Part 21 – Environmental Management

21.1 Introduction

21.1.1 Not Used

21.1.2 Environmental Impacts and Mitigation

The *Contractor* shall seek to limit adverse impacts of the *works* on the environment including the local community and on the operations of Network Rail, London Underground and other rail companies, and mitigate any adverse impact to the minimum practicable. The *Contractor* shall co-operate with Others including non-Crossrail projects to reduce combined impacts.

The *Contractor* shall bring to the attention of the *Project Manager* any mitigation measures and opportunities for environmental enhancement over and above those specified in the Works Information that could reduce any adverse environmental impacts.

21.2 Environmental Staffing and Resources

21.2.1 General

The *Contractor* shall demonstrate that all employees and subcontractors and suppliers of any tier, have an appropriate awareness and working knowledge of environmental legislation, environmental standards and guidance relevant to the construction activities in which they are engaged.

The *Contractor* shall designate a named individual who shall be the primary environmental contact point with the statutory bodies. The *Contractor* may designate a different named individual for each different statutory agency. The *Contractor* shall inform the *Project Manager* and the relevant statutory agency who this individual is and provide contact details. The *Contractor* shall only contact the named individual(s) at these statutory bodies, as provided by the *Project Manager*.

21.2.2 Environmental Personnel

The *Contractor* shall appoint an Environmental Manager and other environmental specialists where required by the Works Information or where necessary to Provide the Works.

The *Contractor* shall submit the curriculum vitae of all proposed environmental personnel to the *Project Manager* for acceptance. Environmental personnel shall not be appointed until the *Project Manager*'s acceptance has been obtained, at any time during the duration of the contract.

21.2.3 Environmental Manager

The Environmental Manager shall:

- develop and implement an Environmental Management System (see 21.4 below) certified by a UKAS (or equivalent) accredited certification body to ISO14001,;
- develop and provide environmental training for all personnel to include induction, tool box talks and specific training for personnel with specific environmental responsibilities;
- manage all environmental personnel including all environmental specialists;
- co-ordinate between the environmental specialists and the construction teams;
- approve the environmental parts of the *Contractor's* method statements;
- co-ordinate with other contractors regarding cumulative impacts on worksites where there are multiple contractors;
- ensure compliance with environmental legal and contractual requirements;
- input to the consents programme managed by the *Contractor*'s Consents Co-ordinator (as specified in Part 3 Planning, Environmental and Traffic Consents of Volume 2B of the Works Information) and prepare environmental consent applications;
- provide advice and instruction to construction teams to deal rapidly and effectively with environmental incidents and complaints;
- liaise with the *Contractor*'s procurement personnel to ensure that procurement incorporates sustainability (as specified in this part of the Works Information);
- ensure an appropriate and competent individual is nominated to liaise with external parties, such as the local authorities, the Environment Agency, Natural England and English Heritage, as necessary and in conjunction with the *Project Manager*;
- analyse individual environmental incidents and complaints to identify root causes, corrective and preventative actions needed;
- analyse environmental incidents and complaints to identify trends and strategic actions;
- manage environmental monitoring included in this part of the Works Information or as required by consents, including analysis and interpretation of monitoring results and actions;

- undertake audits of the *Contractor* and subcontractors against legal and contractual requirements provided that (s)he is independent of the activity being audited and has the competencies, experience and qualifications for Environmental Auditor given below;

- produce report/ information for the environmental part of the progress report and attend the progress meeting to ensure that the Environmental Management System remains suitable, adequate and effective; and

- be the main environmental contact with the *Project Manager*.

The Environmental Manager shall have the following competencies, experience and qualifications:

- appropriate experience of environmental management on construction projects including site experience;

- good knowledge and practical experience of legal requirements and how to comply with them including archaeology, air quality, noise and vibration, surface and groundwater, contaminated land, waste, ecology and built heritage;

- good knowledge and practical experience of developing, implementing and improving Environmental Management Systems compliant with ISO14001;

- experience of liaison with stakeholders including statutory bodies such as local authorities, the Environment Agency, Natural England and English Heritage;

- experience of obtaining and complying with environmental consents; and

- be an associate member or full member of the Institute of Environmental Management and Assessment (or equivalent recognised competent body).

21.2.4 Noise and Vibration Specialist

The *Contractor* shall appoint a Noise and Vibration Specialist. The Noise and Vibration Specialist shall:

- advise and instruct construction teams on how to meet legal and contractual (see 21.8 below) noise and vibration requirements, including Section 61 consents and the Crossrail Noise and Vibration Mitigation Scheme;

- develop and implement the noise and vibration section of the Environmental Plan for the *works* (see 21.8.2 below);

- work closely with construction teams, particularly the construction planning team;

- undertake all assessments and predictions for Section 61 consent applications and produce the consent application;

- undertake baseline noise and vibration surveys (where required);
- complete noise and vibration assessments for the *Contractor*'s temporary works and Equipment to determine their design and location and any necessary mitigation works required to maintain noise and vibration levels below the trigger levels;
- for listed buildings, liaise with the *Contractor*'s Heritage Specialist regarding potential impacts on and mitigation measures for listed buildings;
- plan and implement the *Contractor*'s scheme for noise and vibration monitoring;
- undertake all noise and vibration monitoring activities – no other personnel shall undertake noise and vibration monitoring activities;
- check all results for compliance with requirements and advise construction teams on action required and follow-up;
- provide reports on progress and any problems with noise and vibration issues;
- liaise with local authorities as necessary and in conjunction with the *Project Manager*; including providing them with Section 61 consent applications on time and monitoring results in any timescales agreed with them; and
- work with the *Project Manager* and the *Employer* to manage and control cumulative noise and vibration impacts where there is more than one contractor working concurrently in the Working Areas

The Noise and Vibration Specialist shall have the following competencies, experience and qualifications:

- appropriate experience of dealing with noise and vibration on construction projects;
- good knowledge and practical experience of legal requirements and how to comply with them;
- experience of liaison with stakeholders including statutory bodies such as local authorities;
- experience of obtaining and complying with Section 61 consents; and
- be an Associate or Full Member of the Institute of Acoustics (or equivalent competent body).

21.2.5 Waste Manager

The *Contractor* shall appoint a Waste Manager. The Waste Manager shall:

- advise and instruct construction teams on how to meet legal and contractual (see 21.9 below) waste management requirements;
- develop and implement the Site Waste Management Plan (see 21.9.2 below);
- identify and implement ways to reduce, reuse and recycle waste with a preference given to reusing and recycling of waste within the Project;
- classify waste categories prior to removal from site;
- work with the Environment Manager to provide training and information on waste;
- provide reports on progress and any problems with waste issues;
- work closely with construction teams; and
- liaise with external parties, such as the Environment Agency, as necessary and in conjunction with the *Project Manager*.

The Waste Manager shall have the following competencies, experience and qualifications:

- appropriate experience of waste management on construction projects, including site experience;
- good knowledge and practical experience of legal requirements and how to comply with them, including waste transfer notes, hazardous waste requirements, Waste Management Licensing / Environmental Permits and Exemptions;
- good knowledge and practical experience of developing and implementing Site Waste Management Plans;
- experience of liaison with stakeholders including statutory bodies such as the Environment Agency;
- experience of complying with waste management licenses/ environmental permits and obtaining exemptions to waste management licenses/ environmental permits; and
- have successfully completed at least 2 days formal relevant training in waste management e.g. by the Chartered Institution of Wastes Management

21.2.6 Air Quality Specialist

The *Contractor* shall appoint an Air Quality Specialist. The Air Quality Specialist shall:

- advise and instruct construction teams on how to meet legal and contractual (see 21.10 below) air quality requirements;
- develop and implement an air quality section of the Environmental Plan for the *works* (see 21.10.1 below);
- plan and implement the *Contractor's* scheme for dust monitoring);
- train nominated staff to undertake basic monitoring tasks correctly e.g. downloading data and undertaking initial checking of results for compliance with requirements;
- analyse and interpret all results for compliance with requirements and advise construction teams on action required and follow-up;
- work closely with construction teams;
- liaise with local authorities as necessary and in conjunction with the *Project Manager*, including providing them with monitoring results in any timescales agreed with them; and
- work with the *Project Manager* and the *Employer* to manage and control cumulative dust impacts where there is more than one contractor working concurrently in the Working Areas.

The Air Quality Specialist shall have the following competencies, experience and qualifications:

- appropriate experience of dealing with air quality and dust, including on construction projects;
- a good knowledge and practical experience of legal requirements and the Greater London Authority's "The Control of Dust and Emissions form Construction and Demolition: Best Practice Guidance" and how to comply with them;
- experience of liaison with stakeholders including statutory bodies such as Local Authorities; and
- be an Associate or Full Member of the Institute of Air Quality Management (or equivalent competent body).

21.2.7 Land Contamination Specialist

The *Contractor* shall appoint a Land Contamination Specialist. The Land Contamination Specialist shall:

- advise and instruct construction teams on how to meet legal and contractual (see 21.13 below) contaminated land requirements;

- develop and implement theland contamination section of the Environmental Plan for the *works* (see 21.13.1 below);
- undertake and oversee site assessments, investigations and risk assessments;
- develop remedial strategies to deal with any contamination;
- advise and instruct construction teams on how to meet contaminated land requirements;
- provide reports on progress and any issues with contaminated land;
- work closely with construction teams; and
- liaise with stakeholders including local authorities and the Environment Agency as necessary and in conjunction with the *Project Manager*.

The Land Contamination Specialist shall have the following competencies, experience and qualifications:

- appropriate experience of dealing with contaminated land, including on construction projects;
- good knowledge and practical experience of legal requirements and how to comply with them;
- field experience of contaminated land ground investigations including sampling and scheduling tests;
- experience of liaison with stakeholders including statutory bodies such as local authorities and the Environment Agency; and
- full membership of a relevant professional body, such as IEMA, CIWEM, RSC, CIEH, ICE.

21.2.8 Environmental Auditor

The *Contractor* shall appoint an Environmental Auditor who shall undertake environmental audits of all parts of the *Contractor's* environmental management system including compliance with legal and contractual requirements.

The Environmental Auditor shall have the following competencies, experience and qualifications:

either be:

a registered environmental auditor with the Institute of Environmental Management and Assessment (IEMA) (or an equivalent recognised environment body) in which case the *Contractor* shall submit evidence of their auditor registration to the *Project*

Manager for acceptance at least one month prior to them commencing any audit work.

or

be an auditor from the *Contractor*'s corporate organisation, in which case a curriculum vitae detailing their audit qualification and experience shall be submitted to the *Project Manager* for acceptance at least one month prior to them commencing any audit work. The auditor shall have:

- successfully completed an IEMA (or an equivalent recognised environment body) - approved environmental auditor training course;
- have appropriate experience of environmental management on construction projects including site experience;
- good knowledge and practical experience of legal requirements and how to comply with them including archaeology, air quality, noise and vibration, surface and groundwater, contaminated land, waste, ecology and built heritage; and
- good knowledge and practical experience of developing, implementing and improving Environmental Management Systems compliant with ISO14001.

21.3 Environmental Plan

The *Contractor* shall produce an Environmental Plan and submit it to the *Project Manager* for acceptance. In the case of the first submission of the Environmental Plan the *Project Manager* will reply within 4 weeks of the date of submission. The Environmental Plan may include existing corporate procedures, plans or other documents provided that these meet legal requirements and the requirements of this contract.

The *Contractor* shall not commence work on site until the *Project Manager* has accepted the Environmental Plan.

The Environmental Plan shall include (but not necessarily be limited to):

- the management processes and procedures for complying with legal environmental requirements and all the environmental requirements of the Works Information;
- the roles and responsibilities including the job title of the nominated person responsible for each task
- a staffing plan containinga schedule identifying the names of personnel filling the roles specified in the Works Information; and whether they are employed directly, Subcontractors, full and part time personnel and the duration of their activity on this contract;

- the processes for liaison and communication with Others, including neighbouring contractors and statutory bodies, where required by this Works Information;
- a description of the *Contractor*'s Environmental Management System (see 21.4 below) using the headings of BS EN ISO14001;
- the *Contractor*'s environmental objectives;
- the processes for liaison and communication with subcontractors and suppliers of any tier and ensuring compliance with the requirements described in this part of the Works Information;
- the *Contractor*'s programme(s) for training, site inspections, audits and consents submissions;
- selection of Equipment and the promotion of the use of green Equipment;
- noise and vibration (see 21.8.2 below);
- air quality (see 21.10.1 below);
- water (see 21.11.1 below);
- archaeology (see 21.12.2.1 below);
- heritage (see 21.12.3.1 below);
- land contamination (see 21.13.1 below);
- ecology (see 21.14.1 below);
- energy (see 21.16.1 below) and
- sustainable transport (see 21.15 below.

The *Contractor* shall ensure the plan is appropriate to all activities included in the *works*.

The *Contractor* shall train all employees, including subcontractors and suppliers of any tier, with direct or indirect responsibilities under the plan, on the contents of the plan that apply to its work.

The *Contractor* shall review and update the plan to ensure that it remains suitable, adequate and effective as the *works* progress, ensure that it reflects the current status of the *works* and:

- following any material change to the status of the *works* or site that has an impact on environmental requirements;

- as instructed by the *Project Manager*; and
- at least every 6 months.

The revised plan shall be submitted to the *Project Manager* for acceptance and the *Contractor* shall keep a record of reviews of the Plan.

21.4 Environmental Management System

21.4.1 ISO 14001 Requirement

The *Contractor* shall develop and implement an Environmental Management System which shall be certified to BS EN ISO14001 by a UKAS (or equivalent) accredited certification body. The *Contractor* shall ensure that the scope of this certification covers the full scope of *works* under this contract. If any proposed or actual changes to the status of the certification occur the *Contractor* shall immediately inform the *Project Manager*.

The *Contractor's* Environmental Management System shall be described in the Environmental Plan and contract-specific procedures. The *Contractor* may use its corporate Environmental Management System and shall amend and/ or supplement its corporate Environmental Management System to ensure that it is bespoke to the Crossrail requirements set out in the Works Information. Any such amendments and/or supplements shall be explained in the *Contractor*'s Environmental Plan and/or site-specific procedures.

Where the *Contractor* is a joint venture, the *Contractor* shall either:

Adopt one of the partners' corporate Environmental Management Systems, ensuring that it is bespoke to the Crossrail requirements as required above and shall ensure that the partners' ISO14001 certificate covers the *Contractor's* Environmental Management System. The partner's certification body shall include this contract as part of its regular audits of the partner's ISO14001 certification;

or

Create an Environmental Management System that adopts parts of any of the partners' environmental management systems and/ or develops new parts of the environmental management system, ensuring that it is bespoke to the Crossrail requirements as required; obtain a new ISO14001 certificate for the *Contractor's* Environmental Management System and ensure regular audits are undertaken by the certification body.

21.4.2 Integrated Management System

The *Contractor* may integrate any of the Environmental Management System requirements with those for Health and Safety and/or Quality to create an Integrated Management System. Where the *Contractor* develops and implements an Integrated Management System, it shall be based on PAS99: Specification of common management system requirements as a framework for integration published by the British Standards Institute.

21.4.3 Additional Environmental Management System Requirements

In addition to obtaining and maintaining independent third party certification to ISO14001 (or equivalent), the *Contractor* shall comply with the additional Environmental Management System requirements specified in this section and document them in the Environmental Plan.

21.4.3.1 Objectives

The *Contractor* shall set objectives for himself, Subcontractors and suppliers relevant to the *works* to meet the *Employer*'s environmental objectives for contractors which are to:

- reduce waste and energy use within all of the *Contractor*'s site offices;
- ensure that the *Contractor*, Subcontractors and suppliers comply with the environmental requirements in the contract;
- seek ways to incorporate environmental opportunities within the design;
- seek ways to reduce the carbon footprint of the Project;
- increase awareness of environmental issues in the *Contractor*'s team, subcontractors and suppliers; and
- reduce the amount of construction waste and excavated material generated and going to landfill, with maximised beneficial reuse of the materials.

The *Contractor* shall include these objectives in the Environmental Plan and submit a progress report quarterly to the *Project Manager* for acceptance (at the end of reporting periods one, four, seven and ten each year) using the report format provided by the *Project Manager*.

21.4.3.2 Environmental Data

The *Contractor* shall measure and report on the environmental data listed below. The *Contractor* shall ensure that subcontractors' on-site activities (including operation of site offices and welfare facilities), all Equipment deliveries, and any waste or recycling removed from the Site are included in this data . The *Contractor* shall input data into the *Employer*'s Rivo Safeguard database and the Crossrail version of the Building Research Establishment's Smartwaste software and submit data to the *Project Manager* for each four weekly period in line with the *Project Manager's* reporting requirements for dashboard reporting. The *Contractor* shall use the data to monitor performance against objectives and targets.

Energy Consumption by type:

- Electricity consumption (normal grid mix) (kWh);
- Electricity consumption (quality CHP) (kWh);

- Electricity consumption (onsite renewables) (kWh);
- Electricity consumption (green tariff) (kWh);
- Natural gas consumption (kWh);
- Petrol consumption (litres);
- Diesel consumption (litres);
- Oil consumption (litres);
- LPG consumption (litres);
- Marine diesel consumption (litres);
- Biodiesel consumption (litres);
- Other (please specify).

Resource Consumption:

- Total amount of aggregate used (tonnes);
- Amount of recycled aggregate used (tonnes);
- Amount of timber used (tonnes);
- Amount of timber from recycled or certified sustainable sources (tonnes).

Waste Produced and proportion recycled (see section 21.9 below):

- Amount of excavated material produced (tonnes);
- Amount of excavated material recycled (tonnes);
- Amount of excavated material sent to landfill (tonnes)
- Amount of commercial and industrial waste produced (tonnes);
- Amount of commercial & industrial waste recycled (tonnes);
- Amount of commercial and industrial waste sent to landfill (tonnes)
- Amount of demolition waste produced (tonnes);
- Amount of demolition waste recycled (tonnes);
- Amount of demolition waste sent to landfill (tonnes);

- Amount of construction waste produced (tonnes);
- Amount of construction waste recycled (tonnes);
- Amount of construction waste sent to landfill (tonnes);
- Total amount of waste produced (tonnes);
- Total amount of waste recycled (tonnes);
- Total amount of waste sent to landfill (tonnes);
- Amount of waste classified as hazardous (tonnes), including proportion that results from contaminated soils;
- Amount of contaminated soil cleaned (percentage of total).

Water Consumption: total water consumed. (m^3);

Number of environmental site inspections: actual and planned (not including inspections of compliance with Best Practicable Means and Section 61 consents ;

Number of environmental audits undertaken by the *Contractor*: actual and planned;

Number of non conformities raised during audits undertaken by the *Contractor* and the number overdue during period.

21.4.3.3 Programmes

The *Contractor* shall establish and maintain programmes, listing dates for training, site inspections, audits and consents (as described in this part of the Works Information).

These programmes shall be included in the *Contractor*'s Environmental Plan and shall be revised and re-submitted when necessary to keep them up-to-date, when the plan is updated or when instructed by the *Project Manager*. The *Contractor* shall also include key environmental activities in the Accepted Programme.

21.4.3.4 Resources, Roles, Responsibility and Authority

The *Contractor* shall appoint personnel as required by this part of the Works Information.

Environmental roles and responsibilities shall not be restricted to environmental personnel but shall also include other members of the *Contractor*'s team, such as project managers, site engineers and foremen.

21.4.3.5 Training and Competence

The *Contractor* shall undertake the following environmental training to ensure that personnel, including Subcontractors and suppliers of any tier, are aware of their individual responsibility in complying with legal and contractual requirements:

- an induction scheme for all personnel;
- toolbox talks for site operatives to maintain awareness on environmental topics and to advise personnel of changing circumstances as work progresses. Toolbox talks shall use as a minimum the Construction Confederation's Environmental Forum's Toolbox Talks (available from http://www.thecc.org.uk/index.asp?page=whatsnew). Toolbox talks should cover specific environmental topics relating to a particular location or activity. Toolbox talks shall be undertaken prior to specific activities to which they relate and after nonconformities and complaints; and
- specific environmental training for personnel with environmental responsibilities under the *Contractor*'s Environmental Management.System

In addition, the *Contractor* shall implement a behaviour-based environmental programme to monitor environmental behaviours of personnel, review the findings and take action to improve environmental behaviours and performance. .

The *Contractor* shall identify training needs of personnel to ensure appropriate training is provided and maintain correct and up-to-date records of attendance at all training, including tool box talks.

21.4.3.6 Not Used

21.4.3.7 Progress Meetings

The *Contractor* shall review environmental issues during progress meetings to check that work is proceeding in accordance with plans and arrangements. This review shall allow for consideration of 4-weekly period reports.

21.4.3.8 Operational Control

The *Contractor* shall plan and implement the operational controls in accordance with this part of the Works Information.

The *Contractor* shall include site-wide operational controls in the Environmental Plan and activity-specific controls in construction health and safety method statements.

21.4.3.9 Evaluation of Compliance

The *Contractor* shall check compliance with legal and contractual requirements through site inspections which shall be undertaken at least weekly by the Environmental Manager. The *Project Manager* shall be invited to attend. Site inspections shall be documented using the site inspection form provided in Appendix

21A. Completed site inspection forms shall be made available to the *Project Manager*.

21.4.3.9 A Nonconformity, corrective and preventive action

The *Contractor* shall raise and manage nonconformities with its *Contractor*'s EMS as specified in this part of the Works Information through the PTR system.

21.4.3.10 Internal Audits

The *Contractor* shall undertake environmental audits at least quarterly to cover its entire Environmental Management System over a period of 12 months

The *Contractor* may undertake environmental audits in conjunction with other audits, such as health and safety and quality.

Internal environmental audits shall be undertaken in accordance with the requirements of BS EN ISO 19011.

The *Contractor* shall be aware that the *Project Manager* and *Employer* shall undertake audits and the *Contractor* shall assist with these audits and make personnel and records available.

21.4.3.11 Management Review

The *Contractor* shall undertake a management review at least every six months with the *Project Manager* and the *Contractor*'s top management (as a minimum this should include the *Contractor's* Project Director and Quality Manager and a senior corporate representative) and key personnel including the *Contractor*'s Environmental Manager. The *Contractor* shall issue a report to all attendees prior to the management review to include:

- performance against Key Performance Indicators and objectives;
- adequacy of environmental staffing;
- training undertaken and planned; and
- analysis of site inspections, audits, incidents and non-conformities including any recurring issues, and time taken to complete actions.

At the management review meeting, the *Contractor* shall develop an improvement plan consisting of agreed actions and including personnel responsible for completing the actions and timescales for their completion.

21.5 Communication with Others

The *Contractor* shall develop and implement as part of their Environmental Plan and Environmental Management System a procedure for communication with local authorities and statutory agencies. .

If an enforcing authority attends site the *Contractor* shall notify the *Project Manager* immediately, assist and keep a record of the visit.

21.6 Procurement

21.6.1 General

The *Contractor* shall include an assessment of environment and sustainability and demonstration of environmental track record as a key criterion in the selection of Subcontractors and suppliers. This shall form part of the *Contractor*'s procedure for procurement of Subcontractors and suppliers in line with Quality Management System requirements.

The *Contractor* shall sign up to, and meet the requirements of, The Mayor of London's Green Procurement Code.

The *Contractor* shall ensure that sustainability is incorporated into all procurement activities.

21.6.2 Subcontractors

The *Contractor* shall ensure that Subcontractors either:

- comply with the *Contractor*'s Environmental Management System; or
- comply with their own Environmental Management System that shall be accepted by the *Contractor* and is certified to BS EN ISO 14001 by a certification body accredited by the International Accreditation Forum (e.g. UKAS in the UK).

21.6.3 Equipment, Plant and Materials

The *Contractor* shall develop and implement a green Equipment, Plant and Materials section of the Environmental Plan, setting out the measures to be taken to ensure low or reduced environmental impact, including, but not limited to:

- how preference shall be given to Equipment, Plant and Materials that are:
    - non-hazardous;
    - reused, refurbished or recycled;
    - recyclable;
    - from renewable sources;
    - low(er) in embodied energy;
    - low(er) carbon footprint; and
    - low(er) water footprint; and

- how all timber shall be procured either:
  - from certified recycled, reclaimed or sustainable sources - preference shall be given to recycled or reclaimed sources and all timber shall be supported by chain of custody documentation to verify recycled/ reclaimed or sustainable source, including processes for checking and maintaining records to demonstrate that all timber delivered to site are from such sources; or
  - in accordance with the BREEAM credit (MAT 5) where the *Contractor* is seeking that credit and
  - calculation of recycled content within materials and construction components, using their own tool or the Waste Resources Action Programme (WRAP) Net Waste Tool and Designing Out Waste Tool to be submitted to the *Project Manager* prior to commencement of procurement and quarterly thereafter as part of the progress report for environmental objectives and targets;
  - at least 15% of total material value derives from reused and recycled content in new construction, and aim to exceed 20% by selecting the top opportunities to exceed this figure without increasing the cost of materials, and provide a report on the percentage quarterly thereafter as part of the progress report for environmental objectives and targets.
- options for importing and exporting Equipment by rail and water, including cost and benefits, both fiscal and environmental.

21.7 Environmental Incidents

The *Contractor* shall comply with the Crossrail Guidance on Environment, Traffic and Planning Incidents (CR-XRL-T1-GGG-CR01-00002).

21.8 Noise and Vibration

21.8.1 General

The *Contractor* shall 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 *Contractor* shall apply Best Practicable Means, as defined under Section 72 of the Control of Pollution Act 1974, to all activities.

The *Contractor* shall be aware of the requirements of Sections 20 and 21 of the Crossrail Act 2008 relating to Section 61 Consent appeals and defence against proceedings in respect of statutory nuisance which amend the appeals procedures under the Control of Pollution Act 1974.

21.8.2 Noise and Vibration section of the Environmental Plan

The *Contractor* shall develop and implement a noise and vibration section of the Environmental Plan for the *works*. The noise and vibration section of the Environmental Plan shall set out how the legal and contractual noise and vibration requirements shall be managed in accordance with in this part of the Works Information. The plan shall include the nominated person responsible for each task and shall be produced, and updated by the Noise and Vibration Specialist in conjunction with the Environment Manager.

21.8.3 Construction Noise and Vibration Assessments

21.8.3.1 General

The *Contractor* shall undertake noise and vibration assessments of all works and these assessments shall be used to prepare section 61 consent applications, satisfy the requirements of Crossrail's Noise and Vibration Mitigation Scheme, and satisfy the legal requirements of undertakings and assurances.

21.8.3.2 Noise Assessments

The *Contractor* shall predict noise levels at all noise sensitive receptors from construction and demolition activities using a model that implements the calculation procedure set out in BS 5228-1. The *Contractor* shall submit details of any alternative methods of calculating noise to the *Project Manager* for acceptance prior to undertaking the assessment.

The *Contractor*'s construction noise assessments shall include:

- a detailed construction method statement identifying the rationale for the work, proposed working practices, working hours and a breakdown of construction methodology;
- site location maps and worksite layout plans detailing the geographical locations of all Equipment for each stage of the works;
- the results of previous construction noise assessments, if applicable;
- details of the model or methodology used to predict construction noise;
- a construction Equipment schedule showing the number, type and make of Equipment used for each stage of the construction, and a listing of sound power levels or activity LAeq levels at 10 metres from the source and percentage on times for each item, using either the 'Update of noise database for prediction of noise on construction and open sites' published by Defra, BS 5228, manufacturer's data ;
- details of proposed on-site noise mitigation measures;
- schedules detailing predicted noise levels;

- list of properties qualifying for noise insulation under the Crossrail Noise and Vibration Mitigation Scheme with the associated predicted noise levels;

- details of properties qualifying for temporary re-housing under the Crossrail Noise and Vibration Mitigation Scheme with the associated predicted noise levels;

- details of properties which are borderline qualification for noise insulation and/or temporary re-housing under the Crossrail Noise and Vibration Mitigation Scheme (i.e. where predictions are within 3dB of the relevant trigger levels given in Table 21.1); and

- any other information requested by the *Project Manager* in order to validate the assessment.

21.8.3.3 Baseline Data

The *Contractor* shall use any baseline noise data included in Volume 2A of the Works Information in its noise assessment. The *Contractor* shall review existing baseline data and shall inform the *Project Manager* of the need to obtain additional baseline data. The *Contractor* shall not commence with data gathering until the *Project Manager* has instructed the *Contractor* to do so and accepted the *Contractor*'s proposed methodology for baseline data collection.

The *Contractor* shall be aware that additional baseline monitoring may be required by the local authority and if this is the case the *Contractor* shall immediately inform the *Project Manager* and shall not accept this request from the local authority until instructed by the *Project Manager*.

The *Contractor* shall make provision for calculating demolition and construction noise for each of the core time periods shown in Table 21.1 below.

Where an assessment period is 1 hour the predicted noise levels shall be assessed against the lowest 1 hour baseline level.

Where the calculation interval is specified over a period longer than 1 hour then the calculated level shall be based upon the worst likely hour of activity over that period.

21.8.3.4 Vibration Assessments

The *Contractor* shall carry out an assessment of potential significant vibration impacts that are likely to occur as a result of the *works*. Potential significant impacts will include impacts on the occupants of buildings, on the buildings per se and on vibration sensitive equipment or objects. For the determination of potential significant impacts on buildings and the occupants of buildings proper regard shall be given to the standards and advice given in BS5228-2 and BS7385.

The *Contractor* shall assess the thresholds for potential significant impact for specific properties using the guidance within these standards and submit the assessment for the *Project Manager*'s acceptance prior to the *works* commencing.

If a potentially significant impact is predicted at a property, which is a listed building, the *Contractor*'s heritage specialist shall input into the vibration assessment and the mitigation proposals.

The vibration assessment shall include a survey to identify any vibration sensitive equipment that could be impacted by vibration from the *works*. Where such equipment or objects are identified the vibration assessment shall include an assessment of the risk of adversely affecting the equipment/objects using appropriate tolerance limits derived for each item of equipment/object or classes of equipment/ objects.

The vibration levels shall be calculated in accordance with the calculation procedures and guidance set out in BS 5228 and TRL report 429.

Where the findings of the vibration assessment show the relevant vibration threshold is predicted to be exceeded, the *Contractor* shall not commence the *works* until a Vibration Control and Mitigation Plan has been accepted by the *Project Manager*. The Vibration Control and Mitigation Plan shall include, but not necessarily be limited to:

- Best Practicable Means of minimising vibration levels including community liaison;
- The physical measures proposed to be used to control vibration on-site and, where appropriate, off-site;
- Vibration limits;
- Proposals for monitoring and reporting vibration levels; and
- A vibration trigger action plan setting out the steps to be taken in the event that vibration limits, or other vibration trigger action levels, are exceeded.

21.8.4 Noise Insulation and Temporary Re-housing

21.8.4.1 General

Where noise assessments have been carried out by the *Project Manager*, Volume 2A of the Works Information includes a Site specific noise assessment, which includes construction planning information, noise assessments, construction methodology, proposed mitigation and an assessment of the properties likely to be eligible for noise insulation and temporary rehousing under the Crossrail Noise and Vibration Mitigation Scheme.

The *Contractor* shall review the contents of the noise assessment carried out by the *Project Manager*, and shall either:

- Confirm in writing to the *Project Manager* within 14 days of the *starting date* that the *Contractor*'s proposals for the *works* shall not cause any additional properties to be eligible for noise insulation and/or temporary rehousing; or

- Where the *Contractor* proposes a change to any of the information in the *Project Manager*'s noise assessment, which shall cause any additional properties to be eligible for noise insulation and/or temporary rehousing, the *Contractor* shall submit a revised noise assessment to the *Project Manager* for acceptance within 28 days of the *starting date*. In its assessment the *Contractor* shall provide justification for the change and details of any noise control and mitigation methods proposed to reduce the impact as far as reasonably practicable.

In all cases, the *Contractor* shall be responsible for the implementation of any noise control and mitigation, excluding noise insulation and temporary re-housing, including that required as a result of any changes to the *Employer*'s construction methodology, and any mitigation identified during the *works* in accordance with this part of the Works Information.

Where the *Project Manager* accepts that further noise insulation and temporary rehousing is required, the *Project Manager* will make arrangements for this to be completed by Others.

The Crossrail Noise and Vibration Mitigation Scheme requires that noise insulation and/ or temporary rehousing for any worksite be implemented prior to commencement of the *works* on Site. The *Contractor* shall provide at least 6 months notice to the *Project Manager* in order that any additional noise insulation can be installed or any additional temporary rehousing can be arranged prior to the start of the part of the *works* which give rise to eligibility. The *Contractor* shall include in his Accepted Programme the date by which he shall notify the *Project Manager* of any additional noise insulation and temporary rehousing and the date by which insulation needs to be installed and temporary rehousing needs to be arranged, which is not less than 6 months from the date of notification of the additional requirement.

The *Contractor* shall, after the initial construction noise assessment, keep under review construction assumptions on which noise calculations and evaluations are based and immediately notify the *Project Manager* whether any additional qualifying properties arise at any point during the *works* in accordance with this part of the Works Information.

21.8.4.2 Noise Insulation and Temporary Rehousing Trigger Levels

21.8.4.2.1 Noise Insulation

The trigger levels given in Table 21.1 shall be used by the *Contractor* to assess eligibility for noise insulation and temporary rehousing in accordance with the requirements set out above.

The total noise levels due to the *works* (pre-existing ambient plus airborne Programme construction noise), measured or predicted at a point one metre in front of the most exposed of any windows and doors in any façade of a building, which is an eligible dwelling, are equal to, or exceed, whichever is the higher of, either:

- any of the criteria in Table 21.1; or

- 5 dB above the pre-existing airborne noise level for the corresponding times of day (i.e. the Relevant Time Periods presented in column 2 of Table 21.1); and
- for a period of 10 or more days of working in any 15 consecutive days or for a total of days exceeding 40 in any six consecutive months.

Time	Relevant Time Period	Averaging Time T	Noise Insulation Trigger Level dB $L_{Aeq, T}$
Monday to Friday	07:00 – 08:00	1 hr	70
	08:00 – 18:00	10 hr	75
	18:00 – 19:00	1 hr	70
	19:00 – 22:00	3 hr	65
	22:00 – 07:00	1 hr	55
Saturday	07:00 – 08:00	1 hr	70
	08:00 – 13:00	5 hr	75
	13:00 – 14:00	1 hr	70
	14:00 – 22:00	3 hr	65
	22:00 – 07:00	1 hr	55
Sunday and Public Holidays	07:00 – 21:00	1 hr	65
	21:00 – 07:00	1 hr	55

Table 21.1: Noise Insulation Trigger Level Table

21.8.4.2.2 Temporary Re-housing

Temporary re-housing shall be applied where the total noise level due to the works (pre-existing ambient plus airborne Programme construction noise), measured or predicted at a point one metre in front of the most exposed of any windows and doors in any façade of an eligible dwelling, exceeds whichever is the higher of either:

- 10 dB above any of the noise levels in Table 21.1 above; or

- 10 dB above the pre-existing airborne noise level for the corresponding time of day (i.e. the Relevant Time Periods presented in column 2 of Table 21.1); and

- for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any six consecutive months.

- 21.8.4.2.3 Interpretation of the Noise Insulation and Temporary Rehousing trigger levels

The *Contractor* shall:

- Apply a resolution of 0.1 dB in interpreting where eligibility arises if noise levels in Table 21.1 are met or exceeded (e.g. a value of 55dB would not trigger eligibility whereas a value of 55.1dB would trigger eligibility where the trigger level is 55dB); and

- use the minimum one-hour LAeq.T levels at night to define the pre-existing ambient, by selecting a 7-day survey period during which favourable weather conditions existed (wind speed not more than 5m/s and no precipitation) and select the lowest one-hourly value from that data set.

21.8.4.2.4 Determining eligibility for contiguous facades

When determining the eligibility over contiguous facades, the *Contractor* shall use more than one assessment location if the calculations from different noise measurement locations alongside the same façade differ by at least 3dB.

21.8.4.2.5 Monitoring of trigger levels

Where the *Contractor*'s noise monitoring shows that trigger levels for noise insulation/ temporary re-housing are being exceeded that would result in additional eligibility, the *Contractor* shall identify whether the planned activity causing those levels will carry on for longer than a period of 10 or more days of working in any 15 consecutive days, or for a total of days exceeding 40 in any six consecutive months, and report the findings to the *Project Manager*.

21.8.4.3 Claims after the start of construction

The *Contractor* shall inform the *Project Manager* within 24 hours of receipt of a claim, from any person in the vicinity of the *works* that:

- after the start of construction work, noise levels actually experienced at their dwelling are such as to cause eligibility for noise insulation/temporary re-housing where none was predicted; or

- received levels are sufficient for eligibility for noise insulation/ temporary re-housing where this was predicted, and that the noise has continued, or seems likely to continue for longer than the temporal period predicted (i.e. for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any six consecutive months).

On receipt of such a claim the *Contractor* shall review the works being undertaken, and if they are ongoing, undertake short term noise or vibration monitoring at the claimant's property. The *Contractor* shall then submit the findings of the review to the *Project Manager* within 5 days of receiving the claim.

Where the *Contractor*'s short-term noise monitoring, undertaken in response to a claim, identifies that trigger levels for noise insulation/ temporary re-housing are being exceeded but that operations are being performed in accordance with the conditions of the Section 61 Consent, the *Contractor* shall identify whether the planned activity causing those levels will carry on for longer than a period of 10 or more days of working in any 15 consecutive days, or for a total of days exceeding 40 in any six consecutive months, and report the findings to the *Project Manager*.

The *Contractor* shall:

- identify and implement actions to resolve any valid claim as instructed by the *Project Manager*;
- discuss, in consultation with the *Project Manager*, the results of the review with the claimant and explain the findings and remedial actions to be taken; and
- inform the relevant local authority of the remedial actions if any to be taken in response to the claim.

21.8.4.4 Claims for special cases under the Crossrail Noise and Vibration Mitigation Scheme

Where the *Contractor* is contacted directly by someone who wishes to be considered as a special case under the Crossrail Noise and Vibration Mitigation Scheme, the *Contractor* shall inform the *Project Manager* within 24 hours of receipt of an application.

The *Contractor* shall inform the *Project Manager* of any house boats and mobile homes which are eligible for noise insulation or temporary re-housing in accordance with this part of the Works Information, and where noise insulation is not viable the *Contractor* shall implement alternative mitigation measures as instructed by the *Project Manager*.

21.8.5 Special Case Undertakings and Assurances

The *Contractor* shall be responsible for the discharge and implementation of any noise and vibration control and mitigation requirements specified in any relevant special case undertakings and assurances (see Volume 2A of the Works Information), with the exception of any off-site protection measures such as the installation of noise insulation or the arrangement of temporary re-housing. The *Contractor*'s responsibilities shall include, but not necessarily be limited to:

- the assessment of noise and vibration impacts and the specification of noise and vibration mitigation packages;
- implementation of any special case undertaking trigger level action plans prepared by the Project Manager in respect of those properties included in

Volume 2A of the Works Information covering properties benefiting from undertakings and assurances;

- noise and vibration monitoring in accordance with 21.8.9 below;
- monitoring of compliance with the requirements of the undertakings and assurances;
- provision of evidence, including the results of site audits and noise monitoring, which demonstrates compliance;
- any other surveys and inspections necessary to meet the requirements of the undertakings and assurances (for example condition surveys for vibration damage);
- in support of the *Project Manager* and *Employer*, regular involvement and engagement with the beneficiaries of undertakings and assurances including the occupants/tenants of buildings protected by undertakings and assurances; and
- regular attendance at meetings and provision of support to the *Employer* and *Project Manager* in the negotiation and consultation on noise and vibration aspects of the undertakings.

21.8.6 Section 61 Consents

21.8.6.1 General

The *Contractor* shall obtain consents under the Control of Pollution Act 1974, section 61, for all works (including underground works) for all Working Areas from the relevant local authority (also see Works Information Volume 2B Part 3 Planning, Environmental and Traffic Consents). The section 61 consent application shall include details of the work to be undertaken, including proposed hours of work, site-specific management and mitigation requirements for noise and vibration, both on and off Site.

The *Contractor* shall submit a control of construction noise and vibration plan to the *Project Manager* for acceptance prior to issuing a section 61 consent application to the local authority. The *Contractor* shall not commence construction activities in the Working Areas until formal section 61 consent has been obtained from the local authority and a copy of the granted consent submitted to the *Project Manager* for information.

The *Contractor* shall:

- use the standard section 61 consent application pro-forma given in Appendix 21B;
- include a sample Information Sheet as required by Part 9 of the Works Information in the Section 61 application;

- submit a control of construction noise and vibration plan at least 10 weeks prior to start of construction to the *Project Manager* for acceptance using the pro-forma in Appendix 21C;

- once accepted by the *Project Manager*, use the control of construction noise and vibration plans as the basis of the *Contractor*'s draft section 61 consent applications;

- submit a draft section 61 consent application to the relevant local authority at least 8 weeks prior to the start of construction, unless otherwise agreed with the local authority and *Project Manager* that a draft submission is not necessary;

- submit a formal application for prior consent under section 61 of the Control of Pollution Act, at least 4 weeks in advance of commencement of the *works,* which. addresses the comments received from the local authority on the draft section 61 application in accordance with Best Practicable Means;

- in advance of any Section 61 application, provide notification by letter to the relevant local authority naming the person(s) authorised to sign Section 61 consent applications for the *Contractor*;

- provide construction noise model files and assessment spreadsheets on request from the *Project Manager* or relevant local authority for validation purposes;

- provide sufficient information to the *Project Manager* and the local authority, upon request, in the form of electronic calculation spreadsheets or model files for validation of the predictions, including: noise sources, source levels, source and receiver heights, ground correction, distance and screening data and corrections, façade correction, angle of view corrections, percentage on-time and any other necessary information to facilitate the validation process;

- not submit a draft or final section 61 consent application to the local authority until the *Project Manager* has accepted the *Contractor*'s control of construction noise and vibration plan; and

- hold regular meetings with the *Project Manager* and the local authority to discuss section 61 consent applications and compliance. The *Project Manager* will advise the *Contractor* on an appropriate schedule for these meetings, which the *Contractor* shall agree with the local authority within 6 weeks of the *starting date*.

Where the *works* are wholly within the borders of one local authority but impact upon other local authorities, the *Contractor* shall obtain section 61 consent from the relevant local authority, and forward a copy of the section 61 consent application to adjoining authorities. Where the *works* span the boundaries of more than one local authority, the *Contractor* shall obtain section 61 consents from each of the relevant local authorities.

Where the *Contractor* is working on the same worksite as Others, section 61 consent may be obtained by either the *Project Manager* or the Principal Contractor to cover the *Contractor*'s *works*. In this case the *Contractor* shall be notified by the Principal Contractor or *Project Manager* as appropriate. The *Contractor* shall provide any materials requested by the *Project Manager* or Principal Contractor required in order to gain such consent, and shall comply with the conditions of the section 61 consents.

21.8.6.2 Working Hours

The *Contractor* shall comply with the working hours below unless otherwise agreed in the section 61 consent, variations and dispensations.

The *Contractor* shall adhere to the core working hours of 08:00hrs to 18:00hrs on weekdays and 08:00hrs to 13:00hrs on Saturdays. The *Contractor* may carry out non-disturbing preparatory work, repairs or maintenance on Saturday afternoons between 13:00hrs and 18:00hrs or Sundays between 09:00hrs and 17:00hrs. Except in the case of an emergency, the *Contractor* shall obtain the *Project Manager*'s acceptance in advance of any work required to be undertaken on a Sunday. The *Contractor* shall then obtain the agreement of the local authority (except on sites where 24 hour working has already been agreed by the local authority through the section 61 consent).

All planned activities within and outside of core hours shall be identified in the *Contractor*'s section 61 consent application. Justification for extended hours shall be included in the section 61 consent application for any activity not identified as being normally undertaken on a 24 hour, 7 day per week activity as specified below.

Justification shall comprise an explanation of why the *works* cannot be completed within core working hours, the consequences of not being able to work out of hours and the mitigation which shall be put in place to minimise noise and vibration from the work. Justifications shall take into account safety considerations and engineering constraints, for example works on operational railway land that fall under the railway possession regime and rules of the route.

The *Contractor* shall have a period of up to one hour before and up to one hour after the core working hours for start up and close down of activities. The *Contractor* shall undertake only the following activities during the start up and close down periods:

- 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 Equipment.

During the start up and close down periods, the *Contractor* shall not operate Equipment giving rise to noise likely to exceed the noise trigger levels for the periods either side of the agreed core working hours as specified in this part of the Works Information or as specified in the section 61 consent. The *Contractor* shall not consider the start up and close down periods an extension of core working hours, and shall take particular care to limit and control disturbance to local residents during these periods.

The *Contractor* shall 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.

Deliveries shall be arranged to minimise impacts on the road system. Abnormal and special loads may be delivered outside the core working hours provided that this has been approved by the relevant highways department of the local authority.

The *Contractor* shall ensure that all construction related traffic serving the works abides by the agreed hours of working for each specific location. The hours of working agreed with the local authority shall include the timing of deliveries, off-loading and loading from the public highway. The *Contractor* shall ensure that deliveries, other than abnormal loads which are agreed, shall not take place outside the core working hours and the start up and close down periods without the prior agreement of the local authority, or as otherwise advised by the local authority.

The *Contractor* shall ensure vehicles awaiting loading or off-loading do not leave engines running when not directly in use.

Excavated material shall only be removed from the Working Areas by road transportation during core working hours.

Activities that may normally be undertaken on a 24 hours per day, 7 days per week basis will be limited to:

- tunnelling works together with directly associated activities (such as maintenance of tunnelling equipment, construction of cross passages and installation of tunnel linings);
- transportation, storage and removal of excavated material by conveyor, barge and rail;

- operation and maintenance of items of Equipment needed in order to safeguard and support the *works*, such as fans, compressors, generators and batching Equipment, such Equipment shall be shielded in order to provide appropriate noise attenuation;

- collection of data and samples; and

- surface support to the underground work, including welfare facilities, craneage, workshops and stores.

The *Contractor*'s section 61 consent application shall describe all works to be carried out on a 24 hour, 7 day per week basis as listed above.

Where the *Contractor* can demonstrate that the Accepted Programme would be significantly affected by not being able to remove excavated material by road outside of the core working hours, the *Contractor* shall obtain the *Project Manager*'s acceptance in advance for additional hours for the removal of excavated material. The *Contractor* shall then obtain the agreement of the local authority through a section 61 consent, or variation/dispensation to an existing consent as appropriate.

The *Contractor* may keep items of Equipment running 24 hours per day provided that they are necessary in order to safeguard the works. The *Contractor* shall shield any such Equipment in order to provide appropriate noise attenuation.

The *Contractor* shall collect data and samples outside core working hours on occasion as directed by the *Project Manager*.

The *Contractor* shall undertake certain works, outside the core working hours, namely 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.

21.8.6.3 Section 61 Consent conditions

In reviewing the acceptability of any conditions applied to the *Contractor*'s section 61 consent, variation or dispensation from section 61 consent the *Contractor* shall check that conditions are reasonable and consistent with those in the *Employer*'s model consent conditions given in Appendix 21L.

The *Contractor* shall inform the *Project Manager* immediately of conditions not included in the model consent conditions, or conditions which are considered unreasonable by the *Contractor*.

The *Contractor* shall liaise with the local authority and consult with the *Project Manager* to attempt to resolve any issues with section 61 consents prior to lodging an appeal. The *Contractor* shall be aware that an appeal for a failure to determine a section 61 consent, or an appeal against limitations or conditions contained within a section 61 consent shall be lodged with the Secretary of State within 21 days after the end of the determination period.

21.8.6.4 Dispensations

Where the *Contractor* has to reschedule construction activities which have been granted a section 61 consent, for reasons not envisaged at the time of the submission, the *Contractor* shall submit a dispensation application by post to arrive at the local authority at least 14 days in advance of the start of these proposed activities, and submit an additional copy by email.

The *Contractor* shall obtain dispensation from a section 61 consent for any material changes to consented working methods which are predicted to result in an increase to predicted noise or vibration effects. This is likely to be a revision to working hours, work duration, persistent overrun, or major changes to the proposed construction methodology, for example, changes to major items of Equipment.

The *Contractor* shall submit the dispensation application to the *Project Manager* for acceptance 7 days prior to submitting it to the local authority and shall not submit the application to the local authority until the *Project Manager* has accepted it.

A dispensation shall be sought by means of an application using the dispensation pro-forma given in Appendix 21D, and shall include details of the revised construction programme and/ or method, revised noise and vibration calculations, mitigation measures and eligibility for insulation/temporary re-housing issues resulting from the revised works in accordance with this section of the Works Information.

21.8.6.5 Variations

Where rescheduling relates to work that is of a critical nature for reasons not envisaged and is expected to extend beyond the core working hours or the hours agreed with the local authority in the section 61 consent or exceed the agreed limits and dispensation to the section 61 consent, the *Contractor* shall apply for a variation from the section 61 consent to the local authority. Applications for a variation from the section 61 shall be submitted, by email, to the local authority, by the *Contractor*, at least 48 hours in advance and at least 7 days in advance if works are expected to last for a period of 5 days or more.The variation application shall be submitted using the pro-forma included in Appendix 21E and include the details of the revised construction programme or method and the relevant noise calculations.

21.8.6.6 Over-runs

In the event that pre-planned construction activities extend beyond the hours approved by the local authority in the section 61 consent (including any variations or dispensations) due to unforeseen circumstances, the *Contractor* shall immediately notify (by telephone followed by a confirmatory email) the local authority and the *Project Manager*. The *Contractor* shall use the section 61 overrun pro-forma included in Appendix 21F. This notification shall include the time, location, and nature of the over-run and the *Contractor* shall keep written records of the event, including communication with the local authority. The local authority will provide a telephone number and nominate an officer to receive such notifications.

21.8.6.7 Emergencies

In the case of work required in response to an emergency or which if not completed would be unsafe or harmful to permanent works, the *Contractor* shall inform the *Project Manager* and the local authority immediately by telephone, and follow with an email, of the reasons for, and likely duration of the works. The local authority will provide the *Contractor* with a telephone number and nominate an officer to receive such notifications.

21.8.6.8 Breaches of section 61 consents

If measured noise levels exceed the predicted noise levels contained in the *Contractor*'s Section 61 application by more than 3 dB(A) the *Contractor* shall investigate and determine if this was likely to have been due to the *works*. If the breach was due to the *works* then the *Contractor* shall check to ensure that Best Practicable Means (BPM) were/are being used to control noise and vibration from the *works*. All reasonably practicable steps shall be taken to reduce noise and vibration levels.

21.8.7 Local Authority Liaison

The *Contractor* shall make available the results of any noise and vibration monitoring to relevant local authorities. The *Contractor* shall allow access to the Working Areas at all reasonable times for inspection and/or noise measurements by the local authority environmental health personnel, following site specific induction and/or health and safety training.

21.8.8 Not Used

21.8.9 Control Measures

The *Contractor* shall comply with BS 5228 with regard to noise and vibration mitigation options. Where the *Contractor* considers that alternative authoritative guidance and procedures are more reasonable the *Contractor* shall submit proposals for using such guidance and procedures to the *Project Manager* for acceptance prior to deviating from BS5228.

The *Contractor* shall maintain all vehicles, Equipment and noise control measures in good and efficient working order and operated to minimise noise emissions.

21.8.9.1 Selection and Use of Equipment

The *Contractor* shall:

- ensure that each item of Equipment complies with the noise limits quoted in the European Commission Directive 2000/14/EC/United Kingdom Statutory Instrument (SI) 2001/1701;

- locate Equipment liable to create noise and/or vibration whilst in operation away from sensitive receptors and use barriers to absorb and/or deflect noise away from noise sensitive areas;

- use Equipment and techniques that are non-vibratory means of dismantling attached buildings prior to demolition;
- not operate any defective Equipment or items fitted with noise control equipment until repaired;
- give preference to fixed items of construction Equipment that are electrically powered rather than diesel or petrol driven;
- use vehicles and mechanical Equipment fitted with effective exhaust silencers;
- shut down or throttle down to a minimum machines in intermittent use during periods between work; and
- house static noise emitting Equipment operating continuously within suitable acoustic enclosure.

21.8.9.2 Reversing Alarms

The *Contractor* shall control and limit noise from reversing alarms and shall use the following hierarchy (in order of preference, with the most desirable option listed first, and the least desirable listed last):

- design the site layout to limit and avoid the need for the reversing of vehicles and ensure that drivers are familiar with the worksite layout;
- utilise banksmen to avoid the use of reversing alarms;
- use reversing alarms incorporating one or more of the features listed below or any other comparable system:
    - highly directional sounders;
    - use of broadband signals;
    - self adjusting output sounders; and
    - flashing warning lights; and
    - set reversing alarms to the minimum output noise level required for health and safety compliance.

21.8.10 Noise and Vibration Inspections and Monitoring

21.8.10.1 Construction Inspections

The *Contractor* shall regularly inspect the *works* to ensure that the steps taken to control construction noise and vibration are compliant with Best Practicable Means and the specific requirements of the Section 61 consent. The *Project Manager* shall be notified immediately of any non-compliance issues.

21.8.10.2 Noise Monitoring

The *Contractor* shall undertake noise monitoring in order to:

- comply with the the Section 61 consent process;
- satisfy the requirements of any consent obtained under Section 61 of the Control of Pollution Act 1974;
- satisfy the requirements of the special case undertakings and assurances where noise mitigation packages must be implemented (see specific requirements in 21.4.8 above);
- satisfy the requirements of the Crossrail Noise and Vibration Mitigation Scheme (see specific requirements set out in the noise insulation requirements above); and
- respond to any complaints or incidents about noise and vibration.

The *Contractor* shall undertake noise and vibration monitoring with particular reference to the trigger action levels, set out in the trigger action plans, which have been prepared for properties which benefit from special case undertakings and assurances (see 21.4.8 above).

The *Contractor* shall develop a noise monitoring programme, including monitoring locations, that aligns with the Accepted Programme and shall submit their monitoring programme to the *Project Manager* for acceptance as part of the noise and vibration section of the Environmental Plan.

The *Contractor* shall also detail the monitoring method to be used and shall submit their method statement to the *Project Manager* for acceptance.

Although it is for the *Contractor* to agree the details of the noise monitoring programme with the *Project Manager* he shall use a combination of unattended monitoring (using semi-permanent equipment), and attended monitoring will be employed.

Attended monitoring shall be carried out weekly, as a minimum, at several locations around the site on a sampling basis in accordance with BS 5228 Part 1, unless otherwise accepted by the *Project Manager*. Such monitoring shall be carried out by the noise and vibration specialist .

All measurements shall be carried out using current best practice and shall adhere to the relevant guidance on monitoring set out in the Annex G of BS 5228-1 [1]The *Contractor* shall:

- retain all noise monitoring results (tabulated in electronic format) for at least 6 months after the contract end date; and provide data to the Project Manager within 2 days of a request and within 7 days of the end of the related works; and

- maintain an inventory of all noise and vibration monitoring equipment.

21.8.10.3 Noise Monitoring Equipment

Measurements of noise levels shall be undertaken with sound level measuring Equipment conforming to BS EN 61672-1 (IEC 61672-1), Type 1. The sound level meter shall be capable of real time analysis giving statistical levels measurements and measure LAeq, LAmax and LA90 as a minimum.

Microphones shall be fitted with an all weather microphone protection kit to protect the Equipment from damage. The meter shall be set to record on a fast time response, with random microphone correction.

Semi-permanent Equipment shall be able to provide text alerts to 3-4 designated numbers when any preset trigger values are exceeded. The Equipment shall be capable of setting trigger values for different periods of the day / night. The monitor shall also be capable of being remotely downloaded via GSM modem. Semi-permanent Equipment shall be kept in a secure location which is not publicly accessible. The microphone(s) shall be supported/ located at 1m from the façade of the building and be able to be retracted so that the Equipment can be calibrated weekly.

For attended monitoring Equipment, the *Contractor* shall check the calibration level of the noise measurement instrumentation at the start and end of each survey using a sound level calibrator compliant with BS 7189:1989. Use sound level calibrators which have been calibrated, within two years of use, by a calibration laboratory whose measurements are traceable to national or international standards.

All monitoring Equipment shall be calibrated by an UKAS approved (or equivalent) test laboratory every 12 months, and have test certificates available.

21.8.10.4 Vibration Monitoring

The *Contractor* shall undertake vibration monitoring in order to:

- satisfy the requirements or conditions of any Section 61 consent from the local authority;
- satisfy the requirements of the vibration control and mitigation plan;
- satisfy the requirements of any special case undertakings and assurances; and
- respond to any incidents or complaints.

Such monitoring shall be carried out by the noise and vibration specialist.

The *Contractor* shall develop a vibration monitoring programme that aligns with the Accepted Programme and shall submit their monitoring programme to the *Project Manager* for acceptance as part of the noise and vibration section of the Environmental Plan.

Continuous vibration monitoring shall be carried out at buildings where significant impacts may affect the occupants of buildings, the building itself or vibration sensitive equipment over an extended period. Attended vibration monitoring shall be used to supplement data obtained from continuous monitoring or in situations where specific temporary activities are the source of the risk. The *Contractor* shall use the vibration measurements to:

- compare measured vibration levels against vibration limits or other threshold levels specified in any trigger action plans agreed with the beneficiaries of special case undertakings and assurances,
- check whether all Best Practicable Means are being used to control vibration levels;
- investigate any vibration complaints;
- compare measured vibration levels against vibration limits or other threshold levels; and
- investigate the reasons for any breach of any vibration limits.

The frequency of vibration monitoring shall depend upon the intensity of the construction activity and the risk of the occurrence of a significant impact. The risk of a significant impact shall depend upon, amongst other matters, the level of vibration, the time of day, duration of exposure and the usage of premises.

Where vibration monitoring is required measurements and calibration of equipment shall be made following the guidance in BS 5228-2.

As well as the results of the vibration monitoring, detailed observations of various factors shall be recorded, including:

- condition of the building;
- construction activities which may give rise to significant vibration;
- other extraneous vibration inducing activities (e.g. train or HGV movements);
- indicative ambient vibration levels, including transient event peaks;
- mitigation measures in place; and
- whether Best Practicable Means are in use at the time of the vibration monitoring.

21.8.11 Communications and Reporting

All communications with the owners and occupiers of properties who may be affected by noise and vibration from the *works* shall be managed by the *Contractor* with prior agreement from the *Project Manager*.

The *Contractor* shall submit the format of reports for the *Project Manager*'s acceptance:

- reporting to the local authority and meeting the requirements of the Section 61 application/consent; and
- reporting to key stakeholders to whom special case undertakings and assurances have been made.

Noise and vibration monitoring reports shall be submitted to the local authority and key stakeholders weekly (unless otherwise agreed with the local authority/ key stakeholders and the *Project Manager*) and the *Contractor* must comply with any specific requirements imposed by the local authority.

21.9 Waste and Materials Resource Management

21.9.1 General

The *Contractor* shall manage the excavated materials and demolition and construction wastes generated from the Working Areas in accordance with the waste hierarchy described in this part of the Works Information and in a cost efficient manner.

The *Contractor* shall manage waste Consents, such as environmental permits and exemptions, in accordance with Works Information Volume 2B Part 3 Planning, Environmental & Traffic Consents.

The *Contractor* shall be aware that permanent disposal of waste or spoil within the powers of the Crossrail Act 2008 requires a Schedule 7 consent.

The *Contractor* shall be aware that the *Employer* has an agreement with HM Customs and Excise that all hazardous waste sent for disposal from the Project prior to 1st April 2012 will be exempt from landfill tax provided that advance notification is provided. The *Contractor* shall provide such information, as required by HM Customs and Excise, to the *Project Manager*, at least 4 weeks in advance of the start of disposal operations, or prior to the use of a different landfill site. The *Contractor* shall ensure that it has received confirmation from the *Project Manager* that Her Majesty's Revenue and Customs have been notified prior to commencing disposal.

The *Contractor* shall use the Crossrail version of the Building Research Establishment Smartwaste software to record waste information and data.

21.9.2 Site Waste Management Plan

The *Contractor* shall produce a Site Waste Management Plan and submit it to the *Project Manager* for acceptance. In the case of the first submission of the Site Waste Management Plan the *Project Manager* will reply within 4 weeks of the date of submission. Any further revisions, submissions and responses shall be made

within the *period for reply*. The *Contractor* shall not commence work on site until the *Project Manager* has accepted the Site Waste Management Plan.

The Site Waste Management Plan shall be:

- produced and updated by the Waste Manager in conjunction with the Environment Manager;
- appropriate to all activities included in the *works*; and
- part of the *Contractor*'s environmental management system.

The Site Waste Management Plan shall include (but not necessarily be limited to):

- the management processes and procedures for complying with legal waste requirements and all the waste requirements of the Works Information - it may include existing corporate procedures, plans or other documents provided that these meet legal requirements and the requirements of the contract. ;
- the roles and responsibilities including the job title of the nominated person responsible for each task;
- the processes for liaison and communication with Others, including neighbouring contractors and statutory bodies, where required by this part of the Works Information;
- the processes for liaison and communication with subcontractors and suppliers of any tier and ensuring compliance with the requirements described in this part of the Works Information;
- sample(s) of waste transfer notes that will be used;
- specific measures for the handling and management of excavated materials and waste in accordance with the waste hierarchy;
- auditing the actions of other parties in the waste handling chain;
- procedures for the administrative arrangements for record keeping; and
- the information and data that the *Contractor* shall input to the Crossrail version of the Building Research Establishment's Smartwaste software as a section of, or appendix to, the Site Waste Management Plan including: a list of actions to reduce, reuse and recycle waste; and an estimate of the total quantities of waste (in tonnes), the estimated reuse and recycling rates and percentage of reused and recycled content after mitigating actions (distinguishing

construction, demolition and excavation wastes) which shall be used for reviewing performance against waste targets;

- The Crossrail version of the Building Research Establishment's Smartwaste software will initially be populated by the *Project Manager* who will be responsible for providing the initial waste forecast for this contract. Thereafter the *Contractor* shall keep up-to-date all information and data in the Crossrail version of the Building Research Establishment's Smartwaste software.

The *Contractor* shall comply with the DEFRA Guidance, Non-statutory guidance for Site Waste Management Plans, April 2008.

The *Contractor* shall train all personnel, including Subcontractors, with direct or indirect responsibilities under the Site Waste Management Plan, on the contents of the Plan that apply to their work in accordance with this part of the Works Information.

21.9.3 Waste Hierarchy

The *Contractor* shall use the national hierarchy for management of excavated materials and demolition and construction waste. The national hierarchy is, in order of preference, with the most desirable option listed first and the least desirable option last:

- minimise the generation of material;
- reuse and/or recycle materials within the Project or Programme;
- reuse and/or recycle materials for beneficial use on other projects; and
- dispose of material at licensed sites.
- Excavated materials and waste shall only be disposed of at landfill sites if all other options have been fully investigated by the *Contractor*.

The *Contractor* shall:

- develop and implement waste minimisation techniques including, but not limited to:
    - manage materials storage to prevent spoilage, damage and contamination;
    - minimise wastage allowances;
    - avoid, reduce and reuse packaging;
- adopt methods that maximise off-site manufacture and assembly and modularisation of components taking into account the benefits of this, such as

dealing with limited space available on the worksites, time savings, financial savings, improved health, safety and working conditions by reducing work on-site, improved environmental performance, improved productivity, reduced numbers of deliveries, commissioning advantages from installing pre-tested items, and improved product quality and operational control;

- develop and implement on-site segregation of surplus Equipment and Plant and Materials, including demolition waste, surplus materials and packaging for reuse or recycling;

- re-use the excavated material and construction and demolition waste within the Project and Programme, and on or near to the sites where it is generated (preferably in higher value applications), and where this is not feasible, identify suitable projects or other opportunities for re-use of the excavated material and construction and demolition waste, preferably within the Greater London area;

- maintain records of the volumes/quantities and types of surplus materials when these do arise and identify potential beneficial use; and

- develop a materials register for submission to the *Project Manager* at hand-over that identifies main material types in the construction works to facilitate recycling during deconstruction.

Contaminated material that is reused shall be remediated to make it suitable for reuse, by the *Contractor*, or if the material is not suitable for reuse, shall be transported to treatment facilities. If no other options are acceptable to the *Project Manager*, the *Contractor* shall transport contaminated material to licensed landfill sites.

21.9.4 Performance in managing and reducing waste

To assist in meeting the *Employer*'s commitment to Government waste reduction targets, the *Contractor* shall:

- include in the Site Waste Management Plan targets for waste reduction, reuse and recycling which meet or exceed the performance stated below; and

- reduce waste to meet the following targets:

- reuse and recycle at least 95% of clean excavated waste, and aim to achieve 100%;

- reuse and recycle contaminated waste to achieve a target to be instructed by the *Project Manager*; and

- reuse and recycle at least 90% of demolition waste, and aim to exceed 95%;

- reuse and recycle at least 90% of construction waste, and aim to exceed 95%.

Where materials arising from the works are transferred via a materials recycling facility, the *Contractor* shall obtain data from the operator of the facility on the final destination of the waste and shall use this information to ensure that overall waste targets as given above are met.

21.9.5 Duty of Care

The *Contractor* shall comply with Waste Management – The Duty of Care, A Code of Practice (HMSO March 1996) except where superseded by changes in waste law made since its issue in 1996.

21.10 Air Quality

21.10.1 General

The *Contractor* shall control and limit emissions of gaseous and particulate pollutants from vehicles and Equipment and dust and other atmospheric emissions from construction activities to the atmosphere from the Working Areas. The *Contractor* shall identify potential sources prior to the commencement of *works* and shall apply appropriate control techniques throughout the *works*. This should include consideration of the impacts of using volatile substances on site and the selection of low volatility alternatives.

The *Contractor* shall develop and implement an air quality section of the Environmental Plan setting out how all legal and contractual dust and air quality requirements shall be managed as specified in this part of the Works Information. The plan shall include the nominated person responsible for each task and shall be produced and updated by the Air Quality Specialist in conjunction with the Environment Manager.

21.10.2 Vehicle and Equipment Emissions

The *Contractor* shall implement the following measures to limit emissions and avoid nuisance:

- not leave the engines of vehicles and Equipment running unnecessarily;
- maintain vehicles and Equipment through a programme of routine servicing completed in accordance with the manufacturer's recommendations and keep records for the work undertaken;
- locate haul routes and operate Equipment away from potential sensitive receptors including, but not limited to, houses, schools and hospitals;
- avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment; and

- use commercial road vehicles that meet Euro 3 standards during the works as set out in the EC Directive 98/69/EC (commonly known as Euro standards).

all non-road mobile machinery shall:

- use fuels with a sulphur content equivalent to ultra low sulphur diesel fuel meeting the specification within EN590:2004:
- comply with the current or immediately previous EU Directive Staged Emission Standards; and
- if not compliant with Euro III(b) or IV, and the power output is over 37kW, be fitted with an after-treatment device(s) stated on the approved list managed by the Energy Saving Trust, and ongoing conformity to a performance standard to be defined by the *Project Manager* shall be ensured through a programme of on-site checks which shall be recorded. This requirement may be relaxed on a case-by-case with prior acceptance of the *Project Manager.*

21.10.3 Dust

21.10.3.1 General

The *Contractor* shall design and implement measures to reduce the impact of dust from the Working Areas on the air quality in neighbouring areas prior to commencement of works that have the potential to release dust into the atmosphere.

21.10.3.2 Dust Risk

The *Employer* has assessed the dust risk for each worksite and categorised each as follows:

- Tier 1 – low risk of dust emissions
- Tier 2 – medium risk of dust emissions, real time monitoring required
- Tier 3 – high risk of dust emissions, real time monitoring required.

These tiers for dust risk have been assessed on the basis of site activities and sensitivity of nearby receptors.

The *Project Manager* shall inform the *Contractor* if these additional receptors result in a change of Tier for dust risk and associated control measures, inspections and monitoring, which the *Contractor* shall then implement.

21.10.3.3 Dust Monitoring

The *Contractor* shall undertake dust monitoring for each tier 2 (medium risk) and tier 3 (high risk) worksite identified in Works Information Volume 2A.

The *Contractor* shall:

- undertake monitoring using Osiris, Topaz, DustScan monitors (or equivalent subject to the acceptance of the *Project Manager*);

- deploy a minimum of two instruments at each worksite positioned at the site boundary, at potential receptors or in a transect orientated to the prevailing wind to suit the worksite characteristics;

- obtain any consents and other statutory approvals required in order to install and operate dust monitoring equipment;

- retain all dust monitoring results for at least 6 months after the contract end date; and provide data to the *Project Manager* within 2 days of a request and within 7 days of the end of the related works; and

- assist the *Project Manager* and *Employer* in consultation with stakeholders and statutory undertakers as required, including the preparation of reports, presentation of materials and attendance at meetings.

21.10.3.3.1 Dust monitoring plan

As part of the air quality section of the Environment Plan, the *Contractor* shall prepare a dust monitoring plan for each worksite identified in Works Information Volume 2A. The dust monitoring plan shall describe the *Contractor*'s method for dust monitoring and the proposed locations for dust monitoring stations and, as a minimum, include the following requirements:

- the type of instruments to be deployed;

- a list of any consents and other statutory approvals the *Contractor* needs to obtain in order to locate and install dust monitoring equipment;

- a site action level;

- procedures for the collection and interpretation of monitoring data and providing period dust monitoring reports (to include analysis of dust monitoring data , breaches of site action level and summary of actions taken) the *Project Manager* or on a more frequent basis as agreed with the *Project Manager*;

- procedures for reporting any breach of site action levels to site supervisors, the *Project Manager*, the other stakeholders as advised by the *Project Manager*; and

- procedures for responding rapidly to the site action level being breached, including remedial measures.

21.10.3.3.2 Baseline Monitoring for Tier 3 (High Risk) Worksites only

The *Contractor* shall establish a baseline prior to the commencement of *works* for each Worksite identified in Works Information Volume 2A. In establishing this baseline, the *Contractor* shall:

- ensure that a minimum of four weeks of baseline data is recorded prior to commencement of *works*;
- install dust monitoring equipment and alarm and ensure that it is all fully operational within two weeks of the relevant access date for the worksite or commencement of site mobilisation whichever is the later;
- use information derived from a 12 month period derived from data sourced from local background PM10 concentrations measured by the Automatic and Urban Network (AURN) monitoring sites and appropriate local authority monitoring sites;
- establish the annual average, 24 hour average and peak (15 minute) PM10 concentrations;
- use data from more than one monitoring location if located at a similar distance from the worksite;
- collect data as PM10 $\mu g.m^{-3}$;
- store the annual average, 24 hour averages and record the number of breaches of the 24 hour standard ($50\mu g.m^{-3}$) for future reference;
- update baseline annually during the *works* for each worksite; and
- avoid local, unidentified sources which may create a false baseline; and note any unusual activity in the vicinity of monitoring sites that may affect monitoring results.

21.10.3.3.3.Site Action Levels

The *Contractor* shall set up the dust monitoring equipment to operate an alarm (PC-based or mobile phone) when a pre-determined site action level is reached.

For tier 2 (medium risk) sites, the *Contractor* shall set a site action level of $250\mu gm^{-3}$ (15 minute average).

For tier 3 (high risk) sites, the site action level will be agreed between the *Project Manager* and the local authority and any relevant statutory authorities by reference to the baseline data collected. Subject to consultation with the *Project Manager* and local authority, a preliminary site action level of $250\mu g.m^{-3}$ (15 minute average) shall be adopted by the *Contractor*.

When the site action level is reached, an alarm will be triggered and then the *Contractor* shall:

- immediately undertake an investigation of activities on site, by the *Contractor*'s nominated person, to ascertain if any visible dust is emanating from the site or activities are occurring that are not in line with specified dust control measures;
- notify the *Project Manager* within 24 hours of the trigger action level being reached;
- rectify any identified causes, record actions in the dust log pro-forma included in the Works Information Volume 2B Part 21 Appendix 21M, and notify the *Project Manager* of actions; and
- if the cause of the site action level being breached is not related to site operations, record the outcome of the investigation in the dust log pro-forma included in the Works Information Volume 2B Part 21 Appendix 21M, and report to the *Project Manager* as soon as the investigation is complete.

Review 15 minute averages and where there are frequent occurrences exceeding the preliminary site action level of 250µg.m^{-3} the *Contractor* may propose a higher site action level. For tier 2 (medium risk) sites this will be subject to acceptance by the *Project Manager*. For tier 3 (high risk) sites, this will be subject to acceptance by the *Project Manager* and consultation with the local authority.

21.10.3.4 Dust Control Measures

The control measures and inspections described below are the minimum requirements that apply to all Working Areas. The *Contractor* shall be aware that schedule 7 consent decision notices issued by the local authority may specify additional dust control measures to those specified in this Works Information.

For Tier 1 (low risk), 2 (medium risk) and 3 (high risk) Worksites the *Contractor* shall:

- not burn any materials;
- provide an adequate water supply to the Working Areas;
- dispose of run-off water from dust suppression activities, in accordance with the appropriate legal requirements and this Works Information;
- maintain all dust control equipment in good condition and record maintenance and servicing activities;
- keep site fencing, barriers and scaffolding clean using wet methods;
- provide easily cleaned hardstanding for vehicles;
- ensure regular cleaning of hardstandings using wet sweeping methods;

- not allow dry sweeping of large areas;
- provide and ensure the use of wheel wash facilities near the site exit wherever there is a potential for carrying dust or mud out of the Working Areas onto the highway;
- fit wheel wash facilities with rumble grids to dislodge accumulated dust and mud prior to leaving the Site wherever there is a potential for carrying dust or mud out of the Working Areas;
- ensure there is an adequate area of hard surfaced road between wheel wash facilities and the Working Area exit, wherever site size and layout permits;
- install hard surfaced long term haul routes, which are regularly damped down with fixed or mobile sprinkler systems and regularly cleaned;
- inspect haul routes for integrity and instigate necessary repairs to the surface immediately;
- regularly damp down un-surfaced haul routes and Working Areas in dry conditions;
- routinely clean public roads and access routes using wet sweeping methods;
- position the exhausts of vehicles working on site to minimise the risk of re-suspension of ground dust (exhausts should point upwards where this is possible according to vehicle design and preference shall be given to the selection, purchase and use of vehicles and Equipment with exhausts that point upwards);
- impose and signpost maximum speed limits of 5 mph on un-surfaced haul routes and Working Areas and 10 mph on surfaced haul routes and Working Areas (where long haul routes are required, the *Contractor* may submit any proposals for increasing these speed limits including additional control measures to the *Project Manager* for acceptance who, with the assistance of the *Contractor*, will seek the agreement of the local authority);
- fully sheet all vehicles carrying loose or potentially dusty material to or from the Working Areas;
- 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;
- mix large quantities of cement, bentonite, grouts and other similar materials in designated areas which shall be enclosed or shielded;
- store materials with the potential to produce dust away from Working Area boundaries;

- ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out;
- minimise the amount of excavated material stockpiled in the Working Areas and sheet, seal or damp down unavoidable stockpiles of excavated material held in the Working Areas;
- avoid double handling of material (wherever reasonably practicable);
- use water suppression during demolition operations;
- hold a copy, on site, of the permit required for any crushing or grinding Equipment 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 SI1973;
- use enclosed rubble chutes and conveyors on crushing or grinding Equipment or use water to suppress dust emissions;
- use enclosed conveyors where crossing roads, other public areas and property which is not in the ownership or control of the *Employer*;
- sheet or otherwise enclose loaded bins and skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling Equipment and use fine water sprays on such Equipment;
- seal or re-vegetate completed earthworks immediately after completion;
- use design/prefabrication to reduce the need for grinding, sawing and cutting on site; and
- use cutting, grinding or sawing Equipment fitted, or in conjunction with, suitable dust suppression techniques such as water sprays or local extraction.

For Tier 2 (medium risk) and Tier 3 (high risk) worksites the *Contractor* shall also:

- Strip insides of buildings before demolition;
- Bag and remove biological debris (such as birds nests and droppings) or damp down such material prior to demolition;
- Retain walls and windows, wherever reasonably practicable, while the rest of the building is demolished to provide a screen against dust;
- Screen buildings where dust producing activities are taking place with debris screens or sheeting;

- Avoid carrying out earthworks during dry weather if reasonably practicable having regard to programme or provide, and ensure appropriate use of, water sprays to control dust;

- Seed or seal excavated material and soil stockpiles;

- Ensure slopes on stockpiles are no steeper than the natural angle of repose of the material and maintain a smooth profile;

- Ensure equipment is readily available on site to clean any spillages, and clean up spillages immediately;

- Ensure mixing of cement, bentonite, grout and other similar materials takes place in enclosed areas remote from site boundaries and potential receptors;

- Use increased hoarding height, where appropriate, to protect receptors;

- Fully enclose sites or specific operations where there is a high potential for dust production and the site is active for an extensive period.

The *Contractor* may propose alternative control measures provided that the resulting control is at least as effective as that arrived at using the measures specified above. The *Contractor* shall submit any proposals to the *Project Manager* for acceptance and shall not implement them until the *Project Manager* has granted acceptance.

The *Contractor* shall use additional measures to control the dust risk at high risk (tier 3) Worksites, including nominating designated personnel on site to monitor and manage dust emissions.

21.10.3.5 Dust Inspections

The inspections described below are the minimum requirements that apply to all Working Areas. The *Contractor* shall be aware that schedule 7 consent decision notices issued by the local authority may specify additional inspections to those specified in this Works Information.

The *Contractor* shall:

- record all inspections of haul routes and any subsequent action on the dust log pro-forma, to be provided by the *Project Manager,* at least once a day;

- carry out site inspections to monitor compliance with dust control procedures in accordance with this part of the Works Information and record the results of the inspections, including nil returns, in the dust log pro-forma at least once a day;

- 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

- record any exceptional occurrences causing dust episodes on or off the site and the action taken to resolve the situation.

21.10.4 Odour

The *Contractor* shall adopt measures so as to avoid the creation of statutory nuisance from odours, including, but not limited to:

- covering containers holding waste and regularly removing waste containers from site;
- programming works including, but not limited to, works on sewers;
- removing odour source;
- spraying with an approved oxidising agent; and
- applying an odour guard or masking agent.

21.11 Water

21.11.1 General

The *Contractor* shall undertake the *works* and implement working methods developed to protect surface and groundwater from pollution and other adverse impacts including change to flow volume, water levels and quality and shall do so in accordance with appropriate industry guidance.

The *Contractor* shall avoid interference with surface water features and existing drainage patterns, including important subterranean flows to wetland. Where surface water features, existing drainage patterns, new or extended culverts, stream diversions, and balancing ponds are interfered with as a necessity to Provide the Works the *Contractor* shall ensure:

- that necessary works are positioned, designed and constructed to minimise impacts in terms of flow, minimise or manage flood risk, dewatering, water quality, erosion and/or sedimentation, resulting in adverse impacts on paleoenvironmental, archaeological, ecological or landscape resources;
- continuity of surface flows be maintained to mitigate impacts, by means of stream diversions, creation of natural banks and features. Where these means are not feasible the *Contractor* shall submit a request to the *Project Manage*r to use culverts; and
- mitigation of ecological impacts and nature conservation benefits be provided for drainage works.

The *Contractor* shall develop and implement a water section of the Environmental Plan setting out how all legal and contractual water requirements shall be managed as specified in this part of the Works Information. The plan shall include the nominated person responsible for each task and shall be produced and updated by the Environment Manager.

21.11.2 Consents

The *Contractor* shall be aware of schedule 17 of the Crossrail Act 2008 that differs to normal legislation:

- Part 3: which requires a consent regime for protection of land drainage, flood defence, water resources and fisheries;
- Part 5: which requires a consent regime for protection of land owned by British Waterways Board; and
- Part 6: which requires a consent regime for the protection of the Port of London Authority and the users of the river.

The *Contractor* shall prepare Schedule 17 consent applications using the *Employer*'s templates given in Appendices 21I, 21J and 21K. The applications shall include method statements, temporary works drawings, plans, reports and any other supporting information required to meet the consent granting body's requirements. The *Contractor* shall submit these consent applications to the *Project Manager* for acceptance in order for the *Employer* to submit to the consent-granting body for approval.

The *Contractor* shall manage water consents as in accordance with the Works Information Volume 2B Part 3 Planning, Environmental and Traffic Consents..

The Crossrail Act 2008 disapplies various Consents that are required under normal legislation as set out in Works Information 2A.

For Schedule 17 Part 3 the *Contractor* shall submit the following notices to the Environment Agency, using the pro-formas given in Appendices 21G and 21H of this part of the Works Information:

- notice to commence works covered by a Schedule 17 Part 3 consent that has already been obtained by the *Employer* - to be submitted to the Environment Agency 14 days prior to the start of relevant works; and
- notice of completion of works covered by a Schedule 17 Part 3 consent that has already been obtained by the *Employer* - to be submitted to the Environment Agency not later than 7 days after the date on which the works are brought into use.

21.11.3 Site Drainage

The *Contractor* shall:

- ensure that site drainage, including surface run-off and dewatering effluents, be discharged to sewers, unless consent is obtained for alternative discharge arrangements as agreed with *Project Manger*;

- ensure that the site drainage meets the effluent and flood risk standards required by the sewerage undertaker or Environment Agency in accordance with the relevant trade effluent consent or discharge consent or consent under Schedule 17 of the Crossrail Act;

- provide and maintain holding or settling tanks, separators and other measures to meet the sewerage undertaker or Environment Agency's requirements;

- provide access to the statutory undertaker to obtain and analyse samples of discharge and the flows verified as required; and

- comply with the sections of BS6031: Code of Practice for Earthworks for the general control of site drainage.

21.11.4 Protection of Watercourses

The *Contractor* shall:

- control flood risk to appropriate levels set by the Environment Agency, using mitigation, compensation and/or monitoring;

- plan and implement protection measures for works in or adjacent to watercourses to be agreed with the Environment Agency under schedule 17 part 3 of the Crossrail Act 2008;

- maintain watercourses, including land and/or road drainage, within the worksites to provide effective working conditions at all times;

- 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; and

- comply with the Environment Agency's Pollution Prevention Guidance Note 'PPG05: works in, near or liable to affect water courses' and CIRIA's report 'C532: Control of water pollution from construction sites'.

The *Contractor*'s pollution prevention measures may include use and maintenance of temporary lagoons, tanks, bunds and silt fences or silt screens, type of Equipment used and the time of the year for working in watercourses.

21.11.5 Control of Pollution of Surface Water

The *Contractor* shall plan and implement protection measures to control the risk of pollution to surface water including, but not limited to:

- any containers of contaminating substances on site shall be:

- leak proof and kept in a safe and secure building or compound from which they cannot leak, spill or be open to vandalism;

- protected by impermeable bunds with a capacity of 110% of the maximum stored volume, or if more than one container is stored, 110% of the largest container's capacity or 25% of the total tank capacity within the bund, whichever is greater; and

- transfer of contaminating substances shall be undertaken within similarly protected areas;

- all refuelling, oiling and greasing shall take place above drip trays or on an impermeable surface which provides protection to underground strata and watercourses, away from drains and vehicles and Equipment shall not be left unattended during refuelling;

- only construction equipment and vehicles free of oil/fuel leaks which could cause material contamination shall be permitted on site;

- placing of drip trays below static mechanical Equipment;

- all wash down of vehicles and Equipment shall take place in designated areas and wash water shall be prevented from passing untreated into watercourses and shall comply with Environment Agency's Pollution Prevention Guidance (PPG) note PPG13;

- Environment Agency's Pollution Prevention Guidance (PPG) note PPG 23 shall be followed when carrying out maintenance of structures over water;

- only biodegradable hydraulic oils shall be used in equipment working in or over watercourses; and

- take appropriate measures to protect erodable earthwork surfaces.

21.11.6 Control of Pollution of Groundwater

The *Contractor* shall:

- avoid using materials in the works that could pollute groundwater;

- where the use of List II substances in the Groundwater Regulations SI 1998/2746 (Groundwater Directive: 80/68/EEC) is unavoidable, submit proposals for their use and pollution prevention measures to the *Project Manager* for acceptance 4 weeks prior to their use;

- select and monitor fluids used for shaft sinking and tunnelling to minimise risk of direct contamination of the deep aquifer;

- implement measures to protect the chalk aquifer from impacts, including grout loss and excessive fluid loss; and

- monitor fluids during tunnelling to determine fluid loss.

21.11.6.1 Dewatering

The *Contractor* shall apply the following provisions where dewatering of the *works* is required:

- keeping records of water pumped at all major dewatering sites where wells are constructed in the deep aquifer or where required under the terms of a discharge consent; and
- monitoring water quality at all major dewatering sites on a weekly basis for the first 4 weeks of pumping and monthly thereafter. Such monitoring shall 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 Schedule 17 of the Crossrail Act 2008.

21.11.6.2 Water Use

21.11.6.2.1 General

The *Contractor* shall consult with the Environment Agency to implement best practice for recycling as much water collected on site as practicable for reuse for construction purposes, such as dust control.

21.11.6.2.2 Office Accommodation

Where the *Contractor* is installing new or upgrading site accommodation, the *Contractor* shall minimise water use including, but not limited to, the following technologies as standard in all site accommodation:

- dual flush toilets;
- push or spray taps to all cold-water supplies; and
- passive infrared (PIR) sensors for urinals.

21.12 Archaeology and Built Heritage

21.12.1 General

21.12.1.1 Mitigation

The *Contractor* shall carry out the *works* in such a way as to ensure that there is no 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). If disturbance cannot be avoided, the *Contractor* shall control and limit this through mitigation measures that are in accordance with legal and contractual requirements.

21.12.1.2 Rights of Entry

The *Contractor* shall be aware of Schedule 10 of the Crossrail Act 2008 which gives rights of entry to English Heritage (or nominated individuals) to any land on which

there is a scheduled monument or where works are being carried out to any listed building or building in a conservation area under the powers of the Crossrail Act 2008.

The *Contractor* shall allow English Heritage (or nominated individual(s)) rights of entry to the Site to monitor the archaeological evaluation and mitigation works relating to archaeology, listed buildings, conservation areas and scheduled monuments.

The *Contractor* shall allow the local planning authority access to the site to monitor the archaeological evaluation and mitigation works, where approved by the *Project Manager*.

21.12.1.3 Metal Detectors

The *Contractor* shall not use metal detectors unless prior acceptance has been obtained from the *Project Manager*.

21.12.2 Archaeology

21.12.2.1 General

Under the Crossrail Act 2008, the *Employer* is responsible for developing site specific written schemes of investigation, which detail the archaeological requirements for any particular worksite or group of worksites. These are prepared in consultation with local and statutory authorities.

The *Employer* will appoint a specialist archaeological contractor to implement the archaeological works in accordance with the requirements of the site specific written schemes of investigation.

Any additional works to those included in the site specific written schemes of investigation or resulting from any unexpected finds and subsequent archaeological works will be instructed by the *Project Manager*.

The *Employer*'s archaeological contractor will be managed and supervised by the *Project Manager* and their role will include, but not necessarily be limited to, assessment, evaluation and mitigation (including watching briefs and post-excavation work) relating to:

- below ground archaeological resources; and
- above ground buildings, features and structures of historic interest that do not have any statutory protection.

The *Contractor* shall, in liaison with the *Employer*'s archaeological contractor, develop and implement an archaeological section of the Environmental Plan, setting out how all legal and contractual archaeological requirements shall be managed as specified in this part of the Works Information. The plan shall include the nominated person responsible for each task and shall be produced and updated by the Environment Manager.

21.12.2.2 Support to the *Employer*'s Archaeological Contractor

The *Contractor* shall provide all necessary support and co-operation to enable the *Employer*'s archaeological contractor to plan and undertake archaeological works and comply with the site specific written schemes of investigation. This shall include:

- allowing the *Employer*'s archaeological contractor to attend and access site;
- providing Equipment, materials and services, including any programme information, surveys or plans of the *works* as requested by the *Employer*'s archaeological contractor, to facilitate assessment, evaluation and mitigation;
- assisting the *Employer*'s archaeological contractor in undertaking archaeological works and general watching briefs. This may require the *Contractor* to excavate areas (e.g. trial trenches) and remove spoil (with mechanical plant or hand tools) under supervision of the *Employer*'s archaeological contractor;
- allow the *Employer*'s archaeological contractor to undertake monitoring of the *Contractor*'s works, including periodic inspection and entering the excavations (provided that it is safe to do so) in order to expose, clean and record any archaeological deposits;
- modifying working methods to incorporate targeted watching briefs as set out in the site specific written scheme of investigation, or as instructed by the *Project Manager* on the advice of the *Employer*'s archaeological contractor which may require specific controls on the *Contractor*'s construction method, such as demolition, site clearance and removal of overburden, topsoil or subsoil;
- allowing archaeological features to be mapped and sampled; and
- taking sufficient care and attention to ensure that the archaeological work is unaffected.

The *Project Manager* will advise the *Contractor* which locations will require attendance by the *Employer*'s archaeological contractor (in accordance with the requirements of the site specific written schemes of investigation). The *Contractor* shall only undertake *works* in these areas under the supervision of the *Employer*'s archaeological contractor and the routing of construction vehicles and equipment over watching brief areas shall be specified by the *Project Manager*.

The *Contractor* shall notify the *Project Manager* 4 weeks prior to commencing *works* at a worksite that requires attendance of the *Employer*'s archaeological contractor. Access shall be organised by co-operation between the *Contractor* and the *Employer*'s archaeological contractor, in order to prevent or minimise disruption to the *works*.

The *Project Manager* will inform the *Contractor* of the discovery by the *Employer*'s archaeological contractor of any archaeological remains and will advise the

Contractor of the exact location and timing of any further archaeological assessment, evaluation and mitigation to be carried out.

21.12.2.3 Burial Grounds & Disturbance of Human Remains

The *Contractor* shall:

- for existing burial grounds (those which are either still in use or continue to have the appearance of a burial ground even though no burials may have taken place for some time) where the works will disturb human remains or monuments:
- include in the Accepted Programme timescales to allow for the *Employer*'s archaeological contractor and the *Employer* to manage any notices required under Schedule 15 of the Crossrail Act 2008; and
- not proceed with any work in these areas until instructed to do so by the *Project Manager*; and
- for other burial grounds:
    - with a high risk of disturbing human remains, include in the Accepted Programme timescales to allow for the *Employer*'s archaeological contractor to obtain licences required under Section 25 of the Burial Act 1857 prior to any ground works in these areas;
    - with a low risk of disturbing human remains or unexpected discovery of human remains, on discovering human remains the *Contractor* shall comply with requirements for dealing with unexpected archaeological finds below and the *Project Manager* will instruct the *Employer*'s archaeological contractor to obtain licences required under Section 25 of the Burial Act 1857 prior to recommencing any works in these areas; and
    - comply with any requirements of any licences.

When managing discoveries (or suspected discoveries) of human remains, the *Contractor* shall identify and implement appropriate health and safety requirements, oversight by environmental health officers, preservation of public decency (such as screening of the site) and action in the public interest (such as scientific examination of remains).

21.12.2.4 Unexpected Archaeological Finds

Unexpected archaeological finds are defined as discoveries which could not reasonably have been foreseen from the existing Site Information and which are not reflected in the site specific written schemes of investigation.

In the event of any unexpected finds including archaeological remains, artefacts, finds under the Treasure Act 1996 (unless the *Employer*'s archaeological contractor is present) or any event involving the disturbance of human remains, the *Contractor* shall cease work at the identified site, immediately inform the *Project Manager* and not re-commence work at that location until further instruction from the *Project Manager*, has been obtained. This notification may be initially made personally or by

telephone but, in the case of human remains shall be confirmed in writing within 24 hours of discovery.

The *Project Manager* shall instruct the *Contractor* regarding any further archaeological works required to be undertaken by the *Employer*'s archaeological contractor. Where feasible, further excavation shall be avoided and the archaeological remains shall be recorded by the *Employer*'s archaeological contractor.

21.12.2.5 Nationally Important Finds

Should archaeological remains discovered during construction, be confirmed by the *Employer*'s archaeological contractor as potentially nationally important (defined using Planning Policy Statement 5: Planning for the Historic Environment (PPS5) the *Employer*'s archaeological contractor will immediately inform the *Project Manager* who will instruct the *Contractor* accordingly.

National significance of the remains will be confirmed by the *Project Manager*, as advised by the *Employer*'s archaeological contractor, English Heritage and the relevant local authority and the Secretary of State for Culture Media and Sport.

Where nationally important finds are discovered, the *Project Manager* will consult with the relevant statutory authorities regarding mitigation measures and timescales for implementing them and will instruct the *Contractor* accordingly. The *Contractor* shall allow a period for archaeological recording and excavation that shall not be less than 28 days. The *Contractor* shall be aware that mitigation measures may be decided by the Secretary of State for Transport, who may also extend the timescales for mitigation to be carried out.

21.12.2.6 Ownership of Finds

Ownership of archaeological finds will under no circumstances lie with the *Contractor*.

21.12.3 Built Heritage

21.12.3.1 General

The *Contractor* shall, in liaison with the *Employer*'s archaeological contractor, develop and implement a heritage section of the Environmental Plan for the *works*. This shall set out how the legal and contractual heritage requirements shall be managed in accordance with the Works Information. The plan shall include the nominated person responsible for each task and shall be produced and updated by the Heritage Specialist in conjunction with the Environment Manager.

21.12.3.2 Consents

The *Contractor* shall manage heritage consents in accordance with the Works Information Volume 2B Part 3 Planning, Environmental and Traffic Consents, including the specified timescales.

21.12.3.3 Heritage Agreements

Schedule 9 of the Crossrail Act 2008 relates to Listed Buildings and Conservation Areas and disapplies some of the controls under the Planning (Listed Buildings and Conservation Areas) Act 1990 for specified Listed Buildings and the demolition of specified unlisted buildings in Conservation Areas.

Listed building or conservation area consent is not required for the specified works to the specified buildings set out in the table in paragraph 1 of Schedule 9 of the Act. Listed building or conservation area consent is not required for any works required to protect the buildings specified in the table in paragraph 2 of Schedule 9 of the Act, from ground settlement.

For the listed buildings set out in the table in paragraph 1 of Schedule 9 to the Act, a heritage agreement will be in place between the *Employer* and the relevant local authority and English Heritage. The heritage agreement consists of an undertaking and a heritage deed that requires one or more heritage method statements. Details of all existing heritage deeds and heritage method statements are provided in Works Information Volume 2A.

21.12.3.4 Other Heritage Consents

All other works affecting listed buildings or unlisted buildings in conservation areas that are not specified in the Crossrail Act 2008 require consent under the Planning (Listed Buildings and Conservation Areas) Act 1990. The *Contractor* shall identify and manage such consents in accordance with this part and Part 3 of the Works Information.

The *Contractor* shall produce a drawing indicating the extent of the curtilage of the listed building and this shall be included in the heritage section of the Environmental Plan.

21.12.3.5 Method Statements

The *Contractor* shall include the measures to be employed for the protection of listed buildings in its construction method statements for the *works* as required in accordance with the Works Information.

21.12.3.6 Mitigation Measures

The *Contractor* shall ensure that the vibration screening limit for peak particle velocity is less than 3mm/s at and within the curtilage of listed buildings. If the *Contractor* predicts that peak particle velocity shall be greater than 3mm/s, the *Contractor* shall undertake further assessment to determine whether there is anything in the curtilage vulnerable to vibration impacts. If the *Contractor* can demonstrate that the building and associated parts are sufficiently robust to withstand a higher level of vibration without damage, the *Contractor* shall submit the assessment, evidence, proposed Equipment and working methods and proposed higher limit to the *Project Manager* for acceptance. The *Contractor* shall ensure that listed buildings where the vibration screening limit of 3mm/s may be exceeded shall be monitored during demolition and other major activities, providing full

safeguarding, which shall include cessation of works should vibration levels exceed 3mm/s. The *Contractor*'s Heritage Specialist shall undertake these assessments.

The *Contractor* shall ensure that listed buildings that are attached or contiguous to buildings that shall be demolished shall be unattached, using techniques appropriate for the listed structure, before demolition commences, and consent shall be required and complied with as specified above (heritage deed or listed building consent).

The *Contractor* shall ensure that listed buildings that are located within the proximity of worksites or construction Equipment shall be provided with protection.

The *Contractor* shall notify the *Project Manager* of commencement of works that affect:

- listed buildings or affect their setting or have potential to cause ground movement;
- buildings in conservation areas; and
- historic buildings and structures without statutory protection (as defined below).

The *Contractor* shall plan the works to avoid the need for oversailing of listed and other heritage buildings by cranes and other lifting Equipment. Where this is not practicable, and there is potential for damage to Listed Buildings as a result of falling objects from oversailing cranes, the *Contractor* shall ensure methods shall be used to ensure damage does not occur.

The *Contractor* shall plan for emergency works that may be required to a heritage building or structure.

The *Contractor* shall comply with ground movement requirements relating to listed buildings given in the Works Information.

21.12.3.7 Historic Buildings and Structures without Statutory Protection

The *Contractor* shall be aware that the *Employer* has committed (in the Crossrail Planning and Heritage Memorandum, which is part of the Crossrail Environmental Minimum Requirements) to mitigation for buildings, structures and features of historical interest that do not have any statutory protection.

Assessment, evaluation and mitigation of these shall be undertaken by the *Employer*'s archaeological contractor in accordance with the requirements of the site specific written schemes of investigation.

The *Project Manager* will instruct the *Contractor* which buildings, structures and features will require attendance by the *Employer*'s archaeological contractor. The *Contractor* shall:

- give the *Project Manager* at least 4 weeks notice of the commencement of intrusive works at these buildings, structures and features;

- allow the *Employer*'s archaeological contractor to access the buildings, structures and features of historic interest to undertake surveys;

- not undertake works at these heritage buildings, structures and features until instructed by the *Project Manager*; and

- comply with instructions from the *Project Manager* regarding the implementation of mitigation measures for heritage buildings, structures and features (for example, careful dismantling and salvage and temporary storage of structural elements of particular historic interest).

21.13 Contaminated Land

21.13.1 General

The *Employer* has identified sites that are a potential source of contamination in contaminated land specialist technical reports included in Volume 3 - Site Information.

These sites have been classified as either:

- low risk sites where there is no significant potential pollution linkage and it is not anticipated that further assessment shall be required at these locations; or

- medium or high risk sites where there is potential for significant impacts to human health, groundwater or surface water resources prior to the implementation of suitable mitigation measures.

Any necessary measures shall be agreed with the Environment Agency and the local authorities in conjunction with the *Project Manage*r and the *Employer*.

The *Contractor* shall develop and implement a land contamination section of the Environmental Plan for the *works*. This shall set out how all legal and contractual land contamination requirements shall be managed in accordance with this part of the Works Information. The plan shall include the nominated person responsible for each task and shall be produced, and updated by the Land Contamination Specialist in conjunction with the Environment Manager.

21.13.2 Risk Assessments and Sampling

The *Contractor* shall carry out site assessments, investigations and risk assessments in order to assess the potential for contamination in soil and groundwater in accordance with:

- 'Model Procedures for the Management of Land Contamination' (CLR11), published by DEFRA and the Environment Agency; and

- HSE guidance "Protection of Workers and the General Public during Development of Contaminated Land" (HSG66).

The *Contractor's* site assessments shall be completed for all Working Areas.

The *Contractor* shall carry out risk assessments prior to any works disturbing ground to evaluate mitigation measures and use of personal protective equipment. The *Contractor* shall record any contamination issues in the project health and safety plan in accordance with the Construction (Design and Management) Regulations 2007.

The risk assessment shall include a targeted sampling programme to take soil samples for analysis. The results of any previous sampling are included in Volume 3 - Site Information.

At each sampling location, samples shall be obtained across the soil profile as directed by the Land Contamination Specialist. Additional samples shall be obtained wherever an unusual coloration, odour or soil texture is encountered. The *Contractor* shall be aware that the local authority may require a more extensive sampling strategy.

Soil samples shall be stored, transported and analysed in an appropriate manner by a MCERTS accredited laboratory for a range of analysis according to the historical uses of the site. This shall include, but not be limited to: metals, petroleum hydrocarbons, volatile and semi-volatile hydrocarbons, phenols, polychlorinated biphenyls, asbestos and the physical condition of the soil.

The *Contractor* shall conduct leachability analysis on selected soil samples to determine the mobility of contaminants. The *Contractor* shall assess the leachability results to determine whether significant contaminants are present and the potential to impact controlled waterways.

The *Contractor* shall develop a set of criteria for site investigation prior to the commencement of any intrusive works. The *Contractor* shall submit the criteria to the *Project Manager* at least 4 weeks prior to the start of site investigations for acceptance. The *Contractor* shall not commence any site investigation until the *Project Manager* has accepted the criteria.

The *Contractor* shall ensure that the results of all sampling are readily available to the *Project Manager* and shall submit such results to the local authority, and where groundwater is an identified receptor, to the Environment Agency.

21.13.3 Mitigation

Where site investigation reveals risks from contamination the *Contractor* shall develop and implement an appropriate remedial strategy for dealing with the presence of contamination. The *Contractor* shall submit the remedial strategy to the *Project Manager* for acceptance prior to their implementation, and assist the *Project Manager* and *Employer* in liaison with the local authority, Environment Agency and other relevant statutory bodies regarding control and protection measures.The *Contractor*'s remedial strategy shall include:

- assessments of the composition of waste soil using appropriate techniques, which could include sampling and laboratory analysis to determine if the waste is classifiable as hazardous as defined in the European Waste Catalogue;

- consideration of alternatives to landfill disposal which may include the use of remedial technologies (in-situ or ex-situ) 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;

- designation of areas within the Working Areas to separate contaminated materials from clean ones and store contaminated materials in an appropriate environment to control any migration of contamination, including specific facilities to prevent contaminants from leaching into the ground, nearby watercourses or neighbouring properties;

- separation of contaminated material from other material, with appropriate protection for the transportation of material (for example covered lorries) to treatment facilities or licensed landfill sites;

- compliance with PPS23 and the Environment Agency's Pollution Prevention Guidance Notes (PPGs), in particular PPG01, PPG02, PPG05, PPG06, PPG21 and PPG23;

- provision of a watching brief by the *Contractor*'s Contaminated Land Specialist;

- the identification of remediation measures that are compatible with the construction programme and do not increase cost; and

- methodologies that include an evaluation of impacts and identification of necessary controls.

The *Contractor* shall keep a record of any remedial works undertaken to comply with the remedial strategy, and these records shall include: health and safety, waste disposal, chemical testing, photographs of the works and decisions made regarding the acceptability of soils.

On completion of any remedial works the *Contractor* shall produce a verification report to the *Project Manager* for acceptance prior to submitting that report to the Environment Agency and the local authority. The verification report shall include:

- copies of the method statements, plans and health and safety risk assessments;

- as-built drawings of the implemented schemes;

- details of the parties involved in undertaking the work;

- laboratory and in-situ test validation results;

- certificates demonstrating that imported material and/or material left in situ complies with the approved remedial target concentrations; and

- details of waste classification undertaken including waste acceptance criteria testing, quantities of waste sent off site and the destination of all waste soils, copies of all exemptions, licences, permits, waste carrier registration certificates, hazardous waste producer, waste transfer notes, special waste consignment notes.

21.13.4 Unexpected Contamination

The *Contractor* shall monitor excavation works to check for unexpected or unusual materials with a contaminative potential. This material may consist of, but not be limited to, 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 the *Contractor* shall stop work in the affected area until the *Contractor* has identified the exact nature and extent of the material, undertaken (or amended) risk assessments and amended and submitted the risk assessments and revised mitigation proposals to the *Project Manager* for acceptance. This approach shall be included in the Health and Safety Plan as required by this part of the Works Information.

21.14 Ecology

21.14.1 General

The *Contractor* shall ensure that procedures are implemented to control and limit disturbance to areas of nature conservation interest and protected species. In doing so the *Contractor* shall comply with all relevant nature conservation policy and accepted industry practice, and shall manage ecological consents as required by this part of the Works Information.

The *Contractor* shall develop and implement an ecological section of the Environmental Plan for the *works*, that shall set out how all legal and contractual ecological requirements shall be managed in accordance with this part of the Works Information. The plan shall include the nominated person responsible for each task and shall be produced and updated by the Ecologist in conjunction with the Environment Manager.

21.14.2 Mitigation Measures

21.14.2.1 General

Prior to the *works* commencing the *Contractor*'s Ecologist shall undertake a survey to check worksites for nesting birds, protected species, invasive species, trees and any other ecological features which may require mitigation.

For any ecological mitigation the *Contractor* shall submit a method statement to the *Project Manager* for acceptance prior to commencing the *works.*

21.14.2.2 Nesting Birds

Site clearance (particularly woodland and other trees, and built structures) shall take place outside the breeding bird season (approximately 1st March to the 31st July) to avoid impacts on nesting birds. Where this is not feasible, all woodland, scrub,

vegetation and structures shall be checked by the *Contractor*'s Ecologist for nesting birds before removal. If any are identified, the *Contractor* shall immediately inform the *Project Manager*. The *Contractor* shall not undertake any *works* in the immediate vicinity of the nest until an assessment has been undertaken by the *Contractor*'s Ecologist and appropriate mitigation agreed between the *Project Manager* and Natural England. The *Contractor* shall provide support as instructed by the *Project Manager* and shall implement the required mitigation.

21.14.2.3 Tree Protection

Schedules 18 and 19 of the Crossrail Act 2008 relate to trees on neighbouring land and disapply some of the controls covered by normal legislation. Tree works that are authorised by these schedules of the Crossrail Act 2008 do not require tree preservation order consent or notification to the local authority for trees located in a conservation area.

The *Contractor* shall only cut or remove trees when instructed to do so by the *Project Manager*. The *Contractor* shall plan the *works* to minimise the impact on trees. Any essential remedial or protective work to trees shall be carried out by suitably trained or qualified personnel.

The *Contractor* shall plan and implement appropriate measures for tree protection to ensure compliance with BS 5837 "Trees in relation to construction", including remedial or protective work to trees, protective fencing and prohibition of storing or dumping materials within the protected area.

21.14.2.4 Unanticipated Discovery

In the event of any unanticipated ecological discoveries, including but not limited to: nesting birds; protected species; and invasive species, the *Contractor* shall cease work at the identified site, immediately inform the *Project Manager* and not recommence work at that location until further instruction from the *Project Manager* has been obtained.

21.14.2.5 Generic Protection Measures

All sensitive receptors shall be identified and cordoned off where practicable or other protection measures put in place to avoid accidental damage. All site staff should receive appropriate instruction on the presence of these areas via toolbox talks.

21.14A Sustainable Transport

21.14A.1 General

Sustainable transport is minimising the impacts of the *Contractor's* transport of Equipment, excavated material, waste and all personnel to and from places of work. The *Contractor* shall use the hierarchy for sustainable transport given below:

21.14A.2 Sustainable Transport Plan

The *Contractor* shall develop and implement a sustainable transport section of the Environmental Plan for the *works*. The sustainable transport section of the Environmental Plan shall set out how the legal and contractual sustainable transport requirements shall be managed in accordance with this part of the Works Information. The plan shall include the nominated person responsible for each task and a single individual responsible for overall production, implementation and update of the plan. This shall include:

- how the *Contractor's* construction vehicle movements shall be minimised;
- an assessment of why rail or water transportation are not suitable in cases where the *Contractor* intends to use road transportation;
- how the *Contractor* shall encourage the use of public transport, car sharing, park and ride and cycling by all personnel;
- Provision of focussed public transport packs for all construction workers;
- Promotion of efficient vehicle use (including minimising part-loads and use of pool vehicles); and
- Measures to control nuisance "fly-parking" by personnel, in particular where this would result in potential safety problems or would affect the ability of local residents or businesses to park.

21.14A.3 Sustainable Transport of Equipment

The *Contractor* shall maximise the use of rail and water transportation in delivering the *works*. In considering its modes of transportation the *Contractor* shall:

- review the modes of transport available at each worksite;
- review the need to minimise road transportation;
- configure inbound and outbound transportation to worksites to remove the need for road transport;
- adopt strategies to reduce the use and impact of road freight where it has to be used;
- review the overall journey mileage and carbon dioxide emissions using guidance in Transport for London's "London Freight Plan – sustainable freight distribution: a plan for London"; and
- assess the best option using the carbon dioxide shadow cost methodology specified in the Department for Transport's "Transport Analysis Guidance (WebTAG)".

The *Contractor* shall support the principles of TfL's "London Freight Plan – sustainable freight distribution: a plan for London".

21.14A.4 Sustainable transport of personnel to and from places of work

The *Contractor* shall encourage the use of public transport by personnel.

Some on-site parking will have to be provided to enable specialist equipment to access sites. Where car parking on the Site is potentially possible, such space will be designated and users will be issued with a pass issued by the *Contractor*, in liaison with the *Project Manager*, authorising parking of that car at that location.

21.15 Energy

21.15.1 General

The *Contractor* shall investigate options for procuring energy from renewable sources such as through green electricity suppliers. The *Contractor* shall submit these options, including costs and benefits, to the *Project Manager* for acceptance at least 4 weeks prior to procuring energy.

The *Contractor* shall implement energy efficiency measures which shall include, but not be limited to:

- the purchase and hire of energy efficient (including fuel efficient) Equipment and equipment where it is cost-effective;
- the installation of electricity metering, and sub-metering where there are uses on site that consume large amounts of electricity;
- maximising energy efficiency (which may include using alternative modes of transport, maximising vehicle utilisation by ensuring full loading and efficient routing);
- monitoring and enforcing compliance with energy efficiency measures by the *Contractor's* employees; and
- ensuring that all Equipment is appropriately maintained according to maintenance schedules to ensure that they are operating in an energy efficient manner.
- The *Contractor* shall develop and implement an energy section of the Environmental Plan for the *works* setting out how all legal and contractual energy requirements shall be managed as specified in this part of the Works Information. The plan shall include the nominated person responsible for each task and shall be produced and updated by the Environment Manager.

This part shall be read in conjunction with Works Information Volume 2B Part 26 Logistics Management.

21.15.2 Targeting, Monitoring and Reporting Energy / CO2

21.15.2.1 Energy / CO2 Arising from Site Activities

The *Contractor* shall monitor, report and set targets for CO2 or energy arising from site activities. The *Contractor* may use relevant data obtained for the reporting of KPIs as a basis for this activity but as a minimum the *Contractor* shall undertake the following activities:

- set appropriate target levels of energy consumption. These may be annual, monthly or project targets and should be included in the Environmental Plan under Objectives and Targets as specified in this part of the Works Information;
- display targets in site offices;
- undertake daily monitoring of metered gas (where used) and electricity. Undertake on-going monitoring of bulk fuel purchase. As a minimum monitoring should include displaying some form of graphical analysis in site offices to show consumption over the project duration and how actual consumption compares to the targets set;
- identify any unexplained consumption, and enforce actions to rectify any such consumption; and
- nominate an individual who will be responsible for the monitoring and collection of data, and whose roles and responsibilities as energy champion will be included in the Environmental Plan.

21.15.2.2 CO2 Arising from Transport to and from Site

The *Contractor* shall monitor and report CO2 or energy arising from transport to and from Site. The *Contractor* shall undertake the following activities:

- set up a site monitoring system to monitor and record deliveries (including both deliveries direct to and from the worksites and deliveries to any Crossrail logistics location). This system shall include:
- the number of deliveries – also recorded by the *Contractor* under Part 26 of this Works Information;
- the mode of transport – also recorded by the *Contractor* under Part 26 of this Works Information; and
- the kilometres / miles travelled for all deliveries; and
- estimate and display the kg of CO2 arising from transport to and from site based on the records described above.

These activities shall be reported via the Employer's Traffic Cooordination Centre (see Works Information Volume 2B Part 26 Logistics Management. Where a delivery is specifically for the Site a figure of the total distance travelled shall be

used (from the point of origin, to the Site and back to the point of origin). Where a delivery is part of a multiple delivery route, the recorded figure shall be the distance travelled to the site (from the previous delivery), plus the distance to the next delivery or return.

21.16 Site Lighting

The *Contractor* shall provide lighting and signage to ensure the safety and security of all Working Areas. Lighting shall be at the minimum luminosity necessary. The *Contractor* shall provide lighting to the *boundaries of the site* and sufficient illumination to provide a safe route to the passing public. The *Contractor* shall implement precautions to ensure there are no unlit areas by the Site hoarding on surrounding footpaths, roads and amenity areas.

The *Contractor* shall comply with industry standard procedures for site lighting, including BS 5489, Code of Practice for the Design of Road Lighting and the Guidance Notes for the Reduction of Light Pollution (Institute of Lighting Engineers, 2000).

The *Contractor* shall design, position and direct lighting so as not to unnecessarily intrude on adjacent buildings, wildlife sites, 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. The *Contractor* shall take particular care in Working Areas where night working is required.

The *Contractor* shall develop and implement a lighting section of the Environmental Plan setting out how all legal and contractual energy requirements shall be managed in accordance with this part of the Works Information.

21.17 Electromagnetic Interference

The *Contractor* shall assess the impacts of electromagnetic interference on wireless telecommunication systems, for example from the demolition of buildings and the installation of tower cranes. The *Contractor* shall employ best practice technology to ensure that levels of radio frequency interference are low and at acceptable levels.

21.18 Geology

The *Contractor* shall notify the *Project Manager* immediately if activities expose or encounter geological deposits or features of high scientific value. The *Contractor* shall allow access for the recording or protection of geological features by approved third parties as identified by the *Project Manager*.

21.19 Soil Resources

The *Contractor* shall identify all areas where topsoil and sub-soil resources are present and ensure that measures are put into place to store and reuse these materials as part of site restoration or identify alternative Crossrail or third party sites where they can be beneficially utilised

21.20 Appendices

Appendix 21A Site Inspection Form (Pro-forma)

Appendix 21B Section 61 Consent Application

Appendix 21C Control of Noise and Vibration Plan (Pro-forma)

Appendix 21D Section 61 Dispensation Application

Appendix 21E Section 61 Variation

Appendix 21F Section 61 Overrun

Appendix 21G Notification to the Environment Agency of Intention to Undertake Specified Works

Appendix 21H Notification to the Environment Agency of Completion of Consented Works

Appendix 21I Schedule 17, Part 3 Consent Application

Appendix 21J Schedule 17, Part 5 Consent Application

Appendix 21K Schedule 17, Part 6 Consent Application

Appendix 21L Section 61 Model Consent Conditions

Appendix 21M Dust Log Pro-Formas

Appendix 21N Crossrail Guidance on Environment, Traffic and Planning Incidents (CR-XRL-T1-GGG-CR01-00002)