as either hazardous or non-

hazardous depending on the concentrations of 'dangerous substances' in the soil. An assessment of the composition of the waste soil using appropriate techniques, which could include sampling and laboratory analysis, will be undertaken to determine if the waste is classifiable as hazardous;

(c) the nominated undertaker will also give consideration to alternatives to landfill disposal as the solution to treating contaminated soil. This may include the use of remedial technologies (in-situ and ex-situ) to reduce the quantity of soil requiring disposal, and/or treatment of soils to a standard such that they can be re-used at a site or be disposed of as non-hazardous waste. On-site remedial works will be carried out under the Waste Management Licensing Regulations 1994;

(d) contamination issues will be recorded in the project Health and Safety Plan in accordance with the Construction (Design and Management) Regulations 2007, to protect affected parties;

(e) monitoring of excavation works will be undertaken to check for unexpected or unusual materials with a contaminative potential. This material could consist of buried drums, tanks or containers, soil, groundwater or liquids with an unusual colour or odour, or other evidence of contamination. If this type of material is encountered work will be stopped until the material has been properly identified and suitable precautions taken including amending risk assessments and the remedial strategy if appropriate. This approach will be included in the Health and Safety Plan;

(f) the nominated undertaker will undertake specific precautions if materials containing asbestos are present or encountered during works, in order to comply with the Control of Asbestos at Work Regulations 1987 and Asbestos (Licensing) Regulations 1983 and their amendments, and adhering to relevant guidance including Asbestos: Exposure Limits and Measurement of Airborne Dust Concentrations (EH10 and MDHS 39/4) and Managing Asbestos in Workplace Buildings 1988;

(g) the nominated undertaker will ensure that there are designated areas on site where contaminated materials can be separated from clean ones and stored in an appropriate environment. Storage of contaminated materials may require specific facilities to prevent contaminants from leaching into the ground, nearby watercourses or neighbouring properties;

(h) guidance provided in the Environment Agency's Pollution Prevention Guidance Notes (PPG's) in respect of water pollution in particular PPG01, PPG02, PPG05, PPG06, PPG21 and PPG23 will be followed as far as reasonably practicable. Further guidance is provided in Planning Policy Statement 23: Planning and Pollution Control and Defra/Environment Agency's Model Procedures for the Management of Contamination (CLR11);

(i) provision of a watching brief by an appropriately qualified person, where appropriate; and

(j) on completion of any remedial works, a record will be kept of the works undertaken to comply with the remedial strategy. A verification report will be issued to the EA and the local authority.

8.3 REFERENCES

Contaminated Land

Environmental Protection Act 1990 (Part IIA).
Contaminated Land (England) Regulations 2000 (SI 2000/227).
CIRIA (1996) A guide to safe working on Contaminated Sites Report 132
BSI (2001) *Investigation of Potentially Contaminated Sites. Code of Practice.* 10175.
Planning Policy Statement 23: Planning and Pollution Control.
Defra/Environment Agency's Model Procedures for the Management of Contamination (CLR11).

Asbestos

Control of Asbestos at Work Regulations 2002 (SI/2002/2675).

Asbestos (Licensing) Regulations 1983 and their amendments.

Asbestos: Exposure Limits and Measurement of Airborne Dust Concentrations (EH10 and MDHS 39/4).

Managing Asbestos in Workplace Buildings 1988.

Duty of Care

Environmental Protection (Duty of Care) Regulations 1991.

Hazardous Waste

Landfill (England and Wales) Regulations 2002 and Waste Acceptance Criteria (WAC).
Environment Agency Technical Guidance WM2 *Interpretation and Classification of Hazardous Waste* provides assistance in classifying wastes.

Environment Agency Pollution Prevention Guidance Notes (PPG's)

PPG01 General guide to the prevention of water pollution.
PPG02 Above ground oil storage tanks.
PPG05 Works near or liable to affect watercourses.
PPG06 Working at construction or demolition sites.
PPG21 Pollution incident response planning.
PPG23 Maintenance of structures over water.
EA Guidance Note: Piling into Contaminated Sites.

Other Regulations

Waste Management Licensing Regulations 1994.

EC Landfill Directive 1999.
Special Waste Regulations 1996.
Landfill Tax (Contaminated Land) Order 1996.
Landfill (England and Wales) Regulations 2002.
Construction (Design and Management Regulations) 1994 (SI 1994/3140).
Water Resources Act 1991(WRA 1991).
Groundwater Regulations 1998 (GR 1998).
Animal Health Act 1981 Notifiable Disease Burial Sites.
SI 2002/2677: Control of Substances Hazardous to Health Regulations.

9.1 GENERAL

9.1.1 The nominated undertaker will manage the excavated materials and demolition/construction wastes generated at worksites, so far as reasonably practicable, in accordance with the waste hierarchy and within the relevant regulatory controls and cost restraints under the general protocols described below.

9.1.2 The nominated undertaker will ensure that the management of excavated materials and waste will be in accordance with the waste hierarchy as detailed below.

9.1.3 The nominated undertaker will ensure that the requirements of the waste hierarchy are enforced and the duty of care placed on all parties to take responsibility for protecting the interests and safety of others from the potential impacts of handling, storing, transporting and depositing of excavated materials and wastes. The nominated undertaker will ensure that, for the relevant areas, waste is managed in accordance with Policy 4A.1 of the London Plan.

9.2 EXCAVATED MATERIAL AND WASTE MANAGEMENT STRATEGY

Introduction

9.2.1 This section outlines the strategy for managing surplus materials that will arise from the construction of the Crossrail project. Surplus materials have been categorised as excavated materials and demolition and construction waste.

9.2.2 The construction of Crossrail was expected to generate approximately eight million cubic metres of surplus material when the assessment was completed for the Environmental Statement. The majority of this will be clean material excavated from the tunnel sections of the Crossrail route, the remainder mainly being construction and demolition waste. The estimated breakdown of surplus materials is provided in the following table. These figures estimate the bulked volume of material allowing for the increase in volume of material following extraction.

Clean excavated material (non-contaminated):	6.0 million m^3
Construction material:	1.2 million m^3
Contaminated material:	0.5 million m^3
Demolition material:	0.3 million m^3

9.2.3 The project design is continuing to minimise the generation of excavated material by keeping to a minimum:

(a) the size of tunnels, shafts and stations; and

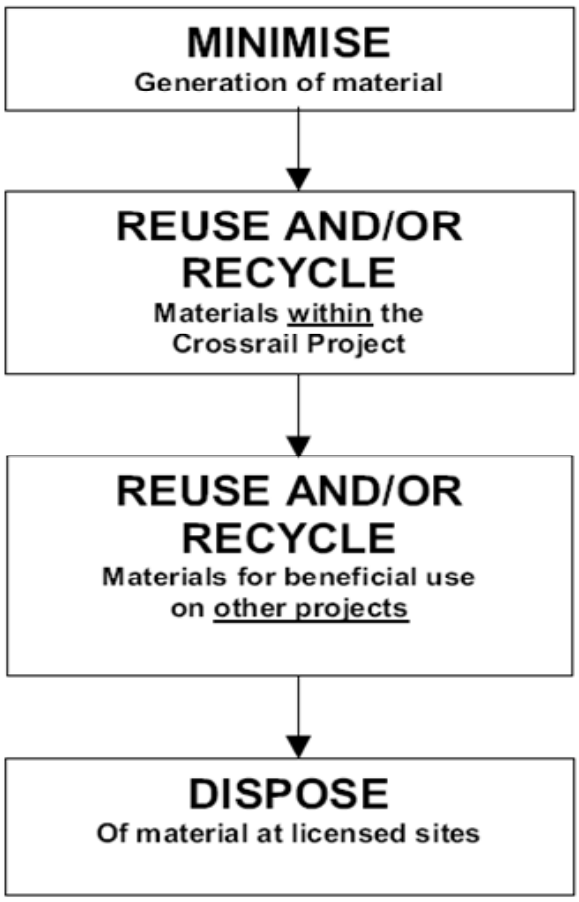
(b) building demolition,

without compromising the safety or functioning of the railway.

9.2.4 Contaminated material is material that will have been contaminated by previous activities or events and will require particular attention in handling and disposal. It includes hazardous and non-hazardous material. The Environmental Memorandum provides more information on the Treatment of Contaminated Land.

Materials Management Hierarchy

9.2.5 The nominated undertaker and any contractor will use the national hierarchy for sustainable waste management for surplus materials management. The diagram below illustrates the hierarchy in order of preference from the most desirable option at the top, to the least desirable option at the bottom:



Minimisation of Excavated Materials and Waste

9.2.6 Through the design process, the project has sought to reduce the amount of excavated material and waste that will be produced, within the constraints of the project specification.

9.2.7 A well run construction site will minimise waste and its effect, for example, by ensuring the correct amount of construction materials are ordered and by minimising and/or recycling packaging where practicable. Contractors will be required to adhere to appropriate industry standards in this respect so that construction waste will not have a major impact on the overall disposal requirements.

9.2.8 The nominated undertaker will minimise waste from construction activities as far as reasonably practicable. The successful application of waste minimisation techniques and on-site segregation of surplus materials and packaging for recycling should reduce the residual waste from construction sites to a level that will be comfortably absorbed into the existing materials recovering and transfer infrastructure in London without a major impact on the waste management strategy.

Re-use of Excavated Materials and waste

9.2.9 The nominated undertaker and any contractors will re-use as much of the excavated material as practicable within the project area and on or near to the sites where it will be generated.

9.2.10 Suitable projects or other opportunities for reuse of the excavated material will be identified as the detailed construction planning of the project is progressed, preferably within the Greater London area. Demolition waste will similarly be reused, where practicable. Any contaminated material that is reused will be decontaminated prior to reuse, or if reuse is not practicable, will be transported to appropriate treatment facilities or appropriate licensed landfill sites.

Transportation of excavated materials

9.2.11 The revised tunnelling strategy, presented in Supplementary Environmental Statement 3, comprised fewer but longer drives in the central section as compared with the original tunnelling strategy. A key objectives of the construction strategy (presented at 2.1 above) is to remove, where reasonably practicable, excavated material by rail and water transport. On this basis, material would be transported by rail from railheads at:

(a) Royal Oak, the site of the western most portal close to Paddington; and

(b) Bow Midland Yard which will take material from the north-eastern portal at Pudding Mill Lane, although the tunnel drive from Pudding Mill Lane may be reversed in which case the material

would be transported by conveyor to the Limmo Peninsula for removal by barge.

Excavated material would be transported by barge from worksites close to the Thames at the Limmo Peninsula shaft; Isle of Dogs station and Manor Wharf (serving Plumstead portal and the Woolwich station area).

9.3 PROCEDURES

Site Waste Management Plan

9.3.1 Site Waste Management Plans (SWMP) will be produced in accordance with the Site Waste Management Plans, Regulations 2008, which details a process which will be followed, and with reference to appropriate industry practice.

Duty of Care

9.3.2 The nominated undertaker will comply with the duty of care to protect the interests and safety of others from the potential effects of handling, storing, transporting and depositing of excavated materials and demolition/ construction wastes arising under the project.

9.3.3 The guidance set out in *Waste Management – The Duty of Care, Code of Practice* (HMSO March 1996) will be followed in addition to the obligations under the duty of care regulations.

9.3.4 The SWMPs will include detailed procedures for compliance with the requirements for waste transfer notes in accordance with the Environmental Protection (Duty of Care) Regulations 1991 and arrangements for auditing the actions of other parties in the waste handling chain. A sample waste transfer note document, together with details of the administrative arrangements for record keeping, will be included in the SWMPs.

9.3.5 The arrangements for handling hazardous wastes will be followed in the context of duty of care and the specific consignment note procedures applicable under the Hazardous Waste (England and Wales) Regulations 2005 or any succeeding relevant legislation.

Specific Provisions

9.3.6 Specific provisions/measures available for the handling of excavated materials and demolition/construction wastes will be reflected in the SWMPs and in the contractual requirements imposed by the nominated undertaker to meet the procedures outlined above.

9.4 REFERENCES

Environmental Protection Act 1990
Environmental Protection (Duty of Care) Regulations 1991

The Site Waste Management Plans -Regulations 2008
Contractors and Clients -Voluntary Code of Practice (Department of Trade & Industry – July 2004)
Waste Management – The Duty of Care, Code of Practice (HMSO March 1996).
CIRIA Guidance.
The London Plan, 2004, published by the Mayor of London.
Hazardous Waste (England and Wales) Regulations 2005.

10 ECOLOGY AND NATURE CONSERVATION

10.1 *GENERAL*

10.1.1 The nominated undertaker will ensure that procedures are implemented to control and limit disturbance to areas of nature conservation interest and protected species in accordance with relevant legislative requirements and accepted industry practice.

10.2 PROCEDURES

10.2.1 The nominated undertaker will ensure compliance with the relevant statutory provisions in respect of the protection of areas of nature conservation interest and of protected species. Relevant provisions include the following:

(a) Wildlife and Countryside Act 1981, as amended
(b) Conservation (Natural Habitats &c) Regulations 1994, as amended
(c) Countryside and Rights of Way (CRoW) Act 2000
(d) Protection of Badgers Act 1992
(e) Wild Mammals (Protection) Act 1996
(f) Salmon and Freshwater Fisheries Act 1975.

In addition, the nominated undertaker will ensure compliance, where appropriate, with other relevant nature conservation policy.

10.2.2 Where species are protected by specific legislation approved guidance will be followed to comply with the requirements and sufficient time will be allowed to obtain the required licences or consents.

10.2.3 The nominated undertaker will produce a general Ecological Management Plan for consultation with local authorities and relevant Statutory Agencies including a programme for any outstanding surveys, methods for watching briefs, measures to be adopted in the event of the discovery of protected species and measures for the relocation of certain species. In addition, as set out in the Environmental Memorandum, site-specific environmental management plans will be produced for environmentally sensitive sites focusing on ecological issues where appropriate.

10.3 *SPECIFIC PROVISIONS*

10.3.1 Mitigation measures to protect species and habitats will be considered on a site by site basis and will include the following general principles which will be applied where applicable:

(a) wildlife habitats which will be disturbed by construction work will be surveyed by an ecologist approved by the nominated undertaker prior to commencement of works to inform restoration work, if

required and where appropriate;

(b) prior to work commencing, sites will be checked for protected species by an ecologist approved by the nominated undertaker. Where protected species are identified, either prior to the works (through surveys), or during the works, Natural England will be contacted to agree appropriate measures for implementation;

(c) appropriate control measures will be adopted in the event that invasive alien species are found on site to ensure that they will not be inadvertently spread along the route;

(d) procedures will be implemented to ensure that species specified in Schedule 9 of the Wildlife and Countryside Act 1981, as amended, are not knowingly introduced or caused to grow in the wild;

(e) temporary work areas including site access will be situated, as far as reasonably practicable, on previously used sites or amenity grassland of low conservation value;

(f) where practicable habitat removal (particularly woodland and other trees) will take place outside the breeding bird season (approximately 1st March to the 31st July) to avoid impacts on nesting birds. Where this is not practicable, all woodland and scrub will be checked by a specialist for nesting birds before removal. If any are identified, appropriate mitigation measures will be agreed with Natural England and implemented;

(g) after construction, habitats or ecological features that have been affected by construction activities will be reinstated or allowed to recolonise so that (so far as is reasonably practicable), they recover to their pre-construction condition;

(h) where appropriate, landscape planting (other than ornamental and specimen tree planting) will be undertaken using native species typical of the area, as far as reasonably practicable obtained from local sources. For landscaping in the vicinity of the railways, the species will be selected with regard to the potential impact on railway operations, subject to any required approval of the local planning authority;

(i) impacts on adjacent wetland habitats and watercourses will be avoided by appropriate design of site drainage and by use of construction techniques to maintain existing drainage patterns along appropriate sections of the route;

(j) topsoil and subsoil will be stripped and stored separately and reinstated appropriately as soon as reasonably practicable to minimise adverse impacts to the soil structure;

(k) topsoil and the seed bank which it contains will be replaced along the works as close as reasonably practicable to the location from which it was taken. This is particularly important for areas of nature conservation interest;

(l) appropriate construction management practices will be adopted on site to minimise the risk of indirect impacts to adjacent habitat (for example, direct incursions, pollution);

(m) where appropriate, construction activities will be screened to protect nature conservation sites; and

(n) where open spaces, sport and recreation facilities have been used as worksites during construction, as far as reasonably practicable, those sites will be reinstated to their former use in consultation with the local authority or other responsible statutory agency.

10.4 PROTECTION OF TREES

10.4.1 The nominated undertaker will use reasonably practicable measures to minimise the loss of trees. Any essential remedial or protective work to trees adjacent to construction activity will be carried out by suitably trained or qualified personnel using recognised methods in accordance with BS 5837 "Guide for trees in relation to construction".

10.4.2 Appropriate protection measures for tree protection will be implemented as specified in BS 5837: 2005. This will include protective fencing and prohibition of storing or dumping materials within the protected area.

10.4.3 For specific worksites where mature tree loss is a concern, such as Finsbury Circus, a landscape management plan will be drawn up by the nominated undertaker as part of the environmental management plan process The plan will be discussed with the local planning authority and in preparing the plans the nominated undertaker will take into account their observations. The plan will cover such issues as tree protection measures, monitoring during construction, replanting and post-construction monitoring.

10.5 REFERENCES

Wildlife and Countryside Act 1981, as amended
Conservation (Natural Habitats &c) Regulations 1994, as amended
Countryside and Rights of Way (CRoW) Act 2000
Protection of Badgers Act 1992
Wild Mammals (Protection) Act 1996
BS 3837: 2005 Guide for Trees in Relation to Construction
Salmon and Freshwater Fisheries Act 1975

11 ARCHAEOLOGY AND HERITAGE

11.1 GENERAL

11.1.1 The nominated undertaker will carry out the works in such a way as to ensure that disturbance to scheduled monuments, archaeological sites and deposits, buildings of historical and architectural interest (both statutorily listed buildings and important non-listed above ground features and structural elements) will be managed in accordance with accepted industry practice and, where disturbance cannot reasonably be avoided, is controlled and limited as far as reasonably practicable.

11.2 PROCEDURES

11.2.1 Works to the listed buildings set out in the tables in Schedule 8 to the Act will be undertaken in accordance with the requirements of the heritage agreements with the relevant local authority.

11.2.2 All archaeological works will be completed in accordance with the requirements of a Written Scheme of Investigation, which shall be based on the principles and methodologies laid down in the Crossrail Generic Written Scheme of Investigation (this document will be issued in late 2007 after consultation has been completed through the Heritage and Design sub-group).

11.2.3 Works to the utilities in the vicinity of London Wall will be undertaken in accordance with the requirements of a Scheduled Monuments agreement.

11.3 SPECIFIC PROVISIONS

11.3.1 Listed buildings where the vibration screening limit for peak particle velocity (PPV) of 3mm/s may be exceeded due to construction works in the vicinity will undergo further assessment to determine whether they are vulnerable to vibration impacts and to inform the selection of plant and working methods.

11.3.2 Listed buildings where the vibration screening limit of 3mm/s may be exceeded will be monitored during demolition and other major activities. This would provide full safeguarding, which may include cessation of works should vibration levels exceed relevant limits.

11.3.3 Listed buildings that are attached or contiguous to buildings that are proposed for demolition will be unattached, where practicable, using techniques appropriate for the listed structure, before demolition commences.

11.3.4 Listed buildings that are located within the proximity of worksites or construction plant will be provided with appropriate protection.

11.3.5 Where there is potential for damage to listed buildings as a result of falling objects from oversailing cranes, appropriate methods will be used to ensure damage does not occur.

12 SETTLEMENT

12.1 GENERAL

12.1.1 The nominated undertaker will design and undertake construction of the scheme in a manner that will minimise the damage to land and property as a result of ground movement.

12.1.2 Techniques for controlling settlement of buildings and protecting buildings from irreparable damage are well developed, based on other tunnelling projects within London such as the Jubilee Line Extension and Channel Tunnel Rail Link. Appropriate techniques will be implemented in order to control and limit, as far as reasonably practicable, the impacts of settlement. The controls described in the settlement policy will also apply to flood defence structures.

12.2 SPECIFIC PROVISIONS

12.2.1 Commitments in relation to settlement are contained in the register of undertakings and assurances and hence are enforceable as part of the Environmental Minimum Requirements (see section 3 of the general principles).

12.3 REFERENCES

Crossrail Ground Settlement Requirements.

Appendix 1: Glossary

The following terms and expressions have been used in this Code:

Blockade (Railway)	Possession with a very long duration
BPM	Best Practicable Means
BS	British Standard
CAA	Civil Aviation Authority
CDM	Construction (Design and Management) Regulations 1994
CIRIA	Construction Industry Research and Information Association
COSHH	Control of Substances Hazardous to Health
CoPA	Control of Pollution Act 1974
CRoW	Countryside and Rights of Way
EA	Environment Agency
EHO	Environmental Health Officer
EMP	Environmental Management Plan
EMR	Environmental Minimum Requirements
EMS	Environmental Management System
EWC	European Waste Catalogue
Fly Parking	Uncontrolled parking (by construction operatives) usually in residential streets
Highway	A route that people can pass along without let or hindrance and would include the footway
HMSO	Her Majesty's Stationery Office
HSC	Health and Safety Commission
HSE	Health and Safety Executive
LFEPA	London Fire and Emergency Planning Authority
ODPM	Office of the Deputy Prime Minister (ODPM became the Department of Communities and Local Government on 5 May 2006.)
Possession (Railway)	Planned safety arrangements which control or prevent the normal movement of rail traffic on the national rail network between defined locations and for pre-defined periods (including any speed restriction)
PPG	Pollution Prevention Guidance (notes published by the EA)
PRM	People with reduced mobility
RFI	Radio Frequency Interference
SWMP	Site Waste Management Plan
TMP	Traffic Management Plan
Toolbox talks	Training talks for construction operatives to increase the health & safety and environmental knowledge and skills of all who work in construction contracting
Transect	A line across a site along the route of which samples are taken
WSI	(Archaeological) Written Scheme of Investigation