

**Code of Construction Practice**  
**7 November 2006**

Glasgow Airport Rail Link

Strathclyde Partnership for Transport

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# Preface

As the design of the Glasgow Airport Rail Link progresses it is envisaged that this Draft Code of Construction Practice (the CoCP) will be revised as appropriate. The CoCP will therefore remain in draft form up until the tender is let for the construction phase. It is intended that the CoCP will continue to evolve as the project develops from and during the Parliamentary Process, up to Royal Assent and then during the period of detailed design. The Promoter will seek to comply with best practice during construction of the Works and the CoCP is seen as being an important element through which this major piece of Public Works can be built.

It is anticipated that changes, both significant and minor, may be incorporated into the CoCP as it develops. It is intended that the final CoCP will become a contractual document under which the Promoter will be able to enforce compliance by the Contractor with the standards and requirements in the CoCP and the Contractor will be contractually obliged to comply with the CoCP.

It should be noted that whilst the CoCP sets out the minimum standards that a Contractor should attain, all Contractors should strive to achieve higher and more stringent standards. In addition, it is intended that the CoCP should be the benchmark by which the public and the contracting organisations can gauge the performance of the project implementation, and against which actual implementation can be measured.”

# Terminology and Acronyms

<b>BAA</b>	BAA plc, 130 Wilton Road, London, SW1V 1LQ, the owner and operator of Glasgow Airport.
<b>BLG</b>	Business Liaison Groups
<b>BRE</b>	Buildings Research Establishment
<b>BS</b>	British Standard
<b>CLG</b>	Community Liaison Groups
<b>CoCP</b>	Code of Construction Practice.
<b>Contract</b>	The GARL Construction Contract.
<b>Contractor</b>	Generally refers to the Principal Contractor of the GARL project construction Contract. Note that where the Contractor is required to comply with provisions of the CoCP, etc., this also applies to any Sub-Contractors engaged on the project.
<b>ES</b>	Environmental Statement. Written report summarising the findings of the Environmental Impact Assessment (EIA).
<b>GARL</b>	Glasgow Airport Rail Link.
<b>Limits (LOD and LLAU)</b>	The 'Limits' comprise the precise boundaries of land shown on the Parliamentary plans for which powers are sought to build and operate the rail line, comprising Limits of Deviation (LOD) and Limits of Land to be Acquired or Used (LLAU). In general, the LOD is the area over which a permanent interest in land is required for the construction and operation of the rail line. The LLAU is the area of land required, or rights over that land are required, either permanently for a specified purpose connected with the construction or operation of the rail line, or temporarily for construction purposes or access. The limits necessarily encompass a wider corridor than is necessary for the rail tracks, not only to construct the rail line, but also to maintain it.
<b>Local Authority</b>	Renfrewshire Council or Glasgow City Council (as the case may be).
<b>MSCP</b>	Multi-Storey Car Park
<b>NR</b>	Network Rail, owner and operator of the UK railways network infrastructure.
<b>OLE</b>	Overhead Line Equipment
<b>PNCC</b>	Paisley North Community Council
<b>Promoter</b>	Refers to the Strathclyde Partnership for Transport (SPT), which is the Promoter of the Glasgow Airport Rail Link (GARL) Private Bill. For consistency with the Bill SPT is referred to throughout as the Promoter', although in terms of the Contract between SPT and the Contractor, SPT will be the Employer. In terms of the Transport (Scotland) Act 2005 and associated subordinate legislation, the functions, rights, assets and obligations of SPT will be assumed by the Regional Transport Partnership for the West of Scotland area on or around 1st April 2006.

<b>Sensitive</b>	The term “noise sensitive” is defined in Section 3.10 of BS 5228:1997 as: “Any occupied premises outside the site used as a dwelling (including gardens), place of worship, educational establishment, hospital or similar institution, or any other property likely to be adversely affected by an increase in noise level”.
<b>SEPA</b>	Scottish Environment Protection Agency
<b>SNH</b>	Scottish Natural Heritage
<b>TRL</b>	Transport Research Laboratory

# 1 Introduction

## 1.1 Background

- 1.1.1 This document relates to the Glasgow Airport Rail Link Bill (GARL Bill) introduced in the Scottish Parliament in 2006. The contents are entirely the responsibility of the Promoter and have not been endorsed by the Parliament.
- 1.1.2 The Promoter has commissioned Faber Maunsell to provide Preliminary Design and Parliamentary Submission services for the Glasgow Airport Rail Link (GARL) project. This project seeks to provide a fixed railway link with sufficient capacity to enable a dedicated train service to operate every 15 minutes between a new station at Glasgow Airport and Glasgow Central Station, calling at Paisley Gilmour Street.
- 1.1.3 The line will run from an elevated station that will be constructed at Glasgow Airport on a viaduct that crosses the M8 and the St James Playing fields to join the main Inverclyde line just to the east of Paisley St James station.
- 1.1.4 The service will then use the existing rail corridor via Paisley Gilmour Street to Glasgow Central Station. However, work undertaken by Faber Maunsell has shown that the section between Paisley Gilmour Street and Central Station does not have sufficient capacity to accommodate additional services and therefore extensive remodelling of Wallneuk and Arkleston Junctions and construction of an additional line within the existing rail corridor will be required.
- 1.1.5 This bi-directional third line, which will be constructed in the space between the two existing lines, will be built between Arkleston Junction and Shields Junction. Modification of a number of other main line junctions will be needed, and in addition, the changes to Wallneuk Junction will require the extension and electrification of the existing Up (east-bound) loop at Elderslie.
- 1.1.6 Finally at Glasgow Central Station the existing platform 11A will be extended into the train shed area of the station.
- 1.1.7 Along the main line section of the GARL scheme the Limits of Deviation (LOD) are set no wider than the NR boundary. However in places, the Limits necessarily encompass a wider corridor than the existing NR boundary, for example, where construction compounds and accesses across private land are proposed. Such land would be placed with Limits of Land to be Acquired or Used (LLAU.)
- 1.1.8 Note that as part of the works the existing airport aviation fuel farm will be decommissioned, as it falls within the branch line alignment. An alternative fuel farm is proposed for a site to the west of St Andrew's Crescent on BAA operational airport land.
- 1.1.9 The overall objective of the GARL project is to deliver a successful heavy rail service between Glasgow Airport and Glasgow Central Station.
- 1.1.10 It is expected, subject to Parliamentary timescales, to complete the work by late 2009.

## 1.2 Objectives of the CoCP

- 1.2.1 This Code of Construction Practice (CoCP) has been prepared to reflect the Environmental Statement (ES) for the GARL project. In effect it is an extension to the ES as it sets out the proposed environmental mitigation measures that will be adopted during construction of the GARL project.
- 1.2.2 The CoCP addresses specific legislative requirements in addition to compliance with the British Standards, Health and Safety Executive Guidance and planning conditions. In this respect it is in place to protect the interests of local residents, businesses, the general public and the surrounding environment in the immediate vicinity of the construction works. It will apply throughout the entire period of the construction works and thereafter during the works maintenance period.

1.2.3 The provisions of the CoCP are included in the Contract for the construction of the GARL project. The Contractor, any Sub-Contractor, any agents of the Contractor or Sub-Contractor and all employees of the Contractor, any Sub-Contractor and any agents will be obliged to comply fully with the terms of the CoCP. There is a mechanism within the CoCP for the rectification of breaches of the CoCP.

### 1.3 **Structure of the CoCP**

1.3.1 The CoCP is structured as follows:

- Chapter 1* Introduction – sets the context for the CoCP including the background to the GARL project, the purpose of the CoCP and an overview of the scheme and associated construction activities.
- Chapter 2* Liaison – sets out the mechanisms for liaison between the Contractor, the community, businesses and the Local Authority during construction of the GARL project.
- Chapter 3* Construction Practice – discusses some general considerations associated with activities that will be employed during construction of the GARL project.
- Chapter 4* General Matters Applicable Under the CoCP - covers all general aspects of construction works possibly impacting on local communities and the environment, these are identified under the topic headings listed below
- Public and private highways
  - Noise and hours of working
  - Vibration
  - Dust and pollution
  - Handling and disposal of contaminated materials
  - Protection of surface and groundwater resources
  - Ecology
  - Site boundaries/hoardings/temporary structures on the public highway
  - Archaeological remains
  - Built Heritage
  - Other site activities
- The measures identified in this chapter are applicable to all areas of the construction works for the duration of the project.
- Chapter 5* Site Specific Requirements – covers the particular requirements relating to individual construction compounds along the route. This chapter is available should any site specific requirements be identified which should be included in the CoCP in the future.
- Appendices* Presents information on, agreements and approvals, environmental intervention criteria, dust suppression measures and useful contacts.

### 1.4 **Applicable Acts of Parliament and Statutory Regulations**

1.4.1 There are numerous relevant Acts of Parliament and statutory regulations covering environmental, construction and health, safety and welfare matters which are in force at present and which would apply to the construction of the GARL project if it were proceeding at this time. By the time construction of the GARL project, a number of these acts and statutory obligations may have been repealed or amended and other statutory obligations may apply. The Contractor, any Sub-Contractor, agents and the Promoter will be obliged to comply with all relevant acts of parliament and statutory regulations in relation to environmental, construction and health, safety and welfare matters in force during the period of construction.

## 2 Liaison

### 2.1 General

2.1.1 The general intent of the CoCP is to ensure that the impacts of Construction activities on the public and the environment are minimised where practical and that appropriate liaison is undertaken with affected parties and statutory bodies. It also sets out various standards of operation with an expectation that **all** Contractors will seek to exceed these standards.

### 2.2 Community

2.2.1 A liaison officer will be appointed by the Promoter and will be responsible for all public relations, information issues and press related matters and shall undertake the role of liaison with the relevant departments of the Local Authority, members of the public, the press and the media.

2.2.2 In order to implement these measures the Promoter will facilitate the formation of Community Liaison Groups (CLG) and Business Liaison Groups (BLG) as appropriate. The purpose of the CLG and BLG will be to represent the views, concerns and comments of the larger community along the proposed route. They will provide ongoing consultation with the public on key issues associated with the route and provide a forum where regular updates will be provided to members regarding the progress of the project. Meetings between the CLG / BLG including Paisley North Community Council (PNCC) (as appropriate) and the Promoter and Contractor, will be held regularly throughout the pre-construction and construction period. These will be on at least a quarterly basis.

2.2.3 In addition to ensuring that the public, the CLG and the BLG are fully informed of the proposed programme of works (including working hours), the Promoter will ensure that procedures are established for notifying the public a minimum of **7 days** in advance of planned works. It should be noted the Promoter intends to discuss the proposed 7 day notification period and can alter this period if agreed by the CLG/BLG. It should also be noted that the agreed period of advanced notification will similarly apply to any alterations in the construction programme or working hours that have been agreed with the Contractor and the relevant departments of the Local Authority.

### 2.3 General Communication

2.3.1 The Promoter will ensure that a complaints procedure is put in place whereby members of the public can, if necessary, make direct contact by telephone using a "hot line" facility which will be answered by a person, not an answer phone, during all hours when works, including deliveries, are taking place. In addition, the Promoter will provide details of the named contacts to which all written complaints should be addressed. Furthermore, a dedicated email address to enable comments and/or complaints from the public to be communicated will also be provided.

2.3.2 The Contractor shall ensure that details of the relevant contacts within the Promoter's organisation are readily available should they be requested by members of the public. Additionally the Contractor shall ensure that all site construction staff are easily identifiable to the public by use of identity cards or an equally effective system. Contractor's staff will wear high visibility clothing and hard hats bearing the Contractor's company logo. In addition, the Contractor shall nominate an individual to act as a point of contact for liaison with the Promoter, the relevant departments of the Local Authority and members of the public. A procedure shall be adopted in the event of an inspection by Planning Officers, Environmental Health Officers and representatives from other statutory bodies and shall be prepared by the Contractor and agreed with the Promoter.

### 2.4 Monitoring and Response

2.4.1 The Promoter will ensure that a system is introduced for the logging and recording of any complaints that will be collated and a copy made available to the Contractor and the relevant department of the Local Authority. Any complaints received will be acknowledged within **24 hours** during all hours when works, including deliveries, are taking place. The Contractor shall

ensure that all complaints receive a written response outlining the action undertaken if any such action is deemed appropriate. The Contractor shall provide the Promoter with a monthly report that details all complaints, who they were filed by and the actions taken. The monthly report will be available to members of the public should they wish to view it.

**2.5****Network Rail**

## 2.5.1

The Contractor shall liaise with Network Rail (NR) Project Manager with respect to the use of compounds and railway line works.

**2.6****Consultees and Approvals**

## 2.6.1

Although the GARL project is the subject of a Scottish Parliamentary Bill, which will confer the appropriate powers to the Promoter to undertake construction of the GARL project, there are a number of areas where agreements and approvals are required. In particular, such agreements and approvals are required for certain aspects of environmental protection during construction. Copies of such agreement and approvals when made will be included in Appendix A of the CoCP.

**2.7****Arbitration**

## 2.7.1

In the event that any of the provisions of the CoCP are subject to agreement or approval, unless such agreement or approval forms part of a statutory process, failure to reach such agreement shall be referred to a single arbiter either jointly appointed by the parties seeking such agreement or approval or, failing agreement on such appointment, to be appointed, on the application of any party (after notice in writing to the other), by the President for the time being of the Institution of Civil Engineers. The arbiter shall be entitled to state a case for the opinion of the Court of Session pursuant to section 3 of the Administration of Justice (Scotland) Act 1972.

# 3 Construction Practice

## 3.1 General Requirements

3.1.1 It is estimated that construction of the GARL project will take place over a three year period, with the exact timing of work not certain until tenders are accepted. The current best estimate, which will be subject to Parliamentary Process, is for the work to be undertaken between 2007 and 2009.

3.1.2 Expanding on the general description of the works provided in Section 1.1 above, the work will comprise the following elements, which are described from west to east, i.e. from Glasgow Airport to Glasgow Central Station:

- (i) A new elevated station at Glasgow Airport located immediately to the south of the existing multi-storey car park (MSCP No. 2). The station will be twin track and ultimately be capable of accommodating two trains of up to four cars in length;
- (ii) An elevated pedestrian link between the eastern end of the new station and the Airport terminal building, crossing Caledonia Way. The link will be fully enclosed and will include a passageway flanked by travelators;
- (iii) A twin track railway viaduct heading westwards from the station;
- (iv) A new bridge structure across the M8, which will be single span and likely to be of tied arch design;
- (v) A twin track viaduct crossing St James' Park and the Murray Business Area. This viaduct structure will bridge a number of roads including the A726, McFarlane Street and Clark Street. Note that the branch will be fitted with overhead line equipment (OLE) to permit the use of electric trains;
- (vi) The railway will be on a reinforced embankment for the last section between Clark Street and a new junction to be formed with the Paisley to Gourock Main Railway Line. The alignment will require the widening of the deck of the Murray Street Bridge. The surface of Murray Street will be lowered by about 300mm to provide the same headroom to the new deck structure as the existing deck;
- (vii) Existing main lines between Paisley St James' Station and Paisley Gilmour Street Station will then be used, although these sections of the route will not fall within the limits of the scheme as there is sufficient capacity on existing lines and therefore no construction work will be required for the GARL project on these stretches of the railway.;
- (viii) From just to the east of Paisley Gilmour Street Station, Wallneuk Junction and Arkleston Junction will then be extensively remodelled in order to accommodate the increased traffic that the GARL project will generate. Note that the remodelled junctions will not extend beyond the limits of existing NR land;
- (ix) Between Arkleston Junction and Shields Junction, a stretch of approximately 6km, a new third track will be built. There is sufficient room to place this new track within the existing rail corridor. The new track will be bi-directional and be placed between the existing Up and Down main lines;
- (x) Tie-in of the new track to Shields Junction;
- (xi) Widening of the Hillington Bridge over Sandwood Road that will include construction of a new deck and sub-structure;
- (xii) Construction of two new crossovers at Cardonald Junction;
- (xiii) Between Shields Junction and Glasgow Central Station, existing rail lines will be used for the GARL project. ;

- (xiv) At Glasgow Central Station platform 11A will be extended into the train shed. This work will mean construction of new track, the loss of existing short stay car parking spaces within the station as well as the exit ramp from the car park;
- (xv) Extension and electrification of the existing Up loop at Elderslie is required as a replacement for the loss of the Up loop at Wallneuk Junction;
- (xvi) All necessary signalling and wiring works;
- (xvii) Provision of OLE Structures associated with the proposed new infrastructure and the removal of redundant OLE structures;
- (xviii) Decommissioning of the aviation fuel farm at Glasgow Airport, as the proposed branch line alignment passes through the existing facility; and construction of a replacement facility on a site to the west of St Andrew's Crescent. This site is approximately 15 metres east of the Paisley Moss Local Nature Reserve (LNR);
- (xix) The commitment by the Promoter that 'temporary' replacement pitches and appropriate changing facilities will be provided elsewhere within the Paisley area. These pitches will be completed prior to closure of pitches at St James Park, thus ensuring that 22 league standard pitches will be available for use at all times during construction works; and
- (xx) Replacement of 20 league standard football pitches at St James' Park with provision of improved drainage and changing facilities. In addition, a further two new league standard pitches will be provided elsewhere in Paisley (at Ferguslie Park).

### 3.2

#### Environmental Clerk of Works

#### 3.2.1

The Planning authorities will appoint an Environmental Clerk of Works, funded by the Promoter, for the duration of the construction period. The purpose of this appointment is to ensure that the natural heritage interests of areas that may be affected by the works are safeguarded. The Environmental Clerk of Works will have the appropriate authority to review method statements, oversee works and recommend action as appropriate, including temporary stopping of works if required, to safeguard protected species and their habitats.

#### 3.2.2

As required, the Environmental Clerk of Works will appoint appropriate environmental specialists, such as ecologists, as required and at the expense of the Contractor.

#### 3.2.3

The Environmental Clerk of Works will be required to review and approve the Contractor's Method Statement (which must be submitted at least 4 weeks prior to the commencement of that phase of works) for each phase of works to ensure that natural heritage issue interests are safeguarded. The Contractor will take due cognisance of the environmental mitigation measures included in the Environmental Statement and this CoCP and also all applicable legislation in preparing such Method Statements.

#### 3.2.4

If the Environmental Clerk of Works considers that the detailed mitigation as proposed in the Method Statement is inadequate to deliver the environmental mitigation that the Authorised Undertaker is obliged by the Act to provide, the Environmental Clerk of Works shall consult with the local planning authorities and will seek advice from SNH and SEPA regarding these mitigation measures.

#### 3.2.5

If during construction the Environmental Clerk of Works considers that the mitigation that is being implemented in relation to any activity or work appears to be inadequate or does not comply with the Authorised Undertaker's obligations under the Act to implement any specific requirements of the Act relating to environmental mitigation, any other legislation, the Environmental Statement, the CoCP or any relevant local construction code, the activity or works in question will be stopped and will not recommence until further mitigation has been discussed with SNH and/or SEPA and agreed with the local planning authorities.

### 3.3

#### Construction Compounds

#### 3.3.1

As the work will take place over an extended period the Contractor will need various secure places to store plant, equipment and material and to assemble engineering components. In addition, office and messing accommodation may be provided depending on the size and duration of occupation at the compound.

- 3.3.2 Suitable locations for these construction compounds have been identified and the following locations, relating to which section of the scheme being worked on, are proposed.
- 3.3.3 Branch Line Construction Compounds. These comprise:
- (i) The compounds located adjacent to Glasgow Airport:
    - Area of car park immediately to the east of multi-storey Car Park (MSCP) No. 2;
    - Area surrounding site of existing airport fuel farm;
    - Southern half of the playing fields to the west of St Andrew's Crescent (with a temporary access from this road) and also area to the south of the proposed fuel farm site;
  - (ii) The eastern half of St James' Park (with a temporary access from the A726); and
  - (iii) Sites located within the Murray Business Area:
    - Car parking area south of Clark Street; and
    - Site north of Murray Street.
- 3.3.4 To improve access to the St James' Park Construction Compound and to avoid using the entrance on Greenock Road, a new temporary entrance will be constructed at the south-eastern corner of the park, opposite the entrance to McFarlane Road. A temporary signalised junction will be provided at this point.
- 3.3.5 Main Railway Line (west to east) Construction Compounds:
- (i) Area of land immediately to the south of the Paisley viaduct between Renfrew Road and East Buchanan Street owned by NR (with access from East Buchanan Street);
  - (ii) Area at the junction of the dismantled Arkleston Branch to the north of the main line but within the NR boundary;
  - (iii) Area of land owned by NR to the south of Arkleston Road bridge next to Barshaw Golf Course (with access from Arkleston Road);
  - (iv) Area to the south of Fifty Pitches Road immediately to the north of Cardonald Junction (with temporary access from Fifty Pitches Road);
  - (v) Area of land owned by SPT to the east of the Transco Gas Holder north of the railway (with access from Broomloan Road near the junction with Paisley Road West);
  - (vi) Area of land on the site of a demolished works adjacent to the railway at Shields Junction (with access from Cornwall Street South); and
  - (vii) Area of Central Station undercroft to the south of Midland Street (using an existing access from this street).
- 3.3.6 Additional activities to undertaken at particular construction compounds and working areas, where these differ or augment the conditions set out below and in Section 4 of the CoCP, are discussed in more detail on Section 5 of the CoCP.
- 3.4 Hours of Working**
- 3.4.1 The normal hours of working for the construction works, other than that required on the existing main railway line, will be within the normal working day, defined as being between **8.00am and 7.00pm Monday to Friday and 8:00 am to 1.00pm on Saturday**, unless the Contractor proposes additional or alternative working hours for construction reasons or the Promoter requires the Contractor to undertake certain works outside these hours.
- 3.4.2 On weekdays there will be a half hour start up period between 0730 and 0800. No noisy activities will be permitted during the start up period so that there is no disturbing construction - related noise audible beyond the site boundary. These periods will only be used by the Contractor to arrive at the site and prepare for the construction works. No deliveries will be made during the start up period unless agreed in advance with the Local Authority. These hours of work do not apply to equipment which is required to operate continuously.

- 3.4.3 In exceptional circumstances, additional or alternative working hours required will be agreed in advance by the Contractor, the Promoter and the Local Authority. The Environmental Clerk of Works shall be consulted where changes to the proposed hours of working are to be increased to ensure that adequate assessment of any impact on natural heritage issues can be considered.
- 3.4.4 Night-time working shall be kept to a minimum and the normal working day as defined above shall be used wherever possible, subject to the balanced consideration of impacts. Working outside normal day-time hours and at weekends and/or bank holidays shall only be permitted in pre-planned circumstances where there are sufficient operational, safety or engineering reasons. In instances where the Contractor proposes a change to the working hours he must seek the prior agreement of the Promoter, who will require approval from the relevant department of the Local Authority. Affected parties shall be advised through the procedures set out in Section 2 of this CoCP. The minimum advance notification period provided to the public and the CLG and BLG is 7 days, although as discussed above the exact notification period will be agreed with the liaison groups.
- 3.4.5 Where required, an application to the Local Authority for variation to the Section 61 consent, as defined in the Control of Pollution Act 1974, as amended by the Building Scotland Act 2003 (Schedule 6 paragraph 10(c)(ii)), on noise limits for each of the work sites or Construction Compounds required for the scheme, will be made. Procedures for notifying the public of changes to working hours will be carried out in accordance with Section 2 of the CoCP.
- 3.4.6 Identified sensitive locations are likely to require different hours of working during construction to those described above and these are addressed in Section 5 of the CoCP.

### **3.5 Delivery Routes**

- 3.5.1 The delivery of construction materials and the transportation of site operatives to working areas and construction compounds shall be planned in consultation with the Local Authority, NR and BAA.
- 3.5.2 Delivery routes outwith the defined 'limits' of the scheme will be defined by the Promoter in consultation with the Contractor. For the branch line compounds it is intended that these routes will be mostly by road, predominantly via the M8 and the St James Interchange (Junction 29). North of the motorway, compounds will be accessed via the local road north of the M8 heading east from Junction 29 (St James' Interchange) and the airport roads, returning to the M8 via Junction 28 and/or 29.
- 3.5.3 For construction compounds south of the M8, it is intended that vehicles will exit the M8 at Junction 29 southwards onto the A726. From this point vehicles will either turn left at the temporary signalised junction into the compound at St James' Park or right, into McFarlane Road. From McFarlane Road, vehicles will use North Greenhill Road to access Clark Street and Murray Street (via McKean Street).
- 3.5.4 Occasionally, however, where Clark Street and Murray Street are temporarily closed, access to the Murray Business Area may be required via the A726 Greenock Road and/or Greenhill Road, respectively.
- 3.5.5 For works on the main railway line, it is intended that the majority of materials will be transported to each construction compound by rail, as these are all adjacent to the railway. However, road access will be required for personnel to enter these sites and the local road network will be utilised in each case.

# 4 General Requirements

## 4.1 Introduction

4.1.1 This section identifies the general aspects of construction works that could impact on local communities and the environment. Activities specific to the main construction zones, construction site compounds and particularly sensitive areas are addressed in Section 5 of the CoCP.

## 4.2 Public and Private Highways

4.2.1 The Contractor shall submit to the Promoter a statement setting out the proposed measures to be taken with respect to traffic and safety, and which shall be approved by the statutory Roads Authority prior to the commencement of work. The statement will be prepared in consultation with the relevant departments of the Local Authority, the Police and the Promoter. Upon commencement of the construction works the approved statement shall be implemented and complied with throughout the construction period. It is intended that measures to be taken with respect to traffic and safety will include where appropriate:

- (i) Where temporary road closures and/or restrictions are required during construction the Promoter shall, at its expense and depending on the nature of the road closure as determined by the provisions of the GARL Bill, consult with the local CLG / BLG and as appropriate consult, or obtain the consent of, the Local Authority on the arrangements relating to the making, implementation and enforcement thereof;
- (ii) Use of temporary signing to identify each active section where construction is taking place, to help construction traffic to locate appropriate delivery/collection points;
- (iii) Use of temporary signing to restrict vehicle type/sizes and agreed haul routes;
- (iv) Use of adequate signing/lighting safety fencing wherever works are in progress to facilitate the safety of all groups of road users; and
- (v) Use of temporary signing in accordance with Chapter 8 of the Traffic Signs Manual (which contains advice to traffic authorities on the correct use of signs and road markings) wherever works are in progress to ensure the safety of all road users; and
- (vi) Prior publication of the proposed programme of roadworks so that the CLG, BLG, the PNCC and the public are kept fully informed of proposed temporary road closures and restrictions.

4.2.2 Approved routes to the working sites and compounds will be identified and the requirement to access the site via those routes will be a condition of the Contract. In addition, the following requirements, at all times, apply to the construction works:

- (i) Any temporary footways and ramps on the public highway will be of an adequate width and surfaced in materials to the reasonable satisfaction of the Local Authority.. The specifications/dimensions are available as part of the Contract specification;
- (ii) All openings or obstructions on the carriageway or footway will be barricaded with a continuous rail (with appropriate lighting where required) stable enough to offer appropriate resistance and remain effective should someone who is visually impaired collide with it;
- (iii) All pedestrian routes diverted onto the carriageway will be clearly defined by continuous barriers, constructed to the reasonable requirements of the Local Authority. The specifications/dimensions will be available as part of the Contract specification;

- (iv) So far as is reasonably practicable, all parts of the public highway including drainage systems will, at all times, be kept free from mud and loose materials arising from the works. A representative of the Promoter will closely monitor mud and dust suppression on the site. To comply with these requirements the Contractor shall take the following measures:
- Provide easily-cleaned horizontal surface for vehicles entering, parking and leaving any work site. Haulage routes within the scheme limits will be surfaced;
  - Provide wheel washing facilities at the exits from Construction Compounds and work sites where appropriate, including, where reasonably practicable, mechanical wheel spinners, adequate provision for drainage via settlement tanks and regular maintenance of settlement tanks, during the working hours specified in Section 3.4 of the CoCP;
  - Provide an approved mechanical road sweeper to clean work sites and any mud or debris deposited by site vehicles on roads or footpaths in the vicinity of each work site, during the working hours specified in Section 3.4 of the CoCP;
  - Ensure the adequate sheeting of each lorry carrying materials which may give rise to dust generation and to prevent spoil falling during its journey to its final destination;
- (v) Vehicles entering and leaving each Construction Compound or work site will only be allowed to cross footways via properly constructed crossings;
- (vi) Access which is deemed to include both the route and entrance to any work site by lorries will be as agreed with the Promoter and the appropriate statutory body and the Police;
- (vii) No daytime or overnight parking of vehicles associated with the works in the vicinity of any work sites or Construction Compounds will be allowed except where delivery or removal of materials is taking place at that location or with prior agreement with the Promoter and the appropriate department of the Local Authority;
- (viii) All parked vehicles or vehicles waiting to enter any work site or Construction Compound will be required to switch off their engines after arrival;
- (ix) Road surfaces on public and private roads used as haul routes will be repaired by the Contractor, to the reasonable satisfaction of the Local Authority, to ensure that damage caused by Contractor's vehicles, delivery vehicles, plant, etc., such as rutting of surfaces, pot holes, damage to kerbs, etc., are made good as soon as possible after damage occurs. Such repair works required for damage would be agreed with the Local Authority or by the private road authority as appropriate;
- (x) All street furniture and other features such as trees within the Bill limits that are not required to be removed or directly affected as part of the works will be carefully protected in accordance with the reasonable requirements of the owners thereof and agreement with the Promoter. Any damage caused by the Contractor will be made good as soon as reasonably practicable, to the satisfaction of the owner of the street furniture or other features at the Contractor's expense; and
- (xi) The Contractor shall ascertain and comply with any restrictions in respect of abnormal load routes as they may affect access to any work site.

4.2.3 Proposals for the temporary closure or diversion of any public right of way, that are not identified in Schedule 3 to the Bill, will be subject to consultation with the local CLG/BLG and submitted to the relevant department of the Local Authority for approval prior to commencement of any construction works.

## 4.3

### Noise

#### 4.3.1

The Contractor shall, as far as reasonably practicable, be required to prepare predictions of construction noise, prior to commencement of the construction works, in order to establish achievable noise levels at each specific work site or Construction Compound. These predictions shall be made in accordance with BS 5228: 1997 Noise Control on Construction and

Open Sites, and be presented to Promoter and the relevant department of the Local Authority for comment.

- 4.3.2 The Contractor shall seek agreements with the Local Authority under section 61 of the Control of Pollution Act 1974, as amended by the Building Scotland Act 2003 (Schedule 6 paragraph 10(c)(ii)), on noise limits for each of the work sites or Construction Compounds required for the scheme. For the purposes of the CoCP, Construction Compounds shall mean those locations utilised by the Contractor for the purposes of storage of plant, machinery, materials and the positioning of cabins etc., in connection with the construction works.
- 4.3.3 The proposed Contract tender documents will include clearly defined Intervention Criteria set by the Promoter with which the successful Contractor will be required to comply. The proposed Intervention Criteria are set out in Appendix B of the CoCP and are based on British Standard BS5228. These Intervention Criteria not only set out noise trigger values but also the actions required should the Contractor fail to maintain noise levels below the trigger values, including the offer to provide secondary glazing or to arrange temporary re-housing during such periods.
- 4.3.4 Prior to the commencement of any construction work, the Contractor will be required to demonstrate to the Promoter that he can comply with these Intervention Criteria and/or the criteria contained within the section 61 agreements, if the latter are more stringent.
- 4.3.5 Where it is predicted that construction noise levels will exceed the published Intervention Criteria the Contractor will be required to implement mitigation measures in order to avoid triggering the Intervention Criteria. Examples of noise mitigation measures that may be employed by the Contractor in order to avoid triggering the Intervention Criteria include:
- (i) Construction Compound to be surrounded with fencing or other barriers, where appropriate, and continuous plant to be housed in acoustic enclosures;
  - (ii) Use of electrical items of plant instead of diesel or petrol plant in especially sensitive locations;
  - (iii) Exhaust silencing and plant muffling equipment to be maintained in good working order;
  - (iv) Use of temporary screens at sensitive locations;
  - (v) All plant, whether stationary or mobile, to only have its engine running when actually in use or when being prepared for use, such as an air compressor building up pressure after being initially turned on. Covers on plant which reduce emitted noise levels shall be maintained in good condition and shall be kept in effective operation at all times when the plant's engine is running; and
  - (vi) Temporary cessation of works.
- 4.3.6 The measures listed above are not exhaustive. Further reasonable measures may be required from time to time which should be agreed between the Contractor and the Promoter, so that noise and vibration impacts can be reassessed and appropriate mitigation measures approved on receipt of the appropriate method statement.
- 4.3.7 Should it be predicted that the proposed works at particular working areas or Construction Compounds will trigger the Intervention Criteria and that such noise levels cannot be mitigated at source, the Contractor will be required, at least **21 days** prior to commencement of construction, to contact owners of eligible properties, as defined in Appendix B, and offer to provide secondary glazing or to arrange temporary re-housing during such periods.
- 4.3.8 Where the need for temporary housing is predicted, the Contractor will liaise with the resident(s) affected to ensure that the provision of temporary housing is adequate and acceptable to the resident(s) and as far as possible is on a 'like for like' basis in terms of location, capacity and facilities (e.g. disabled access, etc.).
- 4.3.9 It should be noted, however, that those offered secondary glazing or temporary re-housing do not necessarily have to take up such offers. In addition, it should also be noted that the Contractor would be unable to provide financial compensation in lieu of the measures set out in Appendix B.

- 4.3.10 If the Contractor wishes to change his proposed method of working once the construction works commence then this can only be achieved following agreement with both the Promoter and the relevant department of the Local Authority.
- 4.3.11 The Contractor shall provide suitably designed and constructed acoustic screens (specifications shall be included within the proposed tender documents) which shall be used as necessary and when directed by the Promoter in consultation with the relevant department of the Local Authority.
- 4.3.12 The Contractor shall allow access to work sites for a Promoter-appointed representative to monitor background noise, for the purpose of checking compliance with the Intervention Criteria. Such monitoring will be undertaken in accordance with a programme to be agreed between the Promoter and the Contractor, which will include the location and frequency of monitoring. The Promoter will pay particular attention to monitoring noise at or in the immediate vicinity of residences of objectors for whom such potential impacts is a concern. The results of such monitoring will be made available to the public.
- 4.3.13 Without the foregoing general stipulations, the following specific locations (for noise and vibration monitoring – see section 4.4.7 below) will be included as a minimum:
- (i) Mainline access points near Fochabers Drive;
  - (ii) The eastern end of Cardonald Station;
  - (iii) At or near Urrdale Road and the M8 Underpass close to Urrdale Road;
  - (iv) At Ladykirk Drive/Chirnside Road and
  - (v) The Arches Theatre.

#### **4.4 Vibration**

- 4.4.1 The Contractor shall, as far as reasonably practicable, prepare predictions of construction vibration prior to commencement of the construction works in order to establish achievable vibration levels at specific work sites. Guidelines for controlling vibration are set out in Appendix C of the CoCP.
- 4.4.2 The Contractor shall seek agreements with the Local Authority under section 61 of the Control of Pollution Act 1974, as amended by the Building Scotland Act 2003 (Schedule 6 paragraph 10(c)(ii)), on vibration limits for each of the work sites or Construction Compounds required for the scheme.
- 4.4.3 The Contractor in agreement with the Promoter shall, in consultation with NR, put in place a vibration monitoring regime to monitor any work that may affect existing NR infrastructure
- 4.4.4 Following agreement with the relevant department of the Local Authority there will be included within the proposed tender documents clearly defined vibration criteria which must be complied with by the Contractor in relation to the proposed method of working, type of plant to be used, and vibration mitigation measures for each work site.
- 4.4.5 The Contractor shall ensure that all reasonable measures are taken to protect local residents, nearby property and the occupiers thereof from nuisance and physical damage that may be caused by vibration.
- 4.4.6 If the Contractor is proposing to use driven piles at any location, a method statement report must be provided. All methods of construction will be approved by the Promoter in advance of work.
- 4.4.7 In order to ensure appropriate measurements are taken, a programme of on-site monitoring by a suitably qualified practitioner is to be agreed between the Contractor and the Promoter. Such a programme will include the location and frequency of readings, and to whom the results should be made available. The Promoter will pay particular attention to monitoring noise at or in the immediate vicinity of residences of objectors for whom such potential impacts is a concern. The results of such monitoring will be made available to the public.
- 4.4.8 The Contractor shall make good damage to public roads and other routes used by construction traffic to the reasonable satisfaction of the Local Authority, in order to ensure that potholes and other unevenness, which may be a source of vibration, are addressed and repaired quickly.

- 4.4.9 The Contractor shall carry out a risk assessment of those buildings and structures that may be vulnerable to vibration generated by the works. A two stage process would be used to identify those buildings and structures as follows:
1. The first stage would involve a review of the proximity of the buildings/structures to the proposed works. BS5228 would be used to predict the construction vibration at various distances and the potential buildings and structures would be derived from that assessment, and
  2. The buildings and structures would be screened based on a range of factors including their form, type, age and sensitivity (e.g. heritage, listed etc...). Based on this and the application of guidance within BS7385, BRE and TRL research the potential buildings and structures would be derived.

In addition to the above process, the Promoter would review any building/structure specific requests for condition surveys received from members of the public or affected parties. Based on the assessment of risk, condition surveys of buildings and structures deemed to be vulnerable will be undertaken in order to establish the 'baseline' condition of such buildings and structures before commencement of construction works.

#### **4.5 Dust and Air Pollution**

- 4.5.1 The Contractor shall take necessary measures to avoid creating a dust nuisance and shall, prior to commencement of any construction work, submit to the Promoter and the relevant department of the Local Authority a statement, setting out the proposed measures to be taken to prevent dust nuisance, and which shall be approved by the relevant department of the Local Authority in consultation with the Promoter prior to the commencement of any construction work. Upon commencement of the construction work, the approved statement will be implemented and complied with throughout the period of the construction work.
- 4.5.2 Additional control measures and site boundary monitoring may be required, depending upon the working methods employed, where land known to be contaminated is disturbed. Site boundary monitoring is to be carried out by an independent specialist at the Contractor's expense for the Promoter in consultation with the relevant department of the Local Authority.
- 4.5.3 Examples of measures to prevent dust emissions to be included in the Contractor's statement are set out in Appendix D to the CoCP.
- 4.5.4 It should be noted that the measures referred to above are not exhaustive. Further reasonable measures may be required from time to time which should be agreed between the Contractor and the Promoter.
- 4.5.5 The Contractor will be responsible for carrying out daily visual inspections to ensure that dust control measures are effective. In the event of dust generation the Contractor will immediately review their dust control measures..
- 4.5.6 The Contractor shall take all necessary precautions as are reasonably practicable to prevent the occurrence of smoke emissions or fumes from site plant or stored fuel oils for safety reasons and to prevent, as far as is reasonably practicable, such emissions or fumes drifting into residential areas, nearby workplaces or areas of public open space. In particular, plant shall be well maintained and measures taken to ensure that engines are not left running for long periods when not directly in use. Plant which emits visible emissions after warm-up shall be taken out of service either repaired or replaced.

#### **4.6 Handling and Disposal of Contaminated Material (Including Waste)**

- 4.6.1 The Contractor shall carry out the works in such a way as to prevent, contain or limit as far as reasonably practicable any adverse impacts arising from the presence of contaminated land or material during construction activities. The Contractor shall take all necessary measures to deal with noxious and toxic materials encountered. All contaminated sites and the hazards that they present will be identified in consultation with the relevant department of the Local Authority prior to the commencement of work.
- 4.6.2 Where contaminated material is excavated, it will be necessary to determine the concentrations of any contaminants to ascertain whether the material can be placed elsewhere on the site, or, if it is classified as an environmental hazard by SEPA, or as a Special Waste as defined in the Environmental Protection Act 1990 (as amended), the appropriate method for disposal will be

identified. Excavated materials classified as giving rise to an environmental hazard, or Special Waste will be disposed of at a suitably licensed waste disposal site and all parties will discharge their statutory obligations in relation to the waste management Duty of Care, imposed by Section 34 of the Environmental Protection Act 1990, etc.

- 4.6.3 The disposal of waste, including any surplus spoil, will be managed to maximise the environmental and developmental benefits from the use of surplus material and to reduce any adverse environmental effects of disposal. Waste materials will be managed in accordance with current statutory guidance concerning the disposal of controlled wastes.
- 4.6.4 In the event that the Contractor wishes to arrange for any recycling of contaminated materials encountered during the construction works, then before undertaking any recycling measures he shall agree with the Promoter, who will consult with the Local Authority, and agree to the recycling of such materials.
- 4.6.5 Waste generated from the construction works will be minimised by re-use and recycling where possible. Waste stored on site will be segregated according to its type to prevent cross-contamination of controlled wastes and special wastes. Separate storage facilities for waste to be recycled will also be provided by the Contractor.
- 4.6.6 Waste will be stored in covered skips to prevent dust and litter being blown out and to prevent accumulation of rainwater.
- 4.6.7 Should invasive species (such as Japanese Knotweed, etc.) be found, the Contractor shall excavate soil, to a depth agreed with the Promoter, around the edge of the plant and ensure that it is destroyed before disposal of the material at a licensed landfill site. Alternatively, the material could be buried on site at a depth greater than 5m. The material should not be reused for construction or landscaping purposes.
- 4.6.8 The Contractor shall make reference to the HSE publication, HSG 66 Protection of Workers and General Public During the Development of Contaminated Land 1991, for guidance on precautions required during construction on potentially contaminated sites. In particular, the Contractor shall ensure that all reasonable precautions are taken to protect workers and members of the public from exposure to any noxious or toxic chemicals. These precautions will include:
- (i) Protective clothing, including overalls, hand protection, head protection, and safety Wellington boots to be worn at all times by all authorised personnel.;
  - (ii) Contact with fill materials to be avoided;
  - (iii) If skin contact occurs, the affected area should immediately be washed;
  - (iv) Shoes and boots should be cleaned off prior to leaving the site;
  - (v) During prolonged dry periods, if there is the potential for significant dust generation in construction, the surface of the site should be damped down;
  - (vi) Entry into confined spaces and trenches should be minimised. If entry is necessary, then clear procedures should be developed for entry into trenches, manholes, etc. Where there is a possibility of oxygen deficiency or asphyxiation from toxic gases, this should include monitoring for a range of gases, etc. Any person entering a confined space must be trained and certified to operate in confined spaces;
  - (vii) If it is necessary to remove contaminated materials from site, then open lorries or skips used for that removal will be sheeted; and
  - (viii) Detailed records of disposal are necessary and the Contractor should discuss the content of such records with SEPA.

## 4.7

### **Protection of Surface and Groundwater Resources**

#### 4.7.1

The Contractor shall carry out the works and implement working methods devised to protect surface and groundwater from pollution and other adverse impacts including changes to flow volume, water levels and quality. All site activities will be carried out in accordance with all current legislation as well as current SEPA Pollution Prevention Guidance notes, such as:

- (i) PPG01 - General Guide to the Prevention of Pollution
  - (ii) PPG02 - Above Ground Oil Storage Tanks
  - (iii) PPG05 - Works In, Near or Liable to Affect Watercourses
  - (iv) PPG06 - Working at Construction and Demolition Sites
  - (v) PPG09 - Pesticides
  - (vi) PPG21 - Pollution Incident Response Planning
  - (vii) PPG23 - Maintenance of Structures Over Water
- 4.7.2 The Contractor shall ensure that any proposed drainage schemes required for the construction of the GARL project are agreed in advance with the Promoter, SEPA, the relevant department(s) of the Local Authority and Scottish Water.
- 4.7.3 The Contractor shall obtain the appropriate consents or licences from the appropriate bodies including SEPA or Scottish Water for discharges to watercourses, sewers or groundwater in accordance with relevant statutory provisions.
- 4.7.4 The Contractor shall obtain the appropriate licences from SEPA for works adjacent to or above watercourses in accordance with the Water Environment (Controlled Activities) (Scotland) Regulations 2005.
- 4.7.5 In planning and carrying out any construction works, precautions are to be taken to secure the protection of watercourses and water in underground strata against pollution. Those should include a ground investigation of sites where past use of the site has indicated the potential for contamination to ensure that suitable mitigation measures are applied where contaminated land is disturbed.
- 4.7.6 The Contractor shall ensure that all personnel are aware of the risks of infections, such as leptospirosis when working in a river environment.
- 4.7.7 If any pollution incident occurs, then the Contractor shall advise SEPA immediately and take prompt action to minimise the effect. A procedure will be in place to ensure an effective response to a pollution incident. This procedure will be agreed with the Promoter in advance of the commencement of any works.
- 4.7.8 A common cause of pollution from sites is through vandalism. Therefore, the Contractor shall ensure that sites are adequately protected by the provision of industry standard hoardings, secure fences, and locked accesses where possible.
- 4.7.9 In order to limit pollution from silt and cement, the Contractor shall ensure the following measures are followed:
- (i) The wash water from concrete mixing plant, or the cleaning of ready mixed concrete lorries, must not be allowed to flow into any drain or watercourse. Washings must be contained in sealed units for disposal off site;
  - (ii) Site roads must be regularly swept or scraped and kept free from deposits in order to prevent silt, oil or other materials entering any drain or watercourse;
  - (iii) Any wheel wash facilities should be securely constructed with no overflow and effluent should be contained for proper treatment and disposal; and
  - (iv) Before any discharge of water is made from the site, adequate provisions, such as settlement lagoons or silt traps fitted with oil absorbent booms, must be made to ensure that pollution will not occur. The local SEPA office should be consulted in order to obtain approval.
- 4.7.10 In order to prevent pollution from oil, fuel and chemicals:
- (i) The construction of any storage facilities for oils, fuels or chemicals should be carried out in accordance with appropriate legislation and details of such storage arrangements will be submitted to and approved in writing by the relevant department of the Local Authority before such construction commences. The

storage facilities for fuel and oil must comply with appropriate regulations<sup>1</sup> and as such the following must be in place:

- Provision of a secondary containment (a bund or drip tray) to ensure that any leaking or spilt oil does not enter controlled waters;
  - Any associated equipment such as valves, filters or sight gauges must be within the bunded area;
  - The volume of the secondary containment facility must be sufficient to contain 110% of the contents of the tank in single tank installations. If more than one storage container is involved, the bund must be capable of containing 110% of the largest tank, or 25% of the total aggregate capacity, whichever is the greatest.
  - The base and walls of the containment facility must be impermeable to water and oil and checked regularly for leaks;
  - There must be no drainage valve or other outlet in the bund;
  - Any oily water collected within the secondary containment facility must be disposed of correctly by a suitably licensed Contractor; and
  - Where reasonably practicable the storage facility should be placed in a location at minimal risk from collision damage, with any underground pipework adequately protected from physical harm.
- (ii) Filling and refuelling must be strictly controlled and together with any oil storage tanks, should be confined to a location remote from any watercourse or drain;
- (iii) Leaking or empty drums must be removed from the site immediately;
- (iv) Any tanks or drums of non oil based chemicals must be recorded and additional records kept as required by the Control of Substances Hazardous to Health Regulations 2002 (COSHH Regulations). Storage facilities should, at the very least, be secure containers or compounds which should be kept locked when not in use; and
- (v) Before any tank is removed or perforated, particularly during demolition works, all contents and residues must be identified for safe disposal. Pipes that may contain significant quantities of oil or chemicals should be capped, or valves closed to prevent spillage.

4.7.1.1 Prior to being discharged into any watercourse, surface water sewer or soakaway system, all surface water drainage from impermeable parking areas, roadways and hardstanding for vehicles shall be passed through an oil interceptor designed and constructed to have a capacity and details compatible with the site being drained. Roof water should not pass through such interceptors.

## 4.8 Ecology and Biodiversity

4.8.1 Prior to commencing the construction work, the Contractor shall establish, in conjunction with the Promoter and the relevant department of the Local Authority, a policy for dealing with trees which may be directly or indirectly affected by the works. Such a policy will be consistent with BS 5837:2005 Guide for trees in relation to construction. In particular:

- (i) The Contractor shall carry out all arboricultural works in accordance with BS 3998 Recommendations for tree work 1989;
- (ii) The Contractor shall ensure that any trees or hedges which are not required to be taken down under the Contract are protected by fencing and visible barriers prior to works commencing, and these will be maintained throughout the works. The protection provided by such fencing should include protection of the area occupied by the tree roots or as advised by the Promoter representative. The Promoter will

<sup>1</sup> Note that the Water Environment Oil Storage (Scotland) Regulations 2006 are not yet in force but are scheduled to come into force on 1 April 2006.

consult with the relevant department of the Local Authority prior to permitting the Contractor to proceed.

- (iii) Where any existing trees or hedges are to be removed for the construction of the works, the Contractor shall, before commencing any clearing in the areas concerned, agree with the Promoter and the relevant department of the Local Authority those trees and hedges to be protected and those to be removed and any measures/working methods necessary to safeguard trees to be retained;
- (iv) If the Contractor considers it essential to prune branches or roots of trees and hedges, it will be necessary to first obtain the permission of the Promoter. Such permission, if given, may include requirements to hand dig to access roots and may specify the size of roots to be pruned, together with any remedial/reinstatement procedures. The Promoter will consult with the relevant department of the Local Authority prior to permitting the Contractor to proceed.

4.8.2 In addition, any new planting of trees or the re-location of plant species will be set out in the Contract and maintained by the Contractor in accordance with the Contract. The Promoter will develop the terms of the Contract as they relate to this clause in consultation with the relevant department(s) of the Local Authority.

4.8.3 The Contractor shall comply with the provisions of the Wildlife and Countryside Act 1981, The Protection of Badgers Act 1992, Conservation (Natural Habitats, &c.) Regulations 1994 and the Nature Conservation (Scotland) Act 2004 together with any specific requirements agreed with the relevant department of the Local Authority. The Contractor shall be required to develop a specific method statement for site specific requirements for sites including Paisley Moss Local Nature Reserve (LNR). The following general principles are applied, however, it must be noted that the Contractor must implement further measures in order to comply fully with legislative requirements, including:

- (i) Wherever wildlife habitats remain alongside working areas, provision shall be made by the Contractor to prevent encroachment onto valuable ecological areas that are not essentially required for construction. This shall include the provision of secure fencing where appropriate, including adjacent to the Paisley Moss Local Nature Reserve (LNR);
- (ii) Harm to badgers and other wildlife should be avoided by ensuring that construction materials and structures are contained within secure compounds;
- (iii) Prior to any works be carried out next to a watercourse, surveys for otters will be undertaken.
- (iv) Measures to inspect cleared vegetation for reptiles prior to removal from site and measures to relocate any reptiles found on site will be instigated;
- (v) Prior to felling or surgery on trees over 8m height and/or 30cm diameter, the Contractor shall commission a bat survey of the affected trees, using an appropriately licensed surveyor, and will undertake any mitigation or protective measures that may be required by Scottish Natural Heritage (SNH) should bats or their roosts be located. In addition, water storage tanks (and other containers) on site shall be sealed to prevent bat entry;
- (vi) Vegetation clearance will be undertaken during September to March, outside the main breeding season for most species. The clearance will be carried out in stages to allow fauna to move from the working area. Cleared vegetation will be stockpiled for two days or more to allow fauna to escape prior to the disposal of the material;
- (vii) Standards of dust and air pollution control, as set out in Section 4.5 will be applied at all work sites to protect adjacent habitats; and
- (viii) Suitable precautions will be taken to prevent entry of pollutants into any bodies of water as set out in Section 4.7.

## 4.9

### **Site Boundaries/Hoarding/Temporary Structures on the Public Highway**

#### 4.9.1

The Contractor shall ensure all work sites are sufficiently and adequately fenced off from members of the public in order to prevent anyone straying onto the work sites. Such fencing

will be constructed to the reasonable satisfaction of both the Promoter and the relevant department of the Local Authority as detailed in the tender documentation. If hoardings are provided, suitable bulkhead lights will be fitted where necessary.

- 4.9.2 The provision of gates in the fencing or hoarding should, as far as reasonably practicable, be positioned and constructed to minimise the noise transmitted to nearby noise-sensitive receptors from the work site directly, or from plant entering or leaving the site.
- 4.9.3 The Contractor shall maintain security at enclosed work sites on a 24 hour basis where it is identified that such security measures are required in order to prevent unauthorised entry or exit from the work sites. Site gates will be closed and locked when there is no site activity. Any alarms provided by the Contractor should meet health, safety and nuisance requirements and be maintained in a satisfactory working condition at all times.
- 4.9.4 Contractors shall ensure site compounds adjacent to railway lines are secure from theft and vandalism and where necessary employ security staff to limit access to railway compounds and prevent damage to NR infrastructure.
- 4.9.5 The Contractor shall ensure that if hoardings are provided they are painted on the side facing away from the site in a plain uniform manner and include a project logo and the Contractor's logo as agreed with the Promoter and the relevant department of the Local Authority. Opportunities will be explored, in conjunction with the Local Authority, to engage with the local community through the use of the hoardings for approved display purposes, e.g. local school displays to engage the local community with the construction works.
- 4.9.6 The Contractor is expressly prohibited from displaying or allowing to be displayed any advertisement, notice, etc., including illicit bill or fly posting on the hoardings. The Contractor shall also ensure that all graffiti or defacement to the hoardings are removed and made good as soon as reasonably practicable.
- 4.9.7 At each enclosed Construction Compound site an information board will be provided detailing information on the project, together with telephone contacts (including an emergency telephone number), addresses and email address for use by members of the public who wish to lodge complaints or comments.
- 4.9.8 Any fenced storage areas, scaffolding gantries, loading/unloading bays, skips and other temporary structures on the public highway provided by the Contractor will be maintained by the Contractor in accordance with the appropriate licence granted by the relevant department of the Local Authority.
- 4.9.9 The Contractor shall ensure that construction buildings, equipment and lighting are sited so as to minimise visual intrusion, consistent with the efficient operation of each work site.

#### **4.10 Archaeological Remains**

- 4.10.1 The Contractor, prior to commencement of any construction work, shall consult with the Promoter, the West of Scotland Archaeology Service (WoSAS), Historic Scotland and the Promoter's Heritage Advisor to agree a scheme for archaeological mitigation setting out the proposed measures to be taken to prevent damage to known and unknown archaeological remains. Where required, approval will be sought from Historic Scotland. Upon commencement of the construction work, the approved statement will be implemented and complied with throughout the period of the construction work.
- 4.10.2 Measures to be addressed in the scheme of archaeological mitigation will include field investigation and recording work, and these will be considered in advance of the appointment of the Contractor. Any archaeological excavation and recording work will be required to be undertaken by the Contractor's Field Archaeologist for:
- (i) The preservation of features *in-situ*;
  - (ii) The translocation of features to be preserved away from the route of the GARL project;
  - (iii) Procedures for advance notification of works in areas where close archaeological monitoring is necessary
  - (iv) A methodology for the watching brief and liaison with WoSAS; and

- (v) A methodology for any archaeological excavation fieldwork assessment and preparation of the cultural heritage archive.

4.10.3 The methodologies adopted for various stages of the work will conform to the Institute of Field Archaeologists Standards and Guidance documents.

4.10.4 The Contractor shall take all reasonable precautions to prevent his workmen or any other persons from removing or damaging any fossils, coins, articles of value or antiquity, structures or other remains, or any other thing of archaeological interest discovered either at the time of the archaeological excavation or during subsequent construction works except for material recovered during archaeological mitigation or for the purposes of preservation at another location.

#### **4.11 Built Heritage**

4.11.1 The Contractor shall carry out the works in such a way as to protect, conserve, enhance or minimise the impact on historic buildings (including Listed Buildings), historic areas (including Conservation Areas) and their settings. The Contractor shall submit to the Promoter a statement or statements for approval, setting out the proposed works, methods to be used and measures to be taken, with respect to historic buildings and areas on sites to be approved by the Promoter.

4.11.2 The Promoter will liaise with the relevant department of the Local Authority prior to approval and commencement of works. This statement will address requirements for specialist monitoring measures. Any such statement shall be approved by the Promoter in liaison with Historic Scotland and the relevant department of the Local Authority prior to the commencement of work at the site(s) to which the statement relates.

4.11.3 Upon commencement of the construction work any relevant statement will be implemented and complied with throughout the construction period. The advice given in National Planning Policy Guidance Note 18, 'Planning and the Historic Environment', Planning Advice Note 42 'Archaeology- the Planning Process and Scheduled Monument Procedures and BS 7913:1998 Guide to the Principles of Conservation of Historic Buildings should be followed.

4.11.4 The Promoter will ensure that all necessary detailed planning approvals are obtained before the start of the relevant part of construction and that the Promoter and Contractor comply with the requirements stipulated in any approvals and the conditions therein.

#### **4.12 General Requirements for Construction Compounds**

4.12.1 The Contractor shall ensure the following general requirements are met in relation to the construction compounds:

- (i) Smoking areas are provided at suitable locations at ground level, as far as is practicable. Smoking will not be allowed at any location below ground level;
- (ii) All fires are prohibited, including fires for the disposal of vegetation, packaging, or any other material. The use of braziers is permitted for the heating of hand held black-top-application tools;
- (iii) Rubbish is removed at frequent intervals and each work site kept clean and tidy;
- (iv) Adequate toilet facilities are provided and kept clean;
- (v) Food waste is contained and removed at least weekly;
- (vi) Wheel washing facilities are brushed clean at frequent intervals;
- (vii) Detailed daily records are kept of climatic conditions including rainfall, minimum and maximum temperatures, humidity and wind direction;
- (viii) Records of construction plant used on the site shall be maintained at weekly intervals; and
- (ix) All necessary measures are taken to minimise fire risks and the Contractor shall comply with the requirements of the local Fire Authority.

4.12.2 Upon completion of construction, the Contractor shall be responsible for the reinstatement of construction compounds locations.

- 4.12.3 Each work site may be inspected on a frequent basis by a nominated representative from the Promoter. A mutually acceptable timescale for site inspections will be agreed between the Contractor and the Promoter prior to commencement of construction. Should the Contractor be found not to be complying in any respect with the CoCP he will be subject to the relevant conditions of the Contract which will stipulate the period by which compliance will be effected. If the Contractor fails to rectify the non-compliance the Promoter will take remedial action.
- 4.12.4 The Contractor shall not allow any living accommodation on site except with the prior consent of the relevant department of the Local Authority. Portable mess rooms, locker rooms, toilets and showers will be permitted.
- 4.12.5 At each work site all vehicles will enter and exit in a forwards direction except where space restriction does not permit this. In that event movement will be properly controlled by a responsible person(s) observing the rear of the vehicle (a banksman).
- 4.12.6 The Contractor shall provide suitable lighting to the site boundaries with illumination sufficient for the safety of the passing public including mobility impaired people. Site lighting must be designed, positioned and directed so as not to unnecessarily intrude on passing drivers on public highways, and having due regard to residential premises neighbouring the site.
- 4.12.7 If site security cameras are provided by the Contractor, these must be located in positions which are not likely to cause offence to local residents or commercial business premises.
- 4.12.8 The Contractor shall prepare emergency procedures to be implemented in the event of an environmental incident such as an accidental spillage.
- 4.12.9 On completion of the construction works the Contractor shall clear away and remove from each work site all plant, surplus materials, rubbish and temporary works of every kind and leave the whole of each work site and works in a clean and tidy condition to the satisfaction of the Promoter and the relevant department of the Local Authority.
- 4.13 Training and Monitoring the Implementation of the CoCP**
- 4.13.1 The Contractor shall prepare and implement a training programme to ensure that all site personnel are aware of the requirements of the CoCP. The training package will be approved by the Promoter in consultation with third parties including the relevant departments from the Local Authority, SEPA, SNH, Historic Scotland and the HSE.
- 4.13.2 A suitably qualified person appointed by the Contractor and approved by the Promoter will oversee the ongoing implementation and monitoring of the CoCP. This person will ensure the continued effective implementation of the CoCP for the duration of the construction works.

# 5 Site Specific Requirements

## 5.1 Introduction

5.1.1 This chapter sets out any site-specific requirements associated with particular working areas and Construction Compounds, over and above those discussed in the previous section. A number of proposed locations for Construction Compounds have been identified during the development of the scheme and these are listed below; however, ultimately it will be the Contractor's responsibility to select those sites that he deems most suitable to be used as Construction Compounds.

## 5.2 Glasgow Airport

5.2.1 Proposed works in this area will comprise the construction of a concrete viaduct structure with piled foundations, a new airport railway station located immediately south of the existing multi-storey car park and an elevated link structure connecting the railway station to the airport terminal building. The new twin track railway will be installed on the viaduct structure with associated signalling and OLE wire and gantries. Works will include connection of the new drainage from the railway viaduct and station into the existing airport drainage system

5.2.2 As stated above the Contractor's general requirements under the CoCP are discussed in detail in the previous section. However, there are a number of issues particular to working in the vicinity of Glasgow Airport.

5.2.3 In general, in addition to adhering to all statutory and other guidance, the Contractor shall be required to comply with BAA requirements for working on BAA property and adjacent to the Airport. Such requirements will include compliance with BAA's Operational and Health and Safety Guidance, implementation of appropriate site induction procedures, liaison with Strathclyde Police and Strathclyde Fire and Rescue Service and other requirements agreed between the Promoter and BAA.

5.2.4 Glasgow Airport is recognised as having an important role in stimulating Scotland's economy and the Promoter recognises the potential impact of the construction of the works on the core business of the airport. The Promoter is committed to ensuring that construction of the works is undertaken in a sensitive manner and in partnership with BAA.

5.2.5 The Contractor shall be required to pay particular attention to working at height and particularly the use of cranes and the potential to produce interference for electromagnetic signals. Specific method statements that describe how this work will be carried out will be required for all on-airport operations. These methods statements will need to be approved by BAA and the Promoter. The Contractor shall be required to maintain close liaison with BAA in order to comply with his obligations under the Contract.

5.2.6 Roads within the airport are owned and maintained by BAA rather than the Local Authority and the Contractor shall be required to liaise with BAA in all matters associated with the use of these roads. Access and haul routes will therefore need to be agreed with BAA.

5.2.7 Construction adjacent to hotels at Glasgow Airport shall comply with the working hours stipulated in the Contract. These will be developed by the Promoter in liaison with the Local Authority and Hotel Management. Noise and hours of working may be restricted in certain areas and at certain times. For example, working times close to the Holiday Inn may be restricted (e.g. to prevent disturbance to air crew on night time flights resting at the Hotel during the day). However, longer working times at other areas may be permitted where these are not adjacent to hotels at Glasgow Airport (such as the Holiday Inn, the Express by Holiday Inn and the Ramada Hotel) or to residential properties.

### 5.3 Airport Fuel Farm

5.3.1 The aviation fuel farm at Glasgow Airport will be decommissioned to accommodate the new railway viaduct structure. A new fuel farm facility will be constructed to the west of St Andrew's Crescent and approximately 15 metres east of Paisley Moss Local Nature Reserve (LNR).

5.3.2 The Contractor shall liaise with the LNR Management Committee to put in place a mitigation plan that will guide the construction of the new fuel farm facility.

5.3.3 In the area adjacent to the Paisley Moss LNR, particular restrictions on the storage of chemicals, fuel, etc., will be required and the Contractor shall be required to comply with all measures discussed in Section 4 of the CoCP. Such measures will include, but not be limited to: segregated storage for different chemicals; bunding around storage tanks; placement of drip trays under parked vehicles; the provision of spill containment kits; and, appropriate spills and emergency training for all site personnel. Compliance with the appropriate SEPA Pollution Prevention Guidelines and liaison with Strathclyde Fire and Rescue Service will be required.

5.3.4 It is intended that the fuel farm will be supported on piles in order to avoid carrying out work below the level of the water table. However dewatering operations may be required to construct foundations, underground services and pipe runs, etc. Where such activity is required, the Contractor shall monitor groundwater levels in order to avoid impacting on water table levels, thus reducing impacts on the LNR.

5.3.5 In addition, the Contractor shall be required, under the terms of the Land Reform (Scotland) Act 2003, to maintain public access routes to the LNR via the existing footpath and cycleway or provide suitable alternatives throughout construction works and to institute well sign-posted diversions and temporary access routes where disruption to direct access is unavoidable. The Contractor may therefore be required to prepare an access plan for works in this area for the Promoter who shall consult the Local Authority and BAA.

5.3.6 A new access road will be built between the fuel farm and a junction to be formed on the local road that joins St James' Interchange (M8 Junction 29) to St Andrew's Drive West.

### 5.4 St James' Park

5.4.1 During construction works the eastern half of St James' Park will be used as a Construction Compound, which will be used to store material and plant as well as housing offices and facilities for site personnel. In addition, this Construction Compound will be used for the construction of the concrete viaduct structure across the park with piled foundations. A bridge structure will be constructed within the playing fields area and when completed will be moved into its permanent position over the M8 motorway. The new twin track railway will be installed on the viaduct and bridge structure with associated signalling, telecommunications and OLE wire and gantries.

5.4.2 Consequently there will be an impact on the 22 football pitches at St James' Park. However, a programme of works will be implemented to ensure that an equivalent 22 league standard pitches will remain available for use in the Paisley area at all times both during and after construction of GARL.

5.4.3 It is intended that during the construction and reinstatement period 11 of these 22 pitches will be maintained on the western side of St James' Park and the remaining 11 will be provided temporarily elsewhere. Four of these temporary pitches will be provided at Ferguslie Park where the 2 existing pitches will be upgraded to league standard and 2 new league standard pitches will be provided.

5.4.4 Following completion of construction, 9 pitches will be reinstated on the eastern side of the park making a total of 20 league standard pitches that will be available at St James' Park. The shortfall of 2 will be accommodated by the retention of the 2 permanent replacement league standard pitches at Ferguslie Park.

5.4.5 Mitigation works will be carried out within the playing fields area and will comprise drainage works to the playing fields area, demolition of the existing changing facilities and the construction of new changing facilities, realignment of the football pitches to accommodate the maximum number, car parking, fencing and landscape works.

5.4.6 The Contractor shall be required to comply with all restrictions stipulated in Section 4 above. As it is envisaged that the St James Park Construction Compound will be a site of major

construction activity during the construction of the viaduct, this activity will be closely monitored by the Promoter and the CLG has been established by the Promoter to ensure that communication is facilitated. The Contractor shall be required to provide a community liaison officer for this site.

- 5.4.7 The Promoter will ensure that the Contractor adheres to the requirements of this CoCP relating to working hours and noise generation, dust and nuisance caused by mud and vehicles on local roads and visual intrusion.
- 5.4.8 A site specific plan shall be developed by the Contractor and approved by the Promoter in liaison with the Local Authority that will set out how the construction activity in the St James Park area will be mitigated. Prior to finalisation of the plan a meeting with the CLG will be held, and where practical and appropriate, the comments of the CLG will be incorporated into the plan.
- 5.4.9 In addition, the CLG including PNCC will be consulted on their views regarding the proposed detailed design, including landscaping and planting mitigation, which will be carried out at St James Park and adjacent properties.

## **5.5 Murray Business Area**

- 5.5.1 Proposed works in this area will comprise several distinct elements. Firstly, a single span bridge will span Murray Street. This work will incorporate extending the existing bridge abutments to accommodate the bridge deck and the construction of a short length of retaining wall. From Murray Street a bridge through to Clark Street an earth embankment with piled foundations will be constructed.
- 5.5.2 At Clark Street a single span bridge similar to the Murray Street bridge will be installed. A concrete viaduct structure similar to the St James viaduct will be built between Clark Street and MacFarlane Street. A two span bridge similar in nature to the Viaduct structure will bridge MacFarlane Street and the A726 Road.
- 5.5.3 The new twin track railway line with associated signalling, telecommunications, OLE wire and gantries, will branch off from the existing Inverclyde railway line immediately to the east of Paisley St James Railway Station and will be installed over the bridge and viaduct structures and embankment areas mentioned above.
- 5.5.4 Some demolition work will be carried out within the area to accommodate the alignment of the proposed railway line.
- 5.5.5 The Contractor shall be required to comply with all restrictions stipulated in Section 4 above including ensuring that, where reasonably practicable, access to business premises in the area will be maintained throughout the period of construction works. Properties in this area which are particularly sensitive to vibration include the operations of Carlton Die Castings Ltd and properties on Greenhill Road and Clark Street.
- 5.5.6 During the construction period close liaison with the local Roads Authority will be maintained with a view to road maintenance and the prompt repair of potholes on Greenhill Road and other roads within the Murray Business Area.

## **5.6 Main Railway Line**

- 5.6.1 This section covers construction compounds adjacent to the existing railway and works on the main railway line.
- 5.6.2 Proposed Works in this area will comprise major reconfiguration of the railway line at and between Wallneuk and Arkleston to provide 4 main line tracks and a high speed junction at Arkleston. A new third track will be installed between Arkleston Junction and Gower Street Junction (just to the west of Shields Depot) and will incorporate new signalling for the third track, new telecommunications, power and distribution supplies, OLE wire and gantry structures.
- 5.6.3 An additional deck structure will be installed at Hillington Bridge (Sandwood Road) to carry the new third track. Associated with the installation of the new third track will be the reconfiguration of Cardonald Junction and Gower Street Junctions to provide crossovers between the existing two tracks and the new third track.

- 5.6.4 The Contractor shall be required to comply with all restrictions stipulated in Section 4 above. In addition, the Contractor shall be required to comply with all NR Company Standards, Railway Group Standards, and Codes for Practice for working on and adjacent to the railway, including all relevant NR environmental standards.
- 5.6.5 In construction sites and compounds located adjacent to housing the Contractor shall be required to comply with the working hours stipulated in the Contract. These will be developed by the Promoter in liaison with the Local Authority. Night time work may be required but this will not be known until the Contract is tendered. Approval for night time working will only be given after consultation with the Local Authority and local residents will be fully informed within 7 days of any activities, or as agreed with the CLG. Where Noise and Vibration limits are predicted to be exceeded liaison with affected parties will be undertaken in good time to implement any agreed interventions or mitigation. The Promoter will require the Contractor to monitor Noise and Vibration.
- 5.6.6 Local residents will be notified within 7 days (or as agreed with the CLG) of any planned alterations to possession schedules and therefore the generation of noise outwith normal working hours.
- 5.7 Central Station**
- 5.7.1 Proposed Works in this area will comprise the extension of the existing platform 11a into the train shed at Central Station. This work will comprise breaking out the existing surface and forming a new platform within the train shed in the area presently occupied by the short term car park, and the installation of the railway track in to the new platform with associated signalling, telecommunications and OLE wire and supporting structures.
- 5.7.2 Work will included blocking off the existing exit ramp from the short term car park, minor alteration of the entry ramp to the short term car park and strengthening works in the station undercroft to accommodate the new platform and track. Other operational activities displaced by the platform extension (such as the waste transfer station, the training room and parking for the British Transport Police) will be relocated elsewhere in the station. Utility diversions will also be required in the area of the new platform to accommodate the new works.
- 5.7.3 The Contractor shall be required to comply with all restrictions stipulated in Section 4 above including complying with all Railway Group Standards and NR Standards. In addition, during construction works, Central Station tenants and the public will be kept fully informed of the schedule of works and timely warning will be given of planned disruptions, etc.
- 5.7.4 The Contractor shall also take due cognisance of the sensitive operations of the Arches Theatre beneath Central Station. In cognisance of the sensitivity of construction noise and vibration impacts on the Arches Theatre business, the Contractor is required to provide 12 months notice prior to the commencement of construction works, including details of the phasing of construction work and maximum periods of the most intense noise generating activities, that are likely to have a material detrimental noise or vibration impact on the Arches Theatre during periods of main performances or events, such events being notified to the Promoter by the Arches Theatre. The Promoter and Contractor will liaise regularly with the Arches Theatre to ensure that disruption and disturbance to the Arches Theatre, including potential access issues, is minimised during construction works.
- 5.7.5 It is recognised that construction activities will have an impact on other businesses who operate in Central Station and particularly those that are in close proximity to the works. The Promoter is actively investigating methods and times of construction to minimise the impacts and will ensure that the Contractor establishes a plan that will seek to minimise impact and disruption.
- 5.7.6 Particular attention will be paid by the Contractor to protection of the fabric of the listed Central Station building and appropriate measure taken in liaison with Historic Scotland, NR and the Glasgow City Council.
- 5.8 Elderslie Loop**
- 5.8.1 Proposed Works in this area will comprise extending the existing Elderslie Loop by approximately 350m. Minor works to existing signalling, telecommunications and OLE structures will be required. The work includes relocating the existing eastern loop connection onto the existing main line and realigning the existing headshunt and sidings.

- 5.8.2 The Contractor shall be required to comply with all restrictions stipulated in Section 4 above. In addition, the Contractor shall be required to comply with all NR Guidelines, Railway Group Standards and Codes for Practice for working on and adjacent to the railway, including all relevant NR environmental standards.
- 5.8.3 In construction sites and compounds located adjacent to housing the Contractor will be required to comply with the working hours stipulated in the Contract, consistent with Section 3.3 of the CoCP. These will be developed by the Promoter in liaison with the Local Authority. Night time work may be required but this will not be known until the Contract is tendered. Approval for night time working will only be given after consultation with the Local Authority and local residents will be fully informed within 7 days of works (or as agreed with the CLG). Where Noise and Vibration limits are predicted to be exceeded liaison with affected parties will be undertaken in good time to implement any agreed interventions or mitigation. The Promoter will require the Contractor to monitor Noise and Vibration.
- 5.8.4 Local residents will be notified as soon as possible of any planned alterations to possession schedules and therefore the generation of noise outwith normal working hours, as stipulated in Section 4 of the CoCP.

# Appendices

## **Appendix A: Schedule of Agreements and Approvals**

(To be populated as Agreements and Approvals are made)

## Appendix B: Noise Intervention Policy

### CONSTRUCTION NOISE – IMPACTS TO RESIDENTIAL AREAS

#### Terminology

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascals, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB(A).

The Table B1 lists the sound pressure level (SPL) in dB(A) for common situations.

Typical Noise Level, dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library, Refrigerator humming at 2m
50	Quiet office, no machinery
	Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m, Vacuum cleaner at 3m
80	General factory noise level
90	Heavy goods vehicle from pavement, powered lawnmower at operator's ear
120	Discotheque - 1m in front of loudspeaker
140	Threshold of pain

The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy motorway, the noise level may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly reduced compared to daytime levels. When considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these second to second variations.

A parameter that is widely accepted as reflecting human perception of the ambient noise is the background noise level,  $L_{A90}$ . This is the noise level exceeded for 90% of the measurement period and generally reflects the noise level in the lulls between individual noise events. Over a one hour period, the  $L_{A90}$  will be the noise level exceeded for 54 minutes.

The equivalent continuous A-weighted sound pressure level,  $L_{Aeq}$ , is the single number that represents the total sound energy measured over that period.  $L_{Aeq}$  is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. It is commonly used to express the energy level from individual sources that vary in level over their operational cycle.

The index adopted by the Government to assess traffic noise is  $L_{A10,18h}$ , which is the arithmetic mean of the noise levels exceeded for 10% of the time in each of the eighteen 1-hour periods between 06:00 and 24:00. A reasonably good correlation has been shown to exist between this index and residents' perception of traffic noise over a wide range of exposures.

The  $L_{Amax,fast}$  measurement parameter is the maximum instantaneous sound pressure level attained during the measurement period (30 seconds, 5 minutes etc.), measured on the 'fast' response setting of the sound level meter. It is generally used to assess potential for night-time sleep disturbance.

Most environmental noise measurements and assessments are undertaken for 'free-field', away from any existing reflecting surfaces (other than the ground). However, it is sometimes necessary to consider noise levels immediately external to a façade when considering the impact on residents inside properties and this requires the addition of 3 dB(A) to the predicted (or measured) free-field level due to noise reflection from the façade. The assessment of road traffic noise, for example, is based on a predicted (or measured) façade noise level (using the  $L_{A10}$  statistical parameter).

Human subjects, under laboratory conditions, are generally only capable of noticing changes in steady levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. (These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to changes in road traffic flow, or intermittent noise sources).

### **Construction Noise**

Noise levels generated by construction activities are regulated by guidelines and subject to Local Authority control. Advice is contained within British Standard BS 5228: 1997 'Noise and vibration control on construction and open sites', which has statutory status by way of section 60, part 4 of the Control of Pollution Act 1974.

This British Standard contains a database on the noise emission from individual items of equipment and activities and routines to predict noise from demolition and construction methods to identified receptors. The prediction method gives guidance on the effects of different types of ground, barrier attenuation and how to assess the impact of fixed and mobile plant.

The original British Standard Code of Practice on 'Noise Control on Construction and Demolition Sites' (BS 5228: 1975, now revised to BS 5228: 1997) suggested noise reference levels for construction work based on the Wilson Report recommendations (Ref. 1), but was more precise, recommending that generally at one metre outside the nearest noise-sensitive building the equivalent continuous sound level over a 12-hour period (07.00 to 19.00 hours) should not exceed 75 dB(A). This gave some flexibility, allowing periods at a high level (exceeding 75 dB(A)) compensated by extended quieter periods.

The suggested level was not mandatory and no longer forms part of the updated 1997 Standard. However it has formed the basis of noise criteria for many modern railway projects including the Channel Tunnel Rail link, the West Coast Main Line Modernisation Scheme, Docklands Light Railway and Thameslink 2000.

The Department of the Environment Advisory Leaflet 72 'Noise control on building sites' gives advice on construction noise limits applicable at residential locations during daytime hours (07.00-19.00 hours). The leaflet states that the noise level outside the nearest occupied room (a 'façade' noise level) of a receptor should not exceed:

- 75 dB(A) in urban areas near to main roads in heavy industrial areas; or
- 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise.

An interim guideline issued by the Greater London Council in 1974 in connection with a major road building scheme was that properties exposed to levels over 75 dB(A) for more than 10% of the time due to construction work should be provided with sound insulation.

The above criteria, however, do not include noise for night-time working, which is not usually associated with demolition and construction works, but which can be necessary with railway infrastructure works in order to minimise the disruption to train services which the railway undertakers have a statutory duty to provide.

Consequently for the Glasgow Airport Rail Link the following criteria are proposed for airborne noise during the construction phase.

**Table B2 – Glasgow Airport Rail Link Construction Noise Level Criteria**

Assessment Period		Construction Noise Threshold (façade)
Day of Week	Time of Day	SPL, dB $L_{Aeq,T}$
Monday – Fridays	08.00 – 19.00	75
Saturday	08.00 – 13.00	75
Monday – Saturdays	19.00 – 23.00	65
Saturday	13.00 – 19.00	70
Sundays & Bank Holidays	07.00 – 19.00	65
	19:00 – 23:00	60
Each Day	23.00 – 08.00	55

Where  $L_{Aeq}$  = the equivalent continuous A-weighted sound pressure level (SPL), being the single number that represents the total sound energy measured over that period; and  
Where  $T$  = 1 hour for night-time periods, otherwise  $T$  = duration of period time of day.

From the above Table B2, it can be seen that for normal daytime operations (Monday to Friday) a sound pressure level threshold of 75 dB  $L_{Aeq,12h}$  (façade) is recommended between the hours of 08.00 and 19.00 hours. This reduces to 65 dB  $L_{Aeq,4h}$  between the hours of 19.00 and 23.00 hours. During the night time period an overall threshold level of 55 dB  $L_{Aeq,1h}$  is recommended between 23.00 and 08.00 hours.

Where possible the Contractor will use best practicable means (as defined by section 72 of the Control of Pollution act 1974) to ensure that noise levels are minimised as far as is reasonably practicable. However, despite this it is possible that noise criteria in Table B2 above may be exceeded during specific periods of the construction phase of the project. This not unusual for railway construction projects and all of the examples of such projects quoted above adopted criteria which if exceeded acted as triggers for the offer of noise insulation or temporary re-housing. Consequently, it is proposed to adopt the following triggering criteria for secondary glazing or temporary re-housing.

### **Noise Insulation**

Where the construction of the railway causes, or is expected to cause, construction noise levels, measured or predicted at a point one metre in front of a noise sensitive facade of a dwelling, to exceed either:

- (i) the criteria in Table B2 where pre-existing ambient noise levels ( $L_{Aeq,T}$ ) do not exceed the criteria in Table B2

**Or**

- (ii) where the pre-existing ambient noise level ( $L_{Aeq,T}$ ) exceeds the criteria in Table B2 above, the airborne construction noise level is predicted or measured as 5 dB above the existing airborne noise level for the corresponding times of day,

**And**

That either for option (i) or (ii) above, the exceedence of the criteria by construction associated airborne noise is for more than a total period of 10 or more days in any 15 consecutive days or for a total of days exceeding 40 in any six-month period

**Then**

That property would be eligible for secondary glazing.

From Table B2, for example, it can be seen that a property where the pre-existing ambient night-time noise level is less than 55 dB  $L_{Aeq,1h}$  would be eligible for noise insulation (acoustic glazing and acoustic ventilation) if the predicted or measured night-time external facade construction noise level exceeds 55 dB  $L_{Aeq,1h}$  in any single night-time hourly period or if the pre-existing ambient night-time noise level exceeds 55 dB  $L_{Aeq,1h}$  the airborne construction noise level exceeds this value by 5 dB(A) or more; on 10 nights in any 15 consecutive night period, or 40 days in any six month period. This property would qualify even if there was no daytime working, or if predicted noise levels did not meet any other criteria tabulated above.

### **Temporary Re-Housing**

Specific to re-housing (where the provision of noise insulation would not provide adequate mitigation against construction noise), the following are proposed:

Where the construction of the railway causes, or is expected to cause construction noise levels, measured or predicted at a point one metre in front of a noise sensitive facade of a dwelling, to exceed whichever is the higher of either:

- (i) Where pre-existing ambient noise levels ( $L_{Aeq,T}$ ) do not exceed the criteria in Table B2 above, a value 10 dB above any of the noise levels in Table B2.

**Or**

- (ii) Where the pre-existing ambient noise level ( $L_{Aeq,T}$ ) exceeds the criteria in Table B2 above, a value 10 dB above the pre-existing airborne noise level for the corresponding time of day;

**And**

That for either option (i) or (ii) above, the exceedence of the criteria by construction associated airborne noise is for more than a total period of 10 or more days of working in any 15 consecutive days or for a total of days exceeding 40 in any six-month period

**Then**

Residents at that property would qualify for temporary re-housing.

For example, where the pre-existing ambient noise level is less than the values given in Table B2 above, if the predicted night-time noise level in any single night-time hour is predicted to exceed 65 dB  $L_{Aeq,1h}$  or where the pre-existing ambient noise level is more than the values given in Table B2 above, the airborne construction noise exceeds the pre-existing ambient night-time noise level by more than 10 dB, for more than 10 days in any consecutive 15 day period or more than 40 days in any six month period, then residents at that property would qualify for temporary re-housing.

### **Section 61 Control of Pollution Act 1974 Prior Approval**

Section 61 of the Control of Pollution Act 1974 allows a Contractor to apply to the Local Authority for prior approval of construction works. The application must include particulars of the proposed works and methods and the means whereby the noise will be minimised.

In deciding whether to grant or refuse approval of the proposed works and means of minimising the noise impacts, the Local Authority has to take into account whether if the works are carried out as described in the application it would serve a notice under section 60 of the Control of Pollution Act 1974 to restrict the methods or times of noisy working or the noise levels emitted from the site. Effectively, this means that only applications for prior approval that incorporate best practicable means, as defined by section 72 of the Control of Pollution Act 1974, into the works programme to minimise the impacts of noise will be granted.

The Local Authority can apply conditions to any prior approval so that it only applies to specific work, lasts for a specified period, and requires particular steps to control and manage noise impacts to be implemented. Noise level monitoring is a typical requirement of a prior approval. This means the Contractor has to appoint independent consultants to monitor the noise levels from the most disruptive parts of the works programme and the results of the noise measurements are used to manage the noise impacts.

Typically the results of the noise monitoring are reported in real time to the works supervisor with advice whether the appropriate criteria are being exceeded and if so the works are reviewed to determine what reasonably practicable steps can be taken to reduce the noise impacts, for example:

Once works are underway variation from the terms of a prior approval, say in the event of unforeseen matters, can be granted by the Local Authority provided the Contractor provides information to justify any variation and the steps whereby noise arising from any variation will be minimised

The main benefits of section 61 prior approvals are that:

- The noisiest components of the construction programme are identified in advance of works commencing and appropriate control measures implemented from the very beginning of the Contract; and
- Provided the Contractor complies with any prior approval granted, they can progress the works safe in the knowledge that noise complaints should not hold up the works programme.

### **References**

1. Wilson Report, 1963, 'Committee on the Problems of Noise': Final Report', Cmnd. 2056, HMSO, London

## Appendix C: Vibration

### Vibration Theory

When an object is in contact with a vibrating surface it is displaced about its reference (stationary) position. Displacement (in mm) is therefore one parameter that can be used to describe the magnitude of a vibration. For sinusoidal signals, displacement, velocity ( $\text{ms}^{-1}$ ) and acceleration ( $\text{ms}^{-2}$ ) amplitudes are related mathematically by a function of frequency and time.

If phase is neglected (as is always the case when making time-average measurements), then the velocity can be obtained by dividing the acceleration signal by a factor proportional to frequency (measured in Hertz, Hz) and the displacement can then be obtained by dividing the acceleration signal by a factor proportional to the square of frequency. Modern electronic integrating meters are capable of providing a wide range of measurement parameters during any single vibration measurement.

For a complex acceleration signal giving rise to a complicated time history, there are several additional quantities that may be used to describe the vibration:

- The root mean square value (rms) is obtained by taking the square root of the mean of the sum of the squares of the instantaneous acceleration measured during the total measurement time (T);
- The peak value is the maximum instantaneous acceleration measured during the measurement time, T. It is a useful indicator of the magnitude of short duration shocks;
- The peak particle velocity (ppv) is the maximum instantaneous velocity of a particle at a point during a given time interval.

### Vibration Perception

The limit of human perception to vibration is of the order of  $0.15 \text{ mms}^{-1}$  to  $0.3 \text{ mms}^{-1}$  ppv, in the frequency range 0.1 Hz to 1500 Hz. The human body is not equally sensitive to all frequencies of vibration and weighting curves to reflect the frequency dependency of the body have been developed and are contained within ISO Standards. The weighting gives a good correlation between the measured vibration level and the subjective feeling or impact produced by the vibration.

The weightings can be incorporated into modern vibration meters, thus enabling measurement of vibration levels that correspond to human perception. Those vibrations occurring between 1-80 Hz are of particular interest when measuring exposure to whole-body vibration.

Sensitivity to vibration is also known to be dependent on the direction of excitation and the human body responds differently when standing (longitudinal) compared to when lying down (lateral). Whole-body vibrations are measured in the directions of an orthogonal co-ordinate system having its origins at the location of the heart and day and night-time assessment routines differ to account for longitudinal (daytime) body position and lateral (night-time) body position.

### Vibration Limits – Nuisance

Ground vibrations may cause reactions ranging from '*just perceptible*', through '*concern*' to '*alarm*' and '*discomfort*'. The subjective response varies widely and is a function of situation, information, time of day and duration.

British Standard BS 6472: 1992 '*Guide to evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz)*' (Ref. 1) gives base curves of vibration for minimal adverse comment, and also vibration dose values (VDVs) at which complaints are probable. VDVs may be used to assess the severity of impulsive and intermittent vibration, such as experienced from blasting at quarries or from rail traffic, and steady vibration such as from a busy road or fixed plant.

The adoption of the VDV parameter is based on social studies undertaken in the 1980s and early 1990s into human response to vibration. BS 6472 requires that the VDV be determined separately for the 16-hour daytime (07.00-23.00) and 8-hour night-time (23.00-07.00) periods.

The VDV is given by the fourth root of the integral of the fourth power of the acceleration after it has been frequency-weighted:

$$VDV = (\int_0^T a^4(t)dt)^{0.25}$$

where VDV is the vibration dose value (in  $ms^{-1.75}$ ),  $a(t)$  is the frequency-weighted acceleration ( $ms^{-2}$ ) and T is the total period of the day (in seconds) during which vibration may occur.

The VDV is measured in each of the three whole-body orthogonal axes and the maximum from the three axes used. Where the vibration conditions are constant or regularly repeated only one representative period need be measured (or predicted) and the 16-hour daytime (or 8-hour night-time) overall VDV level may be calculated from the shortened data.

Where measurement of similar installations is not possible and predictions of VDV are necessary the following formula may be used to predict the estimated vibration dose value, eVDV, knowing the likely frequency weighted rms acceleration level, a, of the source (or estimating this from the known or measured peak particle velocity) and the duration of exposure, t, in seconds:

$$eVDV = 1.4(a)(t^{0.25})$$

The predicted or measured VDV may then be compared to Table 7 in the Appendix of BS 6472, (reproduced below as Table C1), to identify the likelihood of complaint:

**Table C1: Vibration Dose Values ( $ms^{-1.75}$ ) above which various degrees of adverse comment may be expected in residential buildings (taken from BS 6472: 1992)**

Place	Low probability of adverse comment	Adverse comment possible	Adverse comment probable
	VDV, $ms^{-1.75}$		
Residential buildings, 16h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings, 8h night	0.13	0.26	0.54

For example, between 0.4 and 0.8  $ms^{-1.75}$  adverse comment regarding daytime vibration levels becomes possible, or when the VDV increases above 0.54  $ms^{-1.75}$  at night adverse comment becomes probable. For office and commercial buildings the suggested daytime limits above are relaxed by a factor of up to two (Table 5 of BS 6472: 1992).

Data included in BS 6472: 1992 may therefore be used to assess the likelihood of adverse comment arising at residential property from temporary or permanent vibration sources to be introduced into a residential area (demolition, construction, new industrial premises etc.), or from occupiers of future residential property proposed for a site subject to existing vibration (proposed residential site adjacent to railway lines, for example).

#### **Vibration Limits – Building Damage**

Buildings are reasonably resilient to ground-borne vibration and vibration-induced damage is rare; there are less than 12 confirmed instances of vibration-induced damage to buildings in the UK over the last 10 years.

Vibration-induced damage can arise in different ways, making it difficult to arrive at universal criteria that will adequately and simply indicate damage risk. Damage can occur directly due to high dynamic stresses, due to accelerated ageing or indirectly when high quasi-static stresses are induced by, for example, soil compaction.

There are currently two British Standards that offer advice on acceptable levels of vibrations in structures. British Standard BS 7385: Part 2: 1993 'Evaluation and measurement for vibration in buildings Part 2. Guide to damage levels from ground-borne vibration' (Ref. 2) gives guidance on the levels of vibration above which the building structures could be damaged. For the purposes of BS 7385, damage is classified as cosmetic (formation of hairline cracks), minor (formation of large cracks) or major (damage to structural elements). Guide values given in the Standard are associated with the threshold of cosmetic damage only, usually in wall and/or ceiling lining materials.

Since case-history data, taken alone, has so far not provided an adequate basis for identifying thresholds for vibration-induced damage, data using controlled vibration sources within buildings has been established to enable definition of vibration thresholds judged to give a minimal risk of vibration-induced damage.

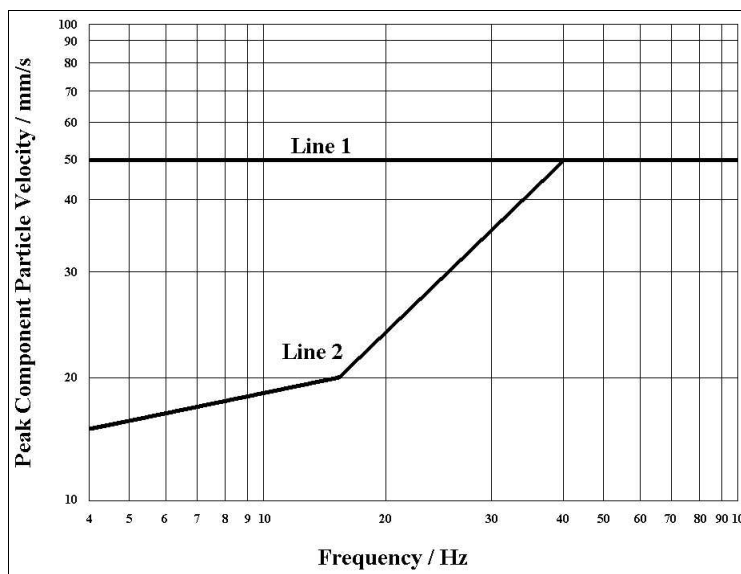
A frequency-based vibration criterion is given in the British Standard because the relative displacements associated with cracking will be reached at higher vibration magnitudes with higher frequency vibration. Limits for primarily transient vibration (from a train, for example) above which cosmetic damage could occur are reported in tabular form and graphical form in the Standard and reproduced exactly below in Table C2:

**Table C2: Transient vibration guide values for cosmetic damage (BS 7385: Part 2: 1993)**

Transient vibration guide values for cosmetic damage			
Line (see figure below)	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures. Industrial and heavy commercial buildings	50 mms <sup>-1</sup> at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mms <sup>-1</sup> at 4 Hz increasing to 20 mms <sup>-1</sup> at 15 Hz	20 mms <sup>-1</sup> at 15 Hz increasing to 50 mms <sup>-1</sup> at 40 Hz and above

NOTE 1. Values referred to are at the base of the building  
NOTE 2. For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded.

**Figure C1: Summary of damage thresholds for transient vibration on domestic structures**



The British Standard indicates, for example, that for a residential building (Line 2) a ppv of greater than  $15 \text{ mms}^{-1}$  at 4 Hz or greater than  $50 \text{ mms}^{-1}$  at 40 Hz or above, measured at the base of the building, may be expected to result in cosmetic damage.

Guidance on acceptable vibration levels in structures is also provided in BS 5228: Part 4: 1992 'Code of practice for noise and vibration control applicable to piling operations' (Ref. 3). This British Standard recommends that a conservative threshold for minor or cosmetic damage should be taken as a peak particle velocity of  $10 \text{ mms}^{-1}$  for intermittent vibration and  $5 \text{ mms}^{-1}$  for continuous vibrations to determine whether there is any risk of building damage, particularly from construction works involving piling. The criteria are not frequency-specific and apply across all frequency bands.

It is not clear why there is a discrepancy in recommended vibration limits between the two Standards.

The criteria shown in Table C3 below (compiled from paragraph 8.4.2, page 24 of BS 5228: Part 4: 1992) can be applied in the case of continuous or intermittent vibration from piling works.

**Table C3: Vibration limits relating to minor or cosmetic damage to buildings from piling operations (from BS 5228: Part 4: 1992)**

Building Classification	Intermittent Vibration (ppv, $\text{mms}^{-1}$ )	Continuous Vibration (ppv, $\text{mms}^{-1}$ )
Residential in generally good repair	10	5
Residential where preliminary survey reveals significant defects	5	2.5
Industrial/commercial - light and flexible structure	20	15
Industrial/commercial - heavy and stiff structure	30	15

BS 5228: 1992 part 4 may, therefore, be used to assess the likelihood of structural damage arising from vibration associated with construction or any permanent new sources of vibration as a consequence of the development.

## IMPACT PREDICTION – VIBRATION

### Methodology - Vibration

The propagation of ground-borne vibration is very complex, involving combinations of shear and compressional waves, with different phase velocities. Impedance boundaries and rock within the soil structure give rise to reflections, refractions and scattering and associated interference effects. The presence of the ground surface introduces a third wave type, a surface wave known as a Rayleigh wave, which has a small wavelength compared to the sub-surface waves and suffers from a lower rate of attenuation.

There are no nationally accepted formulae for prediction of passage of vibration through ground due to the varying effects of non-uniform ground conditions, although some empirical formulae have been proposed for known ground conditions based on previously measured data.

In this instance, vibration due to construction is calculated using measured source data and the propagation relationship taken from the British Standard BS 5228: 1992: part 4 and data included in the British Steel document 'Control of Vibration and Noise During Piling' (Ref. 4). The Standards suggest that attenuation with distance should be calculated as the reciprocal of the root square of the source-receiver distance.

### Ground to Building Transmission

There is no nationally accepted method for predicting the degree of vibration to be transmitted into a building from a ground borne source, such as for new residential development proposed close to an existing railway line, or where demolition work is proposed close to existing properties. Knowing, or predicting, the degree of vibration in the ground, the vibration level realised in practice in the building will depend on a range of factors including the design of the foundations, the floor slab, the height and the existing ground conditions.

For VDV measurements taken in the earth it is necessary to consider the transmission loss into the proposed building when considering likely VDV's experienced in the proposed property at ground floor and first floor (and above) storeys.

It is known that building design and structure will give rise to different ground to building, and ground floor to first floor, transmission factors. It is generally found that massive buildings with piled foundations experience high vibration transmission losses from the neighbouring earth, but that lightweight buildings with concrete slab foundations (or timber raft) suffer higher transmission and consequently will experience higher vibration levels for the same given source than an adjacent, more massive building constructed on piled foundations.

#### **Application to the GARL Project**

It is proposed, on structural damage grounds, that ground-borne peak particle velocities (for continual vibration) at the base of existing local residential properties should not exceed the limit of **5 mms<sup>-2</sup> ppv**, set in British Standard BS 5228: 1992 part 4.

It is proposed, on vibration nuisance grounds, that at nearest residential properties a predicted VDV of **0.4 ms<sup>-1.75</sup>** should not be exceeded for daytime use and **0.26 ms<sup>-1.75</sup>** should not be exceeded for night-time use.

Where there are repeated and regular periods of exposure to transient vibration it is possible to assess the VDV over a shortened measurement period and calculate the expected VDV over the 16-hour day (or 8-hour night).

For on-site VDV vibration measurements taken in-earth, a transmission loss factor of 0.5 is adopted for earth to ground floor, and 1.0 for earth to first floor and above.

Whilst the Contractor will undertake as part of the Section 61 prior approval process to use best practicable means to avoid vibration levels exceeding the criteria in Annex C, if it is not reasonably practicable to prevent the criteria in Annex C being exceeded by vibration from the GARL works, the following are proposed:

Where the construction of the railway causes, or is expected to cause construction vibration levels, measured or predicted externally at the base of a vibration sensitive, to exceed the values given above:

#### ***And***

- (iii) the exceedence of the criteria in Annex C by construction associated vibration is for more than a total period of 10 or more days of working in any 15 consecutive days or for a total of days exceeding 40 in any six-month period

#### ***Then***

Residents at that property would qualify for temporary re-housing."

#### **REFERENCES**

- 1 British Standard 6472: 1992 'Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz), British Standards Institution, 1992
- 2 British Standard 7385: Part 2: 1993 '*Evaluation and measurement for vibration in buildings Part 2. Guide to damage levels from ground-borne vibration*'
- 3 British Standard BS 5228: 1992 'Noise control on construction and open sites' Part 4 Code of practice for noise and vibration control applicable to piling operations, British Standards Institution, 1992
- 4 Control of Vibration and Noise During Piling, British Steel, 1998

## Appendix D: Proposed Measures to Control Dust Emissions

- (i) The enclosure of Construction Compounds with solid hoardings to a height of at least 2.4m;
- (ii) Where reasonably practicable, routing of vehicles and positioning of construction of plant at maximum possible distances from sensitive receptors and residential areas;
- (iii) The enclosure of material stockpiles (such as sheeting) at all times and damping down of potentially dusty materials/construction sites using suitable water sprays during dry weather;
- (iv) Ensuring that the surface of long term stockpiles are stable and do not shed dust;
- (v) Where conveyors are used for handling spoil they shall be fitted with drop chutes. The surface of the material on the conveyor shall be sprayed with water after deposit onto the conveyor if practicable, where there is a likelihood of a dust problem;
- (vi) Storage of cement and other dust generating materials in closed? silos with appropriate filters and overfill alarms or storage in bags;
- (vii) The hard surfacing of heavily used areas which are to be kept clean by regular brushing and water spraying;
- (viii) All surfaced haul roads in regular use shall be regularly cleaned mechanically after being sprayed to suppress dust emission. Care shall be taken to prevent the emission of dust from the air outlets on vacuum road sweepers;
- (ix) The installation and use of vehicle wheel and body washing stations at exit points of the site and public roads, combined with cleaning of public roads where necessary and practical;
- (x) Enforcement of a speed limit, such limit to be displayed on appropriately designed signs, located at all entrances to each Construction Compound, for vehicles on unpaved roads and on the Construction Compound;
- (xi) Additives and binders may be added to water for dust suppression subject to the approval of the Scottish Environment Protection Agency (SEPA);
- (xii) The adequate sheeting of vehicles carrying spoil and other dusty materials.
- (xiii) All fires are prohibited. This includes fires for the disposal of vegetation, packaging, or any other material. The use of braziers is permitted for the heating of hand held black-top-application tools; and
- (xiv) Cutting or grinding equipment shall be fitted with dust extraction where reasonably practicable.

## Appendix E: Useful Contacts

*BAA*

*Glasgow City Council*

*Historic Scotland*

*Local Community Groups*

*Network Rail*

*Promoter's Heritage Advisor (tbc)*

*Renfrewshire Council*

*Scottish Water*

*SEPA*

*SNH*

*SPT*

*West of Scotland Archaeology Service (WoSAS)*