THE MERSEY GATEWAY PROJECT

NOISE AND VIBRATION

CHAPTER 17.0

NOISE AND VIBRATION

C O N T E N T S

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17. NOISE AND VIBRATION

17.1 Introduction

17.1.1 This Chapter assesses the potential noise and vibration effects of the Mersey Gateway Project during the construction phase and the operational phase. The potential effects have been assessed at receptors within Runcorn, Widnes and Halton, and included the consideration of both positive and negative effects on those receptors.

17.2 Purpose of Study

17.2.1 The purpose of the study is to determine and, where possible, quantify whether the Project will have any effect, positive or negative, in terms of noise and vibration and to identify receptors in the study area likely to experience these effects. The study area covered by the noise and vibration assessment is discussed in 17.3 below.

17.2.2 The baseline information required as part of this ES in connection with noise and vibration has been shown and an assessment has been made of how the situation may change in the future both without the Project in a 'do minimum' scenario and with the Project in a 'do something scenario'. The significance of the effects of the Project has been reported and mitigation suggested where appropriate. In addition, this chapter gives an indication of the number of residential properties that may be eligible for compensation under Part 1 of the Land Compensation Act 1973 (Ref 1) and insulation under the Noise Insulation Regulations 1975, as amended 1988 (Ref 3).

17.2.3 The potential effects have been assessed within the study area shown on Figure 17.1 for both the construction and operational phases of the Project to establish which of these potential effects is significant. These effects have been discussed in section 17.7 below.

17.2.4 Mitigation has been discussed in section 17.8 and any residual impacts have been highlighted in section 17.9.

17.3 Study Area

17.3.1 The study area has largely been defined by the changes in traffic flows predicted to be associated with the Project. These flows have been provided from the Variable Demand Model (VDM) produced as part of the traffic impact study which is explained further in Chapter 16. The traffic flows for each road link have been filtered according to the following criteria to determine the study area.

17.3.2 Roads in the study area with levels of traffic that will be less than or equal to 1000 vehicles per 18 hour period were excluded from the assessment. Such a traffic flow would produce a low noise level so the approach removes from the assessment those roads that are not expected to experience significant noise effects as a result of the Project.

17.3.3 The Design Manual for Roads and Bridges (DMRB) Volume 11, Part 3, Section 7 (Ref 2) (described in more detail in section 17.4 below) suggests a method that can be adopted for the assessment of roads in relation to noise and vibration. The objective is to establish the magnitude and significance of noise changes for all areas where traffic volume is likely to be increased by 25% or reduced by 20%. This is broadly equivalent to an increase or a decrease of about 1 dB(A). Road links expected to experience such a change as a result of the Project have been included in the study area

17.3.4 In addition to the above criteria the study area was selected so that at least a 300 metre corridor to either side of the road under assessment was included. Again, this is a recommendation of the DMRB. The DMRB has been developed over many years and a large number of case studies have shown that there are not likely to be impacts outside a 300 metre zone associated with road traffic noise from a given link. The study area is shown in Figure 17.1.

Project Description

17.3.5 The Project is described in detail in Chapter 2 of the ES and in the Construction Management Report (CMR). However, a brief description is given here in relation to the noise and vibration assessment.

17.3.6 The alignment of the Project runs from the North West of Widnes to a junction with the M56 (junction 12) to the South of Runcorn. It also includes the SJB. The western extent of the proposed alignment runs along the A562 Speke Road to the west of the existing Ditton Roundabout Junction (Junction of A562 and A533). The alignment then heads eastwards along the line of, and to the south of, Speke Road towards the Ditton Junction. It then passes, via an embankment, across land currently occupied by industrial units along Ditton Road and over the Garston to Timperley rail freight line, before crossing the alignment of the existing A557 Widnes Eastern Bypass. A new junction (the “Widnes Loops Junction”) will be formed with the A557 at this location. The alignment then continues south eastward over the St Helens Canal, Widnes Warth Saltmarsh, the River, Astmoor Saltmarsh and Wigg Island, before turning south over the Manchester Ship Canal and Astmoor Industrial Estate. The alignment then connects into the existing road network in Runcorn at the Junction of the A533 Bridgewater and Central Expressways with the A558 Daresbury Expressway (the Bridgewater Junction). After this junction the route continues south along the Central Expressway (A533) towards the junctions of the Central/Southern Expressways and the Weston Point Expressway/Weston Link (known respectively as the Lodge Lane Junction and Weston Link Junction). The alignment will finally join the M56 Motorway at Junction 12.

17.3.7 For the purposes of understanding and describing the works in the ES, the structural, highway and construction works for the Project have been split into a number of parts (known as "Construction Areas"). These components reflect the individual construction areas described within the Construction Method Report (CMR). A brief description of the construction activities at each area is given in section 17.7 of this Chapter. The construction areas include the following:

a. Area A – Main Toll Plazas;
b. Area B – Ditton Junction to Freight Line;
c. Area C – Freight Line to St Helens Canal including Widnes Loops Junction;
d. Area D – Mersey Gateway Bridge;
e. Area E – Astmoor Viaduct;
f. Area F – Bridgewater Junction;
g. Area G – Central Expressway, Lodge Lane Junction and Weston Link Junction;
h. Area H – M56 Junction 12; and
i. Area I – Silver Jubilee Bridge and Widnes De-linking.

17.3.8 All of the links comprised in these areas and to be constructed as part of the works will either experience growth in traffic, be a new link with attendant traffic, or be subject to material changes (including decreases) in traffic levels. As such, the level of noise and/or vibration will be subject to change and accordingly each such link was examined.

17.4 Legislation and Planning Policy

European Legislation

17.4.1 There is currently no European legislation that governs the assessment techniques for the noise and vibration impact of new road projects. Directive 2002/49/EC relates to the assessment and management of environmental noise, including roads, but primarily relates to existing roads only.

National Legislation

17.4.2 In the UK there is a range of legislation, planning policy and technical guidance that is relevant to the assessment of noise and vibration. A brief description of each is given in this section.

Land Compensation Act 1973 (Ref 1)

17.4.3 This Act includes provision for compensation for loss of property value resulting from noise from a new or improved road. It also provides for noise insulation compensatory measures, including secondary glazing, for dwellings adjacent to new or improved highways, providing certain conditions are met (see below).

Noise Insulation Regulations 1975 (Ref 3)

17.4.4 The Noise Insulation Regulations 1975 (NIR) as amended in 1988 are regulations made under the Land Compensation Act 1973. Residential properties may become eligible for an offer of sound insulation to mitigate noise from the operation of the Project and/or from noise due to the construction of the Project under the terms of the NIR. The conditions for eligibility due to noise from the operation of a road are as follows:

a. The property must be within 300 metres of the nearest point of the new or altered carriageway;
b. The façade noise level due to the road traffic must be at least 68 $L_{A10,18h}$;
c. There must be at least a 1 dB(A) increase from the noise level prior to the construction; and
d. Noise from the new or altered highway must contribute at least 1 dB(A) to the road traffic noise level.

17.4.5 For noise caused during the construction of a highway scheme, the NIR provide the highway authority with discretionary powers to offer noise insulation where the works *"are expected to cause noise at a level, which, in the opinion of the highway authority, seriously affects or will seriously affect for a substantial period of time the enjoyment of an eligible building adjacent to the site"*. The NIR do not define noise levels which may cause a serious effect nor do they define what is meant by a substantial period of time. This aspect is left for the highway authority to determine. However, a commonly adopted criterion is where noise due to construction activities exceeds an $L_{Aeq,T}$ of 75 dB for 10 consecutive days. These criteria have been successfully applied at public inquiries for other major road schemes.

17.4.6 Whilst the possibility of eligibility has been considered in this Chapter a full assessment would be undertaken when the detailed design is complete. This is usual practice for projects of this type and complexity, where a reference design is developed into a detailed design following the letting of contracts.

The Control of Pollution Act, 1974 (COPA) (Ref 4)

17.4.7 The Control of Pollution Act 1974 provides for the control of noise from construction sites. Section 61 of COPA sets out procedures for obtaining consent in the form of an agreement with the relevant local authority for a noise control regime for construction works prior to the work commencing. Consent is normally granted subject to limitations on noise, restrictions on hours of working and/or possible restriction on processes allowed during the construction process. The contractor can seek a section 61 agreement by application to the local authority. If a section 61 agreement is not in place, then the local authority has powers under section 60 of COPA to control noise from construction activities through the service of a notice which can include the imposition of noise limits at prescribed locations and restrictions on the times when work on site can occur.

17.4.8 A contractor may be required to show that they are employing the *"best practicable means"* (BPM) to reduce noise levels from the construction site. BPM is defined in section 72 of COPA. In this regard 'practicable' is defined as those which are reasonably practical having regard amongst other things to local circumstances, to the current state of technical knowledge and to financial implications. In testing if BPM has been adopted the means used include the design, installation, maintenance and manner and periods of operation of plant and machinery together with the design and maintenance of buildings and any acoustic structures.

The Environmental Protection Act, 1990 (EPA) (Ref 5)

17.4.9 The Environmental Protection Act 1990 gives local authorities the power to take action where they are satisfied that a statutory nuisance is being caused. Section 80 of the EPA empowers the local authority to issue an abatement notice, however in respect of construction activities local authorities would generally use the specific powers of COPA section 60 as described above.

National Planning Policy Guidance

Planning Policy Guidance Note 24 – Planning and Noise (PPG24) (Ref 6)

17.4.10 Planning Policy Guidance Note 24 is currently being reviewed.

17.4.11 The main thrust of the existing guidance refers to new housing development in locations close to existing noisy activities. Little guidance is offered for situations such as the development of major transport infrastructure schemes. However the guidance gives some advice on the development of essential infrastructure. It states *"Much of the development which is necessary for the creation of jobs and the construction and improvement of essential infrastructure will generate noise. The planning system should not place unjustifiable obstacles in the way of such development. Nevertheless, local planning authorities must ensure that development does not cause an unacceptable degree of disturbance."*

Regional Policy

Regional Planning Guidance for the North West RPG13 (Ref 7)

17.4.12 RPG 13 contains no specific policies in connection with the noise and vibration impact of new road schemes.

Regional Spatial Strategy (Ref 14)

17.4.13 There are emerging revisions to the Regional Spatial Strategy set out in a consultation document published in March 2008. There are a few references to noise, mainly in the context of mitigating noise impacts in various situations. There are no references to vibration.

Local Policy

Halton Borough Council's UDP (Ref 8)

17.4.14 The UDP was adopted in April 2005. The Council is in the process of preparing its Local Development Framework. Until this is complete, the UDP policies will continue to be relevant. The UDP has been saved under the Planning and Compulsory Purchase Act 2004 until 2011. The following are relevant to noise and vibration assessment:

Policy PR2 Noise Nuisance

17.4.15 Policy PR2 Noise Nuisance states;

"Development will not be permitted which contains any new noise source likely to cause a significant increase in ambient noise levels for either day or night time conditions and where it is likely to affect land allocated on the Proposals Map for residential or any other existing noise sensitive land uses

Justification

Noise is a widespread source of nuisance and resultant loss of amenity. Planning Policy Guidance note "Planning & Noise" 1994 (PPG24) sets the framework for planning policies related to these issues. Where there is evidence that an existing site creates significant noise problems the Council will negotiate for the overall reduction in noise levels. Conditions may be attached to any planning permission to ensure noise nuisance is not a problem."

17.4.16 Six Regeneration Action Areas (RGA) are identified in the UDP for development and are referred to in the Land Use Chapter of this ES. They are designated for development as mixed use including housing. In designing these schemes account would have to be taken of the proposals associated with this Project.

Policy Summary

17.4.17 The general thrust of these policies is that development would be permitted as long as the noise issues are properly addressed and mitigated where appropriate to manage the size of any adverse impact.

Technical Guidance

Design Manual for Roads and Bridges (DMRB) (Ref 2)

17.4.18 The Design Manual for Roads and Bridges provides Government guidance on the design and assessment of trunk road schemes. The principles of DMRB are the adopted method in the UK for the assessment of road schemes and are based on a large body of experience of such assessments. Volume 11, section 3, part 7, sets out steps for the assessment of the noise impacts of a road scheme. The assessment considers primarily residential properties but also considers other noise sensitive locations such as schools and recreational open spaces.

17.4.19 The noise assessment becomes increasingly detailed as the design of the scheme develops starting with Stage 1, being the least detailed stage, to Stage 3 being the most detailed. This assessment has been based on the principles of Stage 3.

17.4.20 A Stage 3 assessment requires a noise assessment of all properties and other relevant locations, such as schools and recreational open spaces, that are likely to be affected by significant changes in traffic noise. The assessment compares predicted noise levels against baseline information and also identifies expected noise nuisance changes, which can be estimated from tabulated nuisance data given in the guidance. Noise measurements are not required for this assessment and comparisons are made using predicted road traffic noise levels, for the baseline and each future scenario considered. This ensures that comparisons are made on a like for like basis. The predicted noise level values, in terms of the $L_{A10,18h}$ index, are calculated using the well established methods contained in Calculation of Road Traffic Noise, which is described in more detail in below.

17.4.21 DMRB recommends calculation of noise level changes for each residential property potentially affected. However, where a scheme, such as this Project, covers a large, irregularly shaped, densely populated area with some 15,000 dwellings, it is not practical to estimate noise levels at every residential receiver location. Consequently, the general principles of the DMRB recommendations have been followed in this assessment, but receptor properties have been banded into groups. This is normal practice for schemes of this size.

17.4.22 DMRB also gives guidance on the assessment of vibration from road traffic and provides a method of assessing disturbance based on the $L_{A10,18h}$ noise level.

Calculation of Road Traffic Noise (CRTN) (Ref 9)

17.4.23 The most recent version of Calculation of Road Traffic Noise was published in 1988, having previously been published about 15 years earlier, and it contains the procedures for calculating levels of road traffic noise. This is the accepted prediction model used in the UK and is also the method specified for use in the NIR which are described above.

17.4.24 The method is based on traffic flow on the road, in this case both existing and future traffic flows from the VDM output of the traffic modelling. Various corrections are then applied for the traffic speed based on the type of carriageway, i.e. single, dual etc., the mix of traffic in particular the percentage of heavy goods vehicles and road surface type to derive a basic noise level at 10 metres from the nearside carriageway. Further corrections are then applied to account for the sound attenuation with distance from the road; ground attenuation, as acoustically absorptive ground such as grassland absorbs sound more readily than acoustically reflective surfaces such as paved areas; and screening from natural and purpose built barriers. These corrections enable an accurate prediction of the noise level expected at the required receiver position.

BS 5228 Noise and vibration control on construction and open sites (Ref 10)

17.4.25 BS 5228 provides wide-ranging advice on the control of noise and vibration from construction sites describes the method for predicting of construction noise. The standard is a formally adopted Code of Practice under Section 71 of the Control of Pollution Act.

17.4.26 BS 5228 is produced in 5 parts. Only parts 1 and 2 1997 and part 4 1992 are relevant here. Part 1 provides a method of predicting noise from construction activities and includes a database of noise levels for various construction activities. It also provides formulae for estimating noise levels from a construction site. Part 2 gives guidance on legislation and Part 4 gives specialist advice on noise and vibration from piling techniques again including a database and a prediction method.

BS 6472 Evaluation of human exposure to vibration in buildings (1 to 80 Hz) 1992 (Ref 11)

17.4.27 This British Standard provides general guidance on human exposure to building vibration in the frequency range 1 Hz to 80 Hz. Curves of equal annoyance for humans are included together with measurement methods to be employed. The standard provides a means of estimating the probability of "adverse comment" for occupants of dwellings.

17.4.28 If during construction the assessment of vibration affecting people is required then it will be carried out in accordance with this standard.

BS 7385 Evaluation and measurement for vibration in buildings Part 1 1990, Part 2 1993 (Ref 12)

17.4.29 Part 1 of this standard is entitled Guide for measurement and evaluation of their effects on buildings and it provides basic principles for carrying out vibration measurement and for processing the data with regard to the assessment of damage to buildings.

17.4.30 Part 2 of this standard is entitled "Guide to damage levels from groundborne vibration". It identifies the factors involved in the vibration response of a building and it specifies vibration levels above which buildings could be damaged.

17.4.31 If during construction the assessment of vibration affecting buildings is required then it will be carried out in accordance with this standard.

17.5 Assessment Methodology

Introduction

Noise

17.5.1 Noise is often defined as unwanted sound and both are measured in units of decibels, dB. The human ear responds to a wide range of sounds in terms of sound level and the frequency of the sound. The audible range of sound levels is generally quoted as being from 0 dB (the threshold of hearing) to about 140 dB (the threshold of pain). The ear does not respond equally to all frequencies, but is more responsive to the mid frequencies than to the low or high frequencies. To attempt to replicate this natural response, sound level meters have a weighting network referred to as A weighting and sound levels measured using this weighting are designated A weighted decibels or dB(A).

17.5.2 In order to aid the understanding of various sound levels the following table shows the range of typical sound levels associated with situations encountered in every day life.

Table 17.1 - Typical Sound Levels

Sound Level dB(A)	Description
140	Threshold of pain
120	Jet take off at 50 metres
100	Maximum noise level on an underground platform
80	Kerbside of a busy urban street
60	Busy general office
40	Residential area at night
20	Background in a TV and recording studio
0	Threshold of hearing

17.5.3 The measure of road traffic noise used in the UK is the $L_{A10,T}$, where L_{A10} is the level of noise exceeded for 10% of the measurement period, T. In the case of road traffic noise T is the 18 hour period from 06.00 to 24.00 hours for an annual average weekday. The $L_{A10,18h}$ is the average of the 18 hourly $L_{A10,T}$ values from 06.00 to midnight. Although the period from midnight to 06.00 is not expressly included in this measure, research has shown that people's reaction to road traffic noise over the full 24 hour period does correlate well with the $L_{A10,18h}$ level. Thus, describing traffic noise in this way does properly reflect the likely attitude of those affected to the noise.

17.5.4 As the decibel is a logarithmic unit, a 3dB increase in sound level represents a doubling of the sound energy. Similarly, a 3 dB reduction in sound level represents a halving of sound energy.

17.5.5 Whereas the *measurement* of sound is objective, the *perception* of sound is subjective and hence will vary from individual to individual. As a general guide, however, most people regard a 10 dB(A) increase in sound level as a doubling of loudness, whilst a change of 3 dB(A) in sound level is generally regarded as the minimum difference needed for an individual to perceive a change for sounds with similar characteristics.

17.5.6 Noise nuisance is described by the World Health Organization as "A feeling of displeasure evoked by noise". Many surveys have investigated the relationship between traffic noise and its impact on people and nuisance is often used as a general term to describe this impact.

Vibration

17.5.7 Vibration is an oscillating motion and can be transmitted to the human body through a supporting surface. In most cases this will be the ground or the floor of a building.

17.5.8 Vibration is often complex, containing many different frequencies at different levels and occurring in different directions. It is common to find that people are annoyed at levels of vibration only slightly above the threshold of perception. Perception varies according to the frequency of vibration, the direction of vibration and whether the person is sitting, standing or lying down.

17.5.9 Research has found that the human body is most sensitive to vibration in the frequency range 1 to 80 Hz, and is especially sensitive in the range 4 to 8 Hz. DMRB states that such low frequencies are not usually encountered from well maintained roads.

Construction

17.5.10 Noise and vibration from construction will vary considerably during the construction process and may affect the occupants of nearby properties and other sensitive locations, as well as the buildings themselves. However, construction impacts are regarded as localised and temporary in nature. For this reason higher levels are generally tolerated than would be the case for a permanent impact.

17.5.11 The assessment has been based on the DMRB recommendation. The number of properties within 100 metres of the construction activity has been counted, along with any other noise sensitive receptors, such as schools and recreational open spaces, identified during the assessment.

17.5.12 The extent of any significant potential impacts has also been predicted using the methods and principles of BS 5228 together with a more recent database of source noise levels published by the Department for Environment, Food and Rural Affairs (Defra) (Ref 13).

17.5.13 Although techniques are available to predict the likely noise and vibration effects from construction operations, the methodology is based on quite detailed information concerning the type and numbers of plant to be used, as well as their precise location and the length of time they are in operation. As the type of construction plant to be used and the phasing of the work has yet to be decided in sufficient detail to predict the precise effect of construction activities certain assumptions have been made.

17.5.14 In order to assess the possible effects of specific construction activities, unshielded noise levels have been calculated at set distances, 10m, 20m, 50m and 100m from generic operations, such as piling or earthworks, that could have an impact. The predictions have been produced in terms of the equivalent continuous sound level, $L_{Aeq,T}$, over the core working day.

17.5.15 The calculations assume that there are no specific mitigation measures in place. It is also assumed that the intervening ground between the construction noise sources and receptors is acoustically reflective such that there will be no attenuation of sound due to ground absorption. Importantly, this indicative analysis of construction noise takes no account of any shielding. The first row of buildings will provide considerable shielding to those buildings further behind consequently the levels only apply to the first row of building facades with an unobstructed view of the construction works.

17.5.16 In carrying out predictions of the likely construction noise impact, the construction works have been divided into the following phases:

a. Ground works
   Scenario 1 (Causeways & Rock armour) - 2 x 44T Excavators; 2 x 41T Dozers; 2 x 35T Dump Trucks; 2 x Vibratory rollers

Scenario 2 (Small earthwork ops) - 2 x 30T Excavators; 2 x 41t Dozers; 2 x 25T Dump Trucks; 2 x Vibratory Roller

Scenario 3 - 2 x 30T Excavators; 2 x 41T Dozers; 2 x 35T Dump Trucks; 2 x Vibratory rollers

b. Piling operations
Jetties – (2 x Hydraulic Hammer rigs, tubular steel)

Piers – (2 x Large Rotary Bored rigs;1 x Pile case vibratory driven; 4 x Truck mixers)

Towers – (1 x Sheet Vibratory Rig 1 x Water pump; 1 x Tower Cranes) (Note Barrettes are to be used, but sheet piling likely to be noisiest activity)

c. Concreting operations
(1 x Tower Crane; 6 x Mixer Trucks; 2 x Concrete Pumps; 5 Poker Vibrators)

d. Asphalting
(1 x Asphalt Paver; 1 x 9T Dumper; 2 x 10T Wagons; 1 x 18T Wheeled Excavator; 1 x Road Planer; 1 Vibro-roller)

e. Haul Road
(4 axle lorry, 10 vehicles per hour, average speed 30 kph)

17.5.17 The predicted noise levels are given in Table 17.2 below.

Table 17.2 - Predicted construction noise levels

Activity	Sound level, $L_{Aeq,T}$ dB, at distances (m)			
	10	20	50	100
Groundworks Scenario 1	89	83	75	69
Groundworks Scenario 2	86	80	72	66
Groundworks Scenario 3	86	80	72	66
Jetty – Piling Tubular	95	91	84	78
Piers – Piling Bored	92	88	81	75
Towers – Piling Sheet	92	88	81	75
Concreting	91	85	77	71
Asphalting	89	83	76	70
Haul Road	60	57	53	50

17.5.18 In order to assist in the assessment of potential construction noise impact the following interpretation has been used. Construction noise levels of up to 70 dB have been classified as low, from 70 to 80 dB as moderate and above 80 dB as high. It should be remembered that the assessment is activity based; consequently the predicted noise levels will only occur whilst that activity is actually taking place. There will inevitably be periods of inactivity when the noise level and the consequential impact will be less.

Road Traffic Noise

17.5.19 A noise modelling software package (IMMI) has been used to predict the road traffic noise for both the existing situation and the future scenarios. The software follows the method given in CRTN. The results have been produced in the form of colour coded noise contours overlaid on an Ordnance Survey (OS) base map.

17.5.20 All noise calculations have been based on the maximum traffic flow expected on a normal working day during the first 15 years after opening, as well as for the year of opening. Parallel calculations were made for the future do minimum scenarios, i.e. the situations were the Project not to be built. Relevant mitigation measures are included in the assessment.

17.5.21 In accordance with CRTN, the road traffic source height was taken to be 0.5 metres above the carriageway surface. The road traffic predictions also assume moderately adverse wind velocities and directions (i.e. from source to receiver), again in accordance with standard guidance. Any wind from the source to the receiver will result in slightly elevated noise levels compared with a no wind situation and hence the assessment method tends to produce a scenario that tends towards the 'worst case'.

17.5.22 All ground has been assumed to be acoustically reflecting by default. However, any known significant areas of acoustically absorptive ground have been included in the model. This approach again causes the results to tend towards a worst case assessment.

17.5.23 The Project, as envisaged, includes some area of landscaping that will reduce noise levels and these have already been taken into account in the modelling. In addition quiet road surfaces will be used throughout the Project and have been assumed for the future do-something predictions.

17.5.24 Based on the results of these predictions, comparisons have primarily been made between the do minimum situations, i.e. without the Project, and the do something situations, i.e. with the Project, in terms of an increase or decrease in noise levels and the likely consequential increase or decrease in nuisance level as defined in DMRB. This comparison has been made in terms of residential properties together with any other significant noise receivers such as schools, etc. Comment has also been provided on other sensitive receivers such as the Wigg Island community park.

17.5.25 Road traffic noise levels have been calculated for 2006 representing the base year, then for 2015 representing the year of opening and 2030 representing the likely year of highest traffic flow within 15 years of opening as follows, with reference being made to the corresponding contour figures:

a. The base year 2006 (figure 17.2 a & b);
b. The opening year 2015 do minimum (figure 17.3a & b);
c. The design year 2030 do minimum (figure 17.4 a & b);
d. The opening year 2015 do something (figure 17.5 a & b); and
e. The design year 2030 do something (figure 17.6 a & b).

17.5.26 The number of properties within each of the 5 dB noise bands shown on the noise contour graphical outputs has been identified from GIS analysis. Using 2001 Census data indicating the number of people resident in each property the number of properties has then been converted to numbers of people within the 5 dB noise level bands. The relationship between likely disturbance and road traffic noise given in DMRB has been used to estimate the percentage of people bothered expected to be bothered by noise at the various noise levels. The value for the centre point of each 5 dB band has been used as the multiplier to the number of people exposed to that band to arrive at an estimate the number of people likely to be bothered by road traffic noise in the various scenarios. In this context 'bothered' means people 'bothered very much or quite a lot by noise' as defined in DMRB.

17.5.27 In order to assess the significance of impacts from road traffic noise the following descriptions have been applied to the $L_{A10,18h}$ noise level changes. There are no standard descriptions available, but the following have commonly been used in other assessments. The descriptions assume there is no material change in either the traffic mix or in the diurnal pattern of activity.

Table 17.3 Significance of noise level changes

Noise Change dB ($L_{A10,18h}$)	Description
0	No effect
0 – 3	Low effect
3 – 10	Moderate effect
10 or more	High effect

Road Traffic Vibration

17.5.28 Vibration arising from road traffic can be transmitted through the air or through the ground. It is difficult to predict but, nonetheless, DMRB provides guidance on its assessment.

17.5.29 DMRB states that for new roads and for existing roads maintained in good condition, whether they are at ground level or on a bridge, ground-borne vibration is very unlikely to be an issue. However, within 40 metres of the source low frequency noise can cause light weight elements of a structure to vibrate (airborne-induced vibration). This tends only to be superficial and, although it may be noticeable by occupiers, it is very unlikely to cause any structural or even cosmetic damage. Beyond 40 metres from the source, or where buildings are screened from the source, it is extremely unlikely that there will be any vibration impact through airborne or ground-borne transmission. The levels of vibration that can arise from road traffic are extremely unlikely to cause damage to buildings.

17.5.30 DMRB suggests that the $L_{A10,18h}$ has a close association with vibration nuisance levels and the effect of vibration on residents can be estimated by subtracting 10% from the equivalent noise nuisance level. It also recommends that at noise levels below 58 dB(A) there is unlikely to be any impact due to vibration.

17.5.31 This approach has been used in this assessment. In this instance, having counted the number of properties exposed to various noise levels, in order to determine numbers of people affected a multiplier of 2.36 people per dwelling has been used. This is the occupancy figure suggested for use by the Highways Agency in the absence of more specific data.

Assessment receptors

17.5.32 For this assessment, residential areas and schools have been identified as being receptors of high importance, canal side areas and other public open spaces receptors of medium importance and industrial/commercial areas as low importance. The Wigg Island Community Park and the Special Protection Area (SPA) have been classed as being of very high importance.

17.5.33 The particular receptors used in this assessment have been described in order from the north west towards the south east of the study area and, where appropriate, the relevant nearby Construction Management Report identification areas, A to I, described in paragraph 17.3.7 above, are shown in brackets. In addition five schools have been identified as receptors. These have also been listed in this section. Where appropriate, figures have been provided illustrating receptor locations.

17.5.34 **Area 1.** Figure 17.7. The A562 Speke Road (CMR - A), Ditton junction (CMR - B) and Widnes Loops Junction (CMR - C) are all in industrial areas and there are no sensitive receivers in the vicinity. To the south and west of the Widnes Loops, the Project route will pass over the St Helens Canal which is a sensitive receptor because in addition to canal users, the canal towpaths are often used for recreational walking. The Pennine Trail follows the St Helens Canal through this area.

17.5.35 **Area 2.** Figure 17.8. The northern approach to the SJB, the A533 Queensway (CMR - I), passes near to a residential area (Cholmondeley Street) and to West Bank Primary School. This is currently a very heavily trafficked route.

17.5.36 **Area 3.**. The area of the river Mersey to the west of the SJB is classified as a Special Protection Area (SPA) in recognition of its importance as a conservation area especially for birds. The SPA is currently subjected to noise from both road traffic using the SJB and railway noise from the adjacent rail bridge. The CMR Area I shows construction works expected in this area.

17.5.37 **Area 4.** Figure 17.9. On the south side of the SJB there are residential areas to both the east and the west of the A533 Queensway (Brindley Street and Handley Street) which is a heavily trafficked route. The CMR Area I shows construction works expected near to this area.

17.5.38 **Area 5.** Figure 17.10. The Weston Point Expressway A557, marks the most easterly part of the study area and in general has no adjacent noise sensitive areas as it is largely industrial in nature. The exception is the residential area adjacent to Russell Road and Castner Avenue. No construction activities are expected in this area.

17.5.39 **Area 6.** Figure 17.11. The study area includes the area where the new bridge would cross the River Mersey (CMR Area D) and the Wigg Island Community Park on the south bank. Wigg Island has been developed as a Community Park supporting a wide variety of wildlife. The study area then crosses the Manchester Ship Canal and associated towpath.

17.5.40 **Area 7.** Figure 17.12. The study area then passes through the industrial and commercial area known as the Astmoor industrial estate (CMR E). ..

17.5.41 **Area 8.** Figure 17.12. At this point the Bridgewater Expressway is crossed by the Central Expressway via the Bridgewater Junction (CMR F). The proposed alignment also crosses the Bridgewater Canal.

17.5.42 **Area 9.** Figure 17.13 and 17.14. To the south of the junction on the Central Expressway, A533, there are fairly densely residential areas to both sides of the route (CMR G) stretching as far as the Weston Link Junction.

17.5.43 **Area 10.** Figure 17.15 At this point the study area follows the existing road network along the southern section of the A557 Weston Point Expressway (H) leading towards the junction with the M56.

17.5.44 As indicated in paragraph 17.5.32, schools have been classified as sensitive receptors of high importance. The following schools are likely to be affected by the proposals. These are shown on Figure 17.16

a. Cavendish School, Lincoln Close, WA7 4YZ
b. Hallwood Park Primary School, Hallwood Park, WA7 2FL
c. West Bank Primary School, Cholmondeley Street, WA8 0EL
d. Weston Point Community Primary School, Castner Avenue, WA7 4EQ
e. Woodside Primary School, Whitchurch Way, WA7 5YP

17.6 Baseline and Do Minimum Results

Overall baseline and do minimum assessment

17.6.1 The baseline results relating to the year 2006 for the areas located close to the Project alignment are shown graphically in Figures 17.2 a & b. The results for the two future do minimum scenarios (2015 and 2030) are shown graphically in Figures 17.3 a & b and 17.4 a & b respectively. All these contours show the noise levels in terms of the $L_{A10,18h}$ banded into 5 dB contours. .

17.6.2 An overall assessment has been made of the number of people within the study area exposed to various bands of noise levels. The results for the base year and for 2015 and 2030 do minimum are shown in table 17.4 below.

Table 17.4 number of people affected

$L_{A10,18h}$	2006 Base Year	2015 Do minimum	2030 Do minimum
50 – 55	20105	20781	20419
55 – 60	7513	8708	9463
60 – 65	3882	4172	4194
65 – 70	2072	2114	2400
> 70	535	681	780

17.6.3 The VDM traffic model broadly indicates that there would be an increase in traffic along the existing network even if he project were not to proceed. This increase in traffic would give rise to an increase in noise level affecting the sensitive areas affected. It can be seen from Table 17.4 that there would be an increase of just over 9% in the number of people exposed to more than 50 dB(A), $L_{A10,18h}$ in the study area.

Detailed baseline and do minimum assessment

17.6.4 A more detailed evaluation of the baseline and do minimum changes is set out below.

17.6.5 **Area 1**. Figure 17.7.. Noise in this area is expected to rise by about 1 decibel between 2006 and 2030 were the project not to proceed. The area of St Helens Canal currently experiences noise levels of around 55 to 60 dB from the road network.

17.6.6 **Area 2.** The road elevation increases here and there is some noise shielding by the carriageway edge. Nevertheless, the noise levels at the housing are around 70 dB. This is a high level of road traffic noise and some 34% of residents would be expected to be bothered by the noise and some 24% would be expected to be bothered by vibration. In this area, the noise level is predicted to rise by about 3 dB by 2030 for the do minimum scenario.

17.6.7 **Area 3.** The River Mersey SPA to the west of the SJB currently experiences noise levels around 55 dB due to road traffic. It also experiences noise due to rail traffic using the adjacent Ethelfreda rail bridge. The noise levels due to the road traffic are predicted to rise by about 1 dB by 2030 do minimum.

17.6.8 **Area 4.** The carriageway is elevated in this area and the nearby residences to the east and west of the route (Brindley Street and Handley Street, Figure 17.9) experience noise levels around 60 dB. It would be expected that about 13% of those living here would be bothered by the noise. From the assessment it would be expected that no residents would be bothered by vibration. It is predicted that noise levels would rise by about one decibel by 2030 for the do minimum scenario, slightly increasing the proportion of the population expected to be bothered by the noise, and slightly increasing the risk of concerns about vibration.

17.6.9 **Area 5.** The main route to reach the M56 in the south of the study area is the Weston Point Expressway which passes largely through industrial areas although there are some residential areas (Figure 17.10) about 50 metres to the east of the route, e.g. Russell Road. These locations experience noise levels in the range 70 – 75 dB, similar to those to the west of the route, e.g. Castner Avenue. This is a high noise level with some 34% of those living there likely to be bothered by the road traffic noise. Due to the distance from the road it is not anticipated that residents will be bothered by vibration. This noise level is likely to rise by about 1 to 1.5 dB by 2030 for the do minimum situation.

17.6.10 **Area 6.** This assessment area includes the New Bridge where it crosses the River Mersey, together with Wigg Island and the Manchester Ship Canal (Figure 17.11). Currently noise levels are comparatively low at about 50 dB and they are expected to increase by about 1 dB by 2030 for the do minimum scenario.

17.6.11 **Area 7**. To the south of the Manchester Ship Canal the study area includes the Astmoor industrial estate (Figure 17.12) where current road traffic noise levels are of the order of 50 dB and, based on the output of the VFM traffic model for this area, are not expected to increase in the future do minimum scenario. .

17.6.12 **Area 8**. This area includes dwellings in the vicinity of the Bridgewater junction a relatively busy junction at the northern end of the Central Expressway (Figure 17.12). Noise levels here are currently around 55 – 60 dB. This is typical for dwellings near to such a road junction. It is anticipated that only about 4 % of the exposed population would be expected to be bothered by the noise. From the assessment it would be expected that no occupants would be bothered by vibration. Noise levels in the do minimum situation are expected to rise by about one decibel.

17.6.13 **Area 9**. The Central Expressway is the main route for traffic travelling south between the Bridgewater Junction and the M56. Whilst there are residential areas to both sides of the route (Figures 17.13 and 17.14) they are generally of the order of 50 to 60 metres from the road with noise levels of the order of 60 – 65 dB. In the future do minimum scenario levels would be expected to increase by about 1 dB. At this level of noise it would be expected that around 13% of those affected would be bothered. The assessment has indicated that it would not be expected that any residents would be bothered by vibration.

17.6.14 **Area 10.** Further south the assessment area includes the Weston Link to M56 section (Figure 17.15). This has a fairly dense residential area to the north east of the route although the nearest dwellings are about 60 metres from the road. The noise levels here are in the 60 dB range which is moderately high but not untypical of this type of situation. At this level about 13% of the exposed population would be expected to be bothered by noise, but due to the distance from the road there is not expected to be any bother caused by vibration. Noise levels in the do minimum situation are expected to rise by about one decibel.

Schools

17.6.15 For the schools in the study area, the predicted noise levels are shown in the table below in terms of the $L_{A10,18h}$ level. Whilst this assessment period (18 hours) is longer than the school day it will still give a good representation of the impact and will also account for the fact that many school buildings can be used for extra curricular activities after normal school hours. The baseline noise levels for 2006 and for the future years do minimum are shown.

Table 17.5 Schools - road traffic noise, dB, $L_{A10,18\ h}$

	Base 2006	Do Minimum 2015	Do minimum 2030
Cavendish School, Lincoln Close, WA7 4YZ	62.8	63.5	64.1
Hallwood Park Primary, Hallwood Park, WA7 2FL	66.8	67.2	67.8
West Bank Primary, Cholmondeley Street, WA8 0EL	72.2	72.7	73.0
Weston Point Community Primary, Castner Avenue, WA7 4EQ	70.5	71.5	71.9
Woodside Primary, Whitchurch Way, WA7 5YP	56.5	57.3	57.5

17.6.16 Two of the schools experience relatively high noise levels (West Bank Primary and Weston Point Community Primary) and under the do-minimum scenarios, the noise levels are expected to rise by up to about 1.5 dB. Noise levels are not so high at Cavendish School and Hallwood Park Primary, and levels are expected to rise by around 1 – 1.5 dB in the do-minimum scenarios. The noise level is much lower at Woodside Primary and an increase of about 1 dB is expected by 2030 in the do minimum scenario.

Baseline summary

17.6.17 In very general terms it can be concluded that, as would be expected, areas adjacent to the existing highway routes, including the SJB and the Weston Expressway, experience moderate to high noise levels. This is particularly the case with the SPA adjacent to the SJB, and further south alongside the Weston Expressway where traffic speeds tend to be higher. Areas adjacent to the Central Expressway are currently exposed to moderately high noise levels. The St Helens Canal, the New Bridge alignment over the River Mersey, the Wigg Island area and the Manchester Ship Canal are all currently in relatively quiet areas.

17.6.18 For the do minimum scenarios, most areas are expected to experience an increase of around 1 – 1.5 dB. The exception is Area 2 where levels are expected to rise by about 3 dB.

17.6.19 For the most part the distance between residential premises and the various roads means that the degree of bother arising from vibration is expected to be low.

17.7 Effects Assessment of the Project

17.7.1 This Chapter reports on an assessment of the likely effects of the Project on receptors identified earlier in this Chapter. The effects have been assessed for the construction and operation phases of the project.

17.7.2 The effect on the various sensitive receptors described above (paragraph 17.5.32 *et seq.*) is considered.

Construction Phase

Overview of construction effects

17.7.3 The methodology used for assessing the construction effects is described above (paragraphs 17.5.10 – 17.5.18 above.

17.7.4 The route of the Project would pass predominantly through industrial areas. However, there are some 1200 residential properties within a 100 metre corridor to either side of the route, and which could be affected by the noise levels shown in Table 17.2 (depending on their distance from the works). There is the potential that some of those residents would be bothered to some extent during the construction phase. The most densely populated residential areas are those adjacent to road works on the Central Expressway. Although all properties within the 100 metre band have been counted, in areas such as the Central Expressway properties behind the first line of housing will benefit from a considerable element of noise shielding thus reducing the potential impact. The estimated number of properties potentially affected is, therefore, a worst case.

17.7.5 In the more detailed assessment below, the overall effect has been categorised taking account of the likely noise level from the works (based on the results shown in Table 17.2, and the relative sensitivity of the receptor as described in paragraph 17.5.32.

More Detailed description of construction effects

17.7.6 **Area 1.** Figure 17.7**.** Construction activities in this area are expected to involve strengthening of the ground using vibro-concrete columns, then construction of the carriageway pavement. Whilst this technique employs a vibration generator and may require piling there are no vibration sensitive areas near and consequently there will be limited effect. To the east of this assessment area works will include construction of an embankment and some bridgeworks which may involve piling. Again there are no vibration sensitive areas near to this location.

17.7.7 Construction works on the north bank (areas A, B and C of the CMR) will largely be surrounded by industrial and commercial areas and the impact on residential areas is anticipated to be low negative. However the construction site will cross the St Helens Canal and there will be a moderate negative effect in this area while the works are in progress with noise levels in the mid 70 dB range at a distance of 100 metres.

17.7.8 **Area 2.** Figure 17.8. The construction methods expected for this area are mostly minor in connection with the de-linking of the SJB, with some earthworks and concrete breaking for the removal of a viaduct. The deck of the SJB would be planed together with other minor works such as erecting signage. There is a housing area to the east of the SJB northern approach (Cholmondeley Street), but works here are anticipated to be minimal and effects are anticipated to be low negative.

17.7.9 **Area 3.** Construction works on the deck of the SJB adjacent to the SPA are expected to be minimal with no major works and any adverse effect are expected to be low negative at worst.

17.7.10 **Area 4.** Figure 17.9. To the south of the SJB there are no construction works programmed except for minor civils work in connection with re-prioritisation for public transport.

17.7.11 **Area 5.** Figure 17.10. There are no construction works programmed for the Weston Point Expressway.

17.7.12 **Area 6.** Figure 17.11. There will be construction of the bridge towers in this area which will involve a variety of techniques including sheet piling to form cofferdams, the use of cranes and concreting. The jetties and approach viaducts will also require piling using both vibratory and impact methods.

17.7.13 On the south bank (area E of the CMR) there will be an approach viaduct crossing the Astmoor Saltmarsh. The construction of this viaduct, some 24 metres high, will involve the formation of stone tracks for access and reinforced concrete plate piers to support the road deck. This will be one of the noisier activities potentially producing $L_{Aeq,T}$ noise levels in the mid to high 70 dB range at a distance of 100 metres. There will inevitably be an impact on Wigg Island during the construction of this phase of the works and with noise levels around 85 dB at 50 metres. The effect has been classed as high negative.

17.7.14 Where the viaduct passes over the Manchester Ship Canal there is likely to be piling required with noise levels potentially in the range of 80 – 85 dB at 50 metres. This effect has been classified as moderate negative.

17.7.15 **Area 7.** Figure 17.12. The road will pass through the Astmoor industrial site on an embankment and it is likely that piled foundations will be required together with concreting works. Whilst piling can cause noise levels around 85 dB at a distance of 50 metres whist the operation is in progress, the relatively low sensitivity of this area means that the effect has been classified as low negative.

17.7.16 **Area 8.** Figure 17.12. The Bridgewater Junction involves a complex of structures and construction will involve piling, concreting and the placing of prefabricated or pre-stressed concrete beams. Where the viaduct passes over the Bridgewater Canal there is likely to be piling required with noise levels potentially in the range of 80 - 85 dB at 50 metres. Given the relative sensitivity of the canal towpaths, the effect has been classified as moderate negative.

17.7.17 The area of housing near to the Bridgewater Junction embankment (area F of the CMR), is located roughly at a distance of 40 metres or so and is expected to experience noise levels around 75 to 80 dB whilst the embankment is being modified. This effect has been classed as moderate negative.

17.7.18 **Area 9.** Figures 17.13 and 17.14. Further south, after the Bridgewater Junction (part of area F and area G of the CMR), there is housing situated both to the east and west of the existing road. However, the housing is situated some distance from the works, typically 70 to 100 metres. There may be some impact due to construction of the new structures that will be required over the existing Expressway. Work on the main Central Expressway will be limited to traffic management and some highway alignment modifications. There will be no significant earth works. This, combined with the distance between housing and the works means that noise levels are expected to be around 70 dB and there is unlikely to be more than a low to moderate negative effect.

17.7.19 The Lodge Lane junction to Halton Brow (area G of the CMR) will require the provision of distributor roads together with a new single span bridge which will require piled foundations. There is some housing to the west of the road at approximately 30 metres and noise levels of around 75 to 80 dB are expected on occasions. Higher noise levels would occur if piling is required for bridge foundations, and the effect has been classed as moderate to high negative. Given the relatively close proximity of the housing to the works, there is the possibility that vibration from piling will be perceptible from time to time, but even at those distances, it is highly unlikely to cause any damage to properties.

17.7.20 **Area 10.** Figure 17.15. Work on the Weston link to M56 junction 12 (area H of the CMR) will be minimal in nature and in general the nearest housing is of the order of 100 metres from the works. There will be some bored piling for a new retaining wall to the south east side of the northern roundabout at the M56 junction but this will be some 150 to 200 metres from the nearest dwellings and will have no significant effect.

Schools

17.7.21 There are 2 schools that may be affected by construction activities. West Bank Primary School is adjacent to the SJB where minor works are to be carried out in connection with the de-linking of the SJB and Woodside Primary School near to the Lodge Lane Junction works.

17.7.22 As the existing noise level is relatively high at West Bank Primary and assuming the traffic noise will not change materially during the works, the noise from the construction works would probably only be audible from time to time and, the effect has been classified as low negative..

17.7.23 The works near to Woodside Primary School will be greater and in this case, the effect has been classified as a moderate to high negative.

Operational Phase

Overall assessment - Noise

17.7.24 Table 17.6 below shows the numbers of people within various noise level bands for each scenario – base year, 2015 do minimum, 2015 do something, 2030 do minimum and 2030 do something as determined by the noise modelling described in paragraphs 17.5.19 – 17.5.27.

Table 17.6 - number of people within noise contour bands

$L_{A10,18h}$	Base Year 2006	Do minimum 2015	Do something 2015	Do minimum 2030	Do something 2030
50 – 55	20105	20781	17505	20419	17038
55 – 60	7513	8708	11082	9463	12869
60 – 65	3882	4172	3819	4194	4144
65 – 70	2072	2114	2087	2400	1399
> 70	535	681	497	780	668

17.7.25 From these data, the estimated number of people bothered very much or quite a lot by road traffic noise has been calculated according to the method described in paragraphs 17.5.26 above. The results are shown in Table 17.7 below.

Table 17.7 Total Number of people bothered very much or quite a lot by road traffic noise

$L_{A10,18h}$	Base Year 2006	Do minimum 2015	Do something 2015	Do minimum 2030	Do something 2030
50 – 55	1206	1247	1050	1225	1022
55 – 60	751	871	1108	946	1287
60 – 65	660	709	649	713	704
65 – 70	559	571	563	648	378
> 70	182	232	169	265	227
TOTAL	**3358**	**3630**	**3539**	**3797**	**3618**
% Change from base		**+8.1**		**+13.1**	
% Change from do min			**-2.5**		**-4.7**

17.7.26 Compared to 2006 there is expected to be an increase in the number of people bothered by noise of around 8% by 2015 for the do minimum scenario due to the expected increase in traffic flow, rising to an increase of 13% by 2030.. This demonstrates that without the project the noise environment would be expected to worsen were the Project not to be implemented.

17.7.27 Assuming the Project is built, the overall figures show a decrease in the number of people bothered with reductions of about 2.5% in 2015 and 4.5% in 2030 when compared to the do minimum scenario.

17.7.28 Looking at the figures in more detail it can be seen that for the do something scenario in 2030 there are decreases in the number of people bothered in the higher noise bands, above 60 dB, and in the lowest noise band, 50 to 55 dB, but an increase in the mid noise band, 55 to 60 dB. However, as indicated above, the overall effect is that fewer people would be expected to be bothered with the Project in 2030 than would be the case were the Project not to be built.

17.7.29 It can also be seen from Table 17.6, that there would be a reduction of about 20% in the number of people living in dwellings where the road traffic noise is 65 dB or more between do-something 2030 (2067) compared with the baseline (2607).

17.7.30 This is due to the fact that there will be considerably less traffic on the SJB which currently causes moderately high noise levels to nearby dwellings and to dwellings on the Weston Expressway.

Overall assessment – Vibration

17.7.31 Using the methodology described in paragraphs 17.5.28 – 17.5.31 above an estimate of the number of people in the study area likely to be bothered very much or quite a lot by vibration has been made. The results are shown in Table 17.8.

Table 17.8 Number of people bothered very much or quite a lot by vibration

	Do minimum	Do something
Base year, 2006	100	-
2015	112	120
2030	114	125

17.7.32 It can be seen that there will be a slight increase in the total number of people bothered by vibration in the future without the project due to the expected increase in traffic flow. The increase is expected to be slightly higher for the do something situation, but the differences are small. Taking account of the relative sensitivity of the receptors and the size of the expected change, the effect has been classed as a low negative.

More Detailed assessment

17.7.33 The following section describes the future do something scenario for 2030 and makes comparison with the baseline/do-minimum data and assesses the effect. For residential areas estimates have been made of the changes in percentage of people likely to be bothered very much or quite a lot by the noise.

17.7.34 **Area 1.** The Speke Road section of this area is expected to have a 2 to 2.5 dB increase in noise levels at 10 metres from the road side. The area is mostly industrial which has been classed as a low importance; consequently the effect has been classed as low negative.

17.7.35 Where the road alignment passes over the St Helens Canal, as this is a newly exposed area to road traffic, noise levels are expected to rise some 7 or 8 dB to the low 60 dB range. As canal side areas have been classified as moderate importance this increase has been classed as a moderate negative effect.

17.7.36 **Area 2.** For the residential areas adjacent to the SJB northern approach there will be a reduction in traffic noise levels. This is expected to be a 5 or 6 dB reduction in noise levels to the mid 60 dB range. The percentage of people expected to be bothered by noise and by vibration will reduce by about 12%. This is classed as a moderate positive effect.

17.7.37 **Area 3.** The area of the SPA immediately adjacent to the SJB will be expected to have a reduction in noise level due to road traffic of about 5 dB to the high 40 dB range. Although there will still be intermittent noise due to passing trains and other nearby sources, taking account of the relative sensitivity of the area, the effect of the Project has been classed as high positive.

17.7.38 **Area 4.** Figure 17.9. On the south side of the SJB the housing areas will expect a 5 or 6 dB reduction in the contribution from the roads considered in this assessment to the mid 50 dB range. The percentage of people expected to be bothered by noise is expected to reduce by about 5%. It is not expected that any people will be bothered by vibration. This a positive benefit and has been classed as a moderate positive effect.

17.7.39 **Area 5.** Figure 17.10. Housing alongside the Weston Point Expressway will receive a reduction in noise levels about of 5 dB from the low 70 dB to the mid 60 dB range. This will reduce the percentage of people bothered by about 12% from 34% down to 22%. Due to the distance from the road there is not anticipated to be people bothered by vibration. Overall for this area, this has been classed as a moderate positive effect.

17.7.40 **Area 6.** Figure 17.11. The area of the New Bridge and the Wigg Island area will see increases of 5 dB or so despite an element of self shielding by the bridge deck. Although this is classified as a moderate increase, the relative sensitivity of this area means that this has been classed as a high negative effect. The increase in noise level at the Manchester Ship Canal has been classed as a moderate negative effect.

17.7.41 **Area 7.** Figure 17.12. Where the route alignment passes through the Astmoor industrial estate it is expected that high increases in noise levels of about 10 dB will occur. Noise levels would be in the low 60 dB range which is entirely compatible with this type of use. Given the relative sensitivity of this area, the overall effect has been classed a low negative.

17.7.42 **Area 8.** Figure 17.12. The housing near to the Bridgewater Junction will experience noise level increases of about 7 dB from 60 dB to the mid 60 dB range. The percentage of people expected to be bothered by noise and by vibration will increase by about 9%. This has been classed as a moderate negative effect. The increase in noise at the Bridgewater Canal combined with its relative sensitivity as a receptor means that the change has been classed as a moderate negative effect.

17.7.43 **Area 9.** Figure 17.13 and 17.14. For the housing alongside the remainder of the Central Expressway noise levels are generally anticipated to increase by about 2 to 4 dB. The percentage of people expected to be bothered by noise and by vibration will increase by about 9%. This has been classed as a moderate negative effect.

17.7.44 **Area 10.** Figure 17.15. The housing parallel to the route from the Weston Link to the M56 is expected to experience a low increase in noise level of less than 1 dB. The percentage of people bothered by noise is not expected to change. The effect has been classified as a low negative effect

Schools

17.7.45 The predicted noise levels for the schools in the study area for the scenarios assessed are shown in Table 17.9 below.

Table 17.9 Schools - road traffic noise, dB, $L_{A10,18\,h}$

	Base 2006	Do minimum 2015	Do something 2015	Do minimum 2030	Do something 2030
Cavendish School, Lincoln Close, WA7 4YZ	62.8	63.5 (+0.7)	62.7 (-0.8)	64.1 (+1.3)	63.5 (-0.6)
Hallwood Park Primary, Hallwood Park, WA7 2FL	66.8	67.2 (+0.4)	66.2 (-1.0)	67.8 (+1.0)	67.1 (-0.7)
West Bank Primary, Cholmondeley Street, WA8 0EL	72.2	72.7 (+0.5)	66.3 (-6.4)	73.0 (+0.8)	67.1 (-5.9)
Weston Point Community Primary, Castner Avenue, WA7 4EQ	70.5	71.5 (+1.0)	64.3 (-7.2)	71.9 (+1.4)	65.6 (-6.3)
Woodside Primary, Whitchurch Way, WA7 5YP	56.5	57.3 (+0.8)	65.6 (+8.3)	57.5 (+0.2)	66.3 (+8.8)
NB figures in brackets for do minimum show change from base year Figures in brackets for do something show change from do minimum					

17.7.46 The predicted road traffic noise levels at Cavendish School show a reduction for the do something situation of0.6 to 0.8 dB showing that there will be a low positive effect.

17.7.47 At Hallwood Park Primary School predicted road traffic noise levels are expected to reduce for the do something scenarios by a 0.7 – 1.0 dB. This has been classified as a low positive effect.

17.7.48 .For both these schools, the expected growth in traffic between 2015 and 2030 means that the reduction in noise level compared with the baseline is lower in 2030 than in 2015.

17.7.49 For West Bank Primary school road traffic noise levels now and for the future do minimum scenarios are high at 72 to 73 dB. Future road traffic noise levels for the do something scenarios are predicted to reduce by around 6 to 6.5 dB, a very noticeable reduction. This has been classed as a high positive effect.

17.7.50 Weston Point Community School is close to the Weston Point Expressway and road traffic noise levels are currently high at about 71 dB. They are expected to rise by 1 to 1.4 dB in the future do minimum scenarios. However for the do something scenarios levels will reduce by about 6dB, again a very noticeable reduction. This has been classed as a high positive effect.

17.7.51 Woodside Primary School lies adjacent to the Central Expressway near to the Lodge Lane Junction. Road traffic noise levels are currently about 57 dB and are not predicted to alter very much in the future do minimum scenarios. However in the future do something scenarios unmitigated noise levels will increase by 8.3 to 8.8 dB. This is partly due to increased traffic flows on the Central Expressway but also due to the realignment of the carriageway layout bringing a slip road closer to the school. This is classed as a high negative effect and mitigation has been proposed to reduce the effect (see 17.8 below).

Summary of effects

17.7.52 During the construction phase of the Project there will inevitably be some negative effects, however these will not be permanent. A brief description of the construction activities has been given for each assessment area, together with an indication of the likely noise levels and the likely effect. The CMR provides detail of the construction techniques anticipated to be used. However at this stage there is insufficient detail on specific types of equipment and other details to make precise predictions. More detailed calculations will be carried out when specific plant and working methods are known.

17.7.53 There is expected to be a high negative effect at the Wigg Island Community Park during construction of the Project. This is in part due to the baseline low noise levels experienced there at present. In the adjacent Astmoor industrial estate the effect is anticipated to be low reflecting the low sensitivity of this area.

17.7.54 During construction there is expected to be a moderate negative impact on housing near to the Bridgewater Junction and along the Central Expressway as far as the Lodge Lane Junction. Here new slip roads are to be built and the negative impact has been classed as moderate to high.

17.7.55 During the operational phase the assessment has shown overall benefits for the do something scenario with a reduction in the number of people likely to be bothered by road traffic noise. The assessment of people likely to be bothered by vibration shows little change, although it is expected that there will be a slightly greater number of people bothered for the do something scenario.

17.7.56 The main outcome of the detailed analysis is that there are anticipated to be moderate positive effects for the housing adjacent to the northern and southern approach to the SJB and all housing adjacent to the Weston Point Expressway. The positive effect to the SPA adjacent to the SJB has been classed as high. There will be a high negative effect at Wigg Island and moderate negative effects for housing adjacent to the Central Expressway.

17.7.57 There are 5 schools in the assessment area four of which will experience lower noise levels for the do something scenario and one of which will receive higher noise levels. Of those receiving lower noise levels, two have been classified as a low positive effect (Cavendish School and Hallwood Park Primary School), and 2 will have been classified as a high positive effect (Weston Point Community School and West Bank Primary School). Woodside Primary School is expected to have a high negative impact.

Other Issues

17.7.58 The provision of any new housing adjacent to the alignment of the proposed project will not be compromised by the Project in terms of land allocated for housing and PPG 24 Planning and Noise (Ref 6). It will be possible by appropriate design to achieve suitable internal noise levels for any housing development.

17.7.59 Three of the Regeneration Action Areas identified in the UDP (Ref 8) and referred to in the Land Use Chapter of this ES are adjacent to the Project alignment in the Widnes Loops area, and they feature land allocated for residential development. However there is sufficient space within the areas to phase development so that noise sensitive development, such as housing, is located away from the road or is shielded by development that is not noise sensitive. This will allow development of housing without conflicting with PPG 24 or with the UDP.

17.7.60 Following completion of the Project, it is planned to redevelop land under the Astmoor viaduct. This will present no noise or vibration difficulties providing the development is suitable for the area, i.e. industrial or commercial.

Table 17.10 Summary of Potentially Significant Noise and Vibration Effects

Effect	**Receptor and Importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)
Construction Phase			
General construction activities	Dwellings – High importance	Temporary effect for Project duration. Approximately 1,200 dwellings within 100 metres.	Moderate negative
Noise from general construction activities including canal bridge	Area1 – St Helens Canal – medium importance	Temporary increase in noise, up to 6 months	Moderate negative
Noise from minor construction activities	Area 2 – SJB northern approach. Dwellings - high importance	Temporary increase in noise, up to 6 months	Low negative
Noise from bridge construction activities	Area 6 – Wigg Island – high importance	Temporary increase in noise, up to 27 months	High – negative
Noise from viaduct construction activities	Area 6 – Manchester Ship Canal – medium importance	Temporary increase in noise, up to 9 months	Moderate - negative
Noise from viaduct construction activities	Area 7 – Astmoor industrial estate – low importance	Temporary increase in noise, up to 25 months	Low – negative
Noise from general construction activities	Area 8 – Bridgewater Canal – medium importance	Temporary increase in noise, up to 9 months	Moderate – negative
Noise from general construction activities	Area 8 – residential areas near Bridgewater Junction – high importance	Temporary increase in noise, up to 11 months	Moderate - negative
Noise from construction and highway alignment modifications	Area 9 – residential areas adjacent to the Central Expressway – high importance	Temporary increase in noise, 12 months	Low to moderate – negative
Noise from construction of distributor roads and bridge	Area 9 – residential areas adjacent to Lodge Lane Junction	Temporary increase in noise, 12 months	Moderate to high – negative
Noise from minor construction activities	West Bank Primary School – high importance	Temporary increase in noise, up to 6 months	Low - negative
Noise from construction of distributor roads and bridge	Woodside Primary School – high importance	Temporary increase in noise, 12 months	Moderate to high - negative
Operational Phase			
Overview Noise from operation of the road –	Residential areas – high importance	Permanent decrease in number of people affected by noise	Moderate positive
Overview - Vibration from operation of the road	Residential areas – high importance	Permanent – slight increase in number bothered	Low negative
Road traffic noise	Area 1 – industrial and commercial areas – low importance	Permanent - slight in crease in noise	Low negative
Road traffic noise	Area 1 – St Helens Canal – medium importance	Permanent increase in noise levels	Moderate negative

Effect	Receptor and Importance	Nature of Effect (Permanent / Temporary and Magnitude)	Significance (High, Moderate, Low and Positive/Negative)
Road traffic noise	Area 2 – residential areas adjacent to northern approach to SJB – high importance	Permanent decrease in noise levels	Moderate positive
Road traffic noise	Area 3 – SPA – high importance	Permanent decrease in noise levels	High positive
Road traffic noise	Area 4 – residential areas adjacent to the southern approach to SJB – high importance	Permanent – decrease in noise levels	Moderate positive
Road traffic noise	Area 5 – residential areas adjacent to the Weston Point Expressway – high importance	Permanent – decrease in noise levels	Moderate positive
Road traffic noise	Area 6 – Wigg Island – very high importance	Permanent – increase in noise levels	High negative
Road traffic noise	Area 6 – Manchester Ship Canal – medium importance	Permanent – increase in noise levels	Moderate negative
Road traffic noise	Area 7 – Astmoor industrial estate – low importance	Permanent – increase in noise levels	Low negative
Road traffic noise	Area 8 – residential areas adjacent to Bridgewater junction	Permanent – increase in noise levels	Moderate negative
Road traffic noise	Area 8 – Bridgewater Canal – medium importance	Permanent – increase in noise levels	Moderate negative
Road traffic noise	Area 9 – residential areas adjacent to the Central Expressway	Permanent – increase in noise levels	Moderate negative
Road traffic noise	Area 10 – residential areas adjacent to the Weston link to M56	Permanent – slight increase in noise levels	Low- negative
Road traffic noise	Cavendish School – high importance	Permanent – slight decrease in noise levels	Low positive
Road traffic noise	Hallwood Park Primary School – high importance	Permanent – slight decrease in noise levels	Low positive
Road traffic noise	West Bank Primary School – high importance	Permanent – decrease in noise levels of about 6 dB	High positive
Road traffic noise	Weston Point Community School – high importance	Permanent – decrease in noise levels of about 6 dB	High positive
Road traffic noise	Woodside Primary School – high importance	Permanent – increase in noise levels of about 9 dB	High negative

17.8 Mitigation, compensation, enhancement and monitoring

Mitigation of Noise during Construction

17.8.1 Some potential adverse noise impacts have been identified in this assessment. The contractor(s) should ensure that predictions of construction noise and vibration are updated as the construction programme develops. It should be remembered however, that construction impacts are temporary in nature and suitable mitigation and control measures can be introduced to minimise any negative impacts.

17.8.2 It is likely that the contactor(s) will submit an application to the local authority for a Section 61 agreement under COPA (Ref 4)

17.8.3 The contractor(s) should adopt maximum construction noise targets for the project using guidance as presented in the table below. These are based on other, similar projects but are subject to agreement with the relevant local authorities. Noise measurement terminology relates to BS 5228:1997 (Ref 10).

Table 17.11 - Recommended construction noise target levels at nearest noise sensitive receiver

Period of Construction		Level $L_{Aeq,T}$ dB(A)	Duration T (hours)
Day			
Monday-Fridays	0700-1900	75	12
Saturdays	0700-1300	75	6
Evening (and weekends)			
Mondays-Fridays	1900-2200	65	3
Saturdays	1300-2200	65	9
Sundays	0900-1700	65	8
Night (and weekends)			
Any day	2200-0700	60	9
Sundays	0700-0900	60	2
Sundays	1700-2200	60	5

17.8.4 To keep construction noise to a minimum and within the thresholds outlined in the above table, the contractor will be expected to follow good practice including noise management mitigation measures as an integral part of a Noise and Vibration Management Plan (NVMP) for the Project which would be expected to include the following:

a. To provide good communication with the local community the contractor will appoint a community liaison officer with a publicised contact telephone number;
b. Where noisy tasks have to be undertaken close to occupied buildings, the occupiers would be given advance notice, in writing, explaining the reason for the works, the expected time and duration, and the procedures to be adopted for minimising the noise or vibration;
c. Where work has to be undertaken during either the evening or night-time periods, the Contractor would advise and consult with the environmental health officers of the Council in accordance with an agreed procedure;
d. All plant and equipment associated with the construction works would be properly maintained, provided with effective silencers and operated in such a manner as to avoid

causing any excessive noise emission. Where plant has been designed to operate with engine covers to reduce noise, these would be used and remain closed while the plant is in operation. Unless otherwise directed by senior construction management, items of plant in intermittent use would be shut down during idle periods;

e. Static plant would be located in areas as far from inhabited buildings as possible and would be screened where practicable. Plant known to emit noise predominantly in one direction would, when possible, be screened or orientated so that the noise is directed away from noise sensitive areas;
f. No music or radios should be played on site;
g. Audible warning systems, such as vehicle reversing sirens, would normally be set to as low a setting as is compatible with safety requirements. Where appropriate, broadband warning systems would be used;
h. Site compounds would be located as far as possible from local occupied premises and, where possible, site buildings would be situated to provide additional screening between the works and other occupied premises. Where appropriate, the stockpiling of site materials, soil or spoil would be located where it can provide some additional screening provided that any plant associated with this would in itself not generate nuisance, provided that prevailing wind conditions would not increase the potential for nuisance due to dust. The transport of materials on or off site by road would generally take place during the normal daytime working period and where possible would also be routed away from particularly sensitive receivers; and
i. Site personnel would be informed about the need to minimise noise to the neighbouring community as well as about the health hazards of exposure to excessive noise or vibration. Their training would include advice relating to the proper use and maintenance of tools and equipment, the positioning of machinery on site to reduce noise emissions to neighbouring communities, and the avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment.

17.8.5 Night working would be kept to a minimum. However, there may be occasions where it is unavoidable such as works to the railway in Widnes. Operations such as piling works would not generally be undertaken at night.

17.8.6 Haul routes within the site would generally be on existing main roads. However, as specified in the CMR it will be possible to bring some materials in by canal direct to the site, thus avoiding the road network.

17.8.7 In addition, to these measures the constructor(s) will be required to carry out a more detailed verification of noise levels for specific construction activities when specific plant and working methods are known or when required by the local authority.

Noise Insulation Regulations (Ref 3)

17.8.8 As described in paragraph 17.4.5, there is the power within these regulations to offer noise insulation to residential properties where the construction works *"are expected to cause noise at a level, which, in the opinion of the highway authority, seriously affects or will seriously affect for a substantial period of time the enjoyment of an eligible building adjacent to the site".* Levels defining 'seriously affected' or 'substantial period of time' are not given in the regulations but are commonly defined as 75 dB $L_{Aeq,12h}$ for 10 consecutive days. It is anticipated that these criteria would be used with this Project. Furthermore, if properties are found to be eligible for noise insulation as a result of operational noise, every effort would be made to bring forward such treatment so that it would assist in mitigating noise from the construction phase.

Noise and vibration monitoring during construction

17.8.9 It is common practice to conduct monitoring of noise and vibration levels during major construction projects to check that agreed targets are being met. This is likely to be required as part of a section 61 agreement under the COPA and the contractor will be required to reach agreement on the methodology with the planning authority.

17.8.10 All monitoring should be carried out by competent personnel and should be in accordance with the guidance given in BS 5228. Noise monitoring can either be carried out at the noise sensitive receiver location or in some circumstances can be carried out on the construction site boundary with suitable corrections to enable estimation of noise levels at the required location.

17.8.11 Vibration during construction activities is not expected to cause major effects, but monitoring may be required during some piling activities. In such cases monitoring should be carried out at the relevant sensitive receiver location.

Mitigation of Noise during Operation

17.8.12 When considering the reduction of any negative impact due to road traffic noise, the preferred mitigation option is to reduce noise at source, for example, by the provision of roadside noise barriers.

17.8.13 The following discussion of mitigation is divided into four separate areas.

17.8.14 Although the new bridge will pass over Wigg Island at a height of about 25 metres a high negative impact has been identified for this location. Consideration has been given to roadside windscreens which would also reduce noise levels to an extent. However, as these screens are unlikely to be solid they will only reduce levels by 1 dB or so.

17.8.15 In the Central Expressway area the road will pass through largely residential areas and consideration has been given to the provision of roadside noise barriers to reduce the negative impacts here.

17.8.16 For a barrier to be effective it needs to be either close to the source or close to the receiver. In the situation of a new road it is convenient to place a barrier close to the source, i.e. at road side. A barrier needs to obscure the line of sight to be effective and can generally give reductions of 5 dB(A) to 10 dB(A). The required height of a barrier therefore depends on the geometry of the source height and the location of the receiver, which, in the case of a first floor bedroom window is generally taken to be 4.5 metres above ground level.

17.8.17 The proposed barriers on the Central Expressway would be located at the road side between the carriageway and the residential areas. For illustrative purposes and for the Reference Design, barriers of 2.4 metres height have been proposed in areas where the road is at ground level. This will means that noise levels at the dwellings will be expected to reduce by at least 5 dB. Where carriageways are elevated the barrier height has been reduced to 1.2 metres as the ground elevation of the barrier site provides an additional screening effect. The locations of the barriers are shown in figures 17.17 and 17.18. This will reduce the effect of road traffic noise on all dwellings adjacent to the Central Expressway from moderate to low.

17.8.18 In the area adjacent to the Lodge Lane junction there is anticipated to be a moderate negative effect for both residential areas and for Woodside Primary school. As in the remainder of the Central Expressway area, barriers will be provided here to reduce the potential impact. A barrier can be expected to reduce the effect from moderate to low negative.

17.8.19 Roadside barriers alongside the Central Expressway from Bridgewater Junction to the Weston Link Junction are expected to reduce noise levels with the Project such that for the majority of properties there will be no eligibility for sound insulation under the NIR.

17.8.20 The location of the proposed barriers has been shown on Figures 17.17 and 17.18. These figures indicate in red where 2.4 metre barriers will be provided and in blue where 1.2 metre barriers will be provided.

17.8.21 Vertical barriers employed for noise attenuation should in themselves integrate with their surroundings. As described in section 12.8 of Chapter 12 of this ES (the Landscape and Visual Impact Assessment chapter), they would be constructed as timber panels which would be visually recessive and suitable for the urban situations in which they would be deployed. In this situation timber panels would be used in association with brick plinths and pillars to promote visual coherence with the surroundings. The surface density of the timber should be at least 7 kg/sq m and the barrier should contain no gaps.

17.8.22 It should be remembered however, that if the detailed design changes then the location, height and type of barriers will need to be re-assessed.

Noise Insulation Regulations (Ref 3)

17.8.23 An estimate has been made of the number of dwellings likely to be eligible for an offer of sound insulation under the Noise Insulation Regulations. The estimate has been made for the year 2030 which is expected to show the greatest impact within 15 years of the opening of the Project. Firstly, those dwellings with a facade level of at least 68 dB $L_{A10,18h}$ and adjacent to the area of works were identified. The dwellings were then compared with the 2030 situation without the project to determine whether there would be at least a 1 dB increase due to the scheme.

17.8.24 The result of this analysis shows that approximately 120 properties may be eligible for an offer of insulation. It should be remembered that this is an indicative estimate and not a definitive statement. Furthermore, the mitigation which has been proposed above is expected to reduce noise levels such that no properties will be so adversely affected that the criteria of the regulations will be met.

Summary of mitigation

17.8.25 During the construction phase of the Project mitigation will primarily be through the adoption of a Noise and Vibration Management Plan (NVMP, as part of the Construction Environmental Management Plan (CEMP – see Chapters 22 and 23). This will specify good practice for the management of noise on the site through, for example, controlling the hours of working together with noise control targets. Many elements of a noise management plan are described in BS 5228 and these will be incorporated into the NVMP.

17.8.26 It is probable that the contractor(s) will apply for a section 61 agreement with the local authority under COPA. This would have the effect of formalising many of the clauses of the NVMP into a legally binding agreement.

17.8.27 It is likely that the local authority will require a programme of monitoring during the construction phase to ensure that targets are being met.

17.8.28 For the operational phase, it is expected that noise barriers would be employed alongside the Central Expressway to mitigate the road traffic noise. These would be up to 2.4 metres in height and would be expected to attenuate noise levels such that the unmitigated moderate negative noise effect along the Central Expressway would be reduced to a low negative effect.

17.8.29 Although it has been estimated that around 120 properties may be eligible for noise insulation under the terms of the Noise Insulation regulations, the installation of the noise barriers described above would remove that eligibility. This provides evidence of the low residual effect of the works.

17.9 Residual Effects

17.9.1 The impact summary tables show that there would be some residual effects after mitigation and these are shown in Table 17.12 and are described below.

Construction residual Effects

17.9.2 During the construction phase a Noise and Vibration Management Plan (NVMP) will be implemented through the CEMP. This will include best practice on the control and management of noise and vibration. It will include the specification of noise and vibration targets together with hours of working. It will also include careful and detailed liaison between the contractor(s) and the local authority.

17.9.3 However this will not mitigate the negative construction effects entirely and it is anticipated that there will still be low to moderate negative impacts throughout the construction area particularly at Wigg Island and at Woodside Primary School.

17.9.4 The route alignment crosses 3 canals and there are anticipated to be moderate negative effects therein the vicinity of all of them during construction. Although footpaths would be diverted during construction, the diversions will still be adversely affected by noise.

17.9.5 The Wigg Island Community Park is currently a relatively quiet area and would suffer high negative effects throughout the construction of the elevated structure on the south side of the new bridge. These effects will be unavoidable.

17.9.6 Two schools will be adversely affected during construction. West Bank Primary School will have a low negative effect and Woodside Primary School will have a moderate to high negative effect.

Operational residual effects

17.9.7 Overall there will be moderate positive residual effects in terms of the total number of people likely to be bothered by road traffic noise from the operation of the road.

17.9.8 There will be low residual negative impacts in the industrial areas on the north and south banks of the River Mersey under the alignment of the Project.

17.9.9 The SPA adjacent to the SJB will experience a permanent reduction in noise level of about 5 dB which is a high positive residual effect. All residential areas from the northern approach to the SJB, the southern approach to the SJB and the Weston Point Expressway will have a permanent reduction of 5 or 6 dB for the do something scenario which is a moderate residual positive effect.

17.9.10 Wigg Island Community Park will have a high residual negative effect. Wind screens will be constructed at the road side on the New Bridge, but these will only reduce noise levels by about 1 dB and there would still be a residual negative effect.

17.9.11 The 3 canals crossed by the route alignment will all experience increases in noise level and will have moderate negative residual effects.

17.9.12 Residential areas alongside the Central Expressway will have moderate negative effects, but the use of road side noise barriers will reduce this to a low residual negative effect.

17.9.13 Of the 5 schools assessed, Cavendish School and Hallwood Park Primary will have low positive residual effects with noise level reductions of about 1 dB. West Bank Primary School and Weston Point Community Primary School will benefit from a reduction in noise of about 6 dB. This is a high positive residual effect. One school, Woodside Primary School will have its high negative effect reduced to a low negative by the use of road side noise barriers.

Table 17.12 Summary of Residual Noise and Vibration Effects

Effect	**Receptor and Importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)	**Mitigation & Enhancement Measures**	**Residual Significance** (High, Moderate, Low and Positive/Negative)
Construction Phase					
General construction activities	Dwellings – High importance	Temporary effect for Project duration. Approximately 1,200 dwellings within 100 metres.	Moderate negative	Noise and Vibration Management Plan (NVMP)	Moderate negative
Noise from general construction activities including canal bridge	Area1 – St Helens Canal – medium importance	Temporary increase in noise, up to 6 months	Moderate negative	NVMP	Moderate negative
Noise from minor construction activities	Area 2 – SJB northern approach. Dwellings - high importance	Temporary increase in noise, up to 6 months	Low negative	NVMP	Low negative
Noise from bridge construction activities	Area 6 – Wigg Island – high importance	Temporary increase in noise, up to 27 months	High – negative	NVMP	High – negative
Noise from viaduct construction activities	Area 6 – Manchester Ship Canal – medium importance	Temporary increase in noise, up to 9 months	Moderate - negative	NVMP	Moderate - negative
Noise from viaduct construction activities	Area 7 – Astmoor industrial estate – low importance	Temporary increase in noise, up to 25 months	Low – negative	NVMP	Low – negative
Noise from general construction activities including canal bridge	Area 8 – Bridgewater Canal – medium importance	Temporary increase in noise, up to 9 months	Moderate – negative	NVMP	Moderate– negative
Noise from general construction activities	Area 8 – residential areas near Bridgewater Junction – high importance	Temporary increase in noise, up to 11 months	Moderate - negative	NVMP	Moderate – negative

Effect	**Receptor and Importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)	**Mitigation & Enhancement Measures**	**Residual Significance** (High, Moderate, Low and Positive/Negative)
Noise from construction and highway alignment modifications	Area 9 – residential areas adjacent to the Central Expressway – high importance	Temporary increase in noise, 12 months	Low to moderate – negative	NVMP	Low to moderate - negative
Noise from construction of distributor roads and bridge	Area 9 – residential areas adjacent to Lodge Lane Junction	Temporary increase in noise, 12 months	Moderate to high – negative	NVMP	Moderate to high – negative
Noise from minor construction activities	West Bank Primary School – high importance	temporary increase in noise, up to 6 months	Low - negative	NVMP	Low - negative
Noise from construction of distributor roads and bridge	Woodside Primary School – high importance	Temporary increase in noise, 12 months	Moderate to high - negative	NVMP	Moderate to high - negative
Operational Phase					
Overview Noise from operation of the road –	Residential areas – high importance	Permanent decrease in number of people affected by noise	Moderate positive		Moderate positive
Overview - Vibration from operation of the road	Residential areas – high importance	Permanent – slight increase in number bothered	Low negative		Low negative
Road traffic noise	Area 1 – industrial and commercial areas – low importance	Permanent - slight in crease in noise	Low negative		Low negative
Road traffic noise	Area 1 – St Helens Canal – medium importance	Permanent increase in noise levels	Moderate negative		Moderate negative
Road traffic noise	Area 2 – residential areas adjacent to northern approach to SJB – high importance	Permanent decrease in noise levels	Moderate positive		Moderate positive

Effect	**Receptor and Importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)	**Mitigation & Enhancement Measures**	**Residual Significance** (High, Moderate, Low and Positive/Negative)
Road traffic noise	Area 3 – SPA – high importance	Permanent decrease in noise levels	High positive		High positive
Road traffic noise	Area 4 – residential areas adjacent to the southern approach to SJB – high importance	Permanent – decrease in noise levels	Moderate positive		Moderate positive
Road traffic noise	Area 5 – residential areas adjacent to the Weston Point Expressway – high importance	Permanent – decrease in noise levels	Moderate positive		Moderate positive
Road traffic noise	Area 6 – Wigg Island – very high importance	Permanent – increase in noise levels	High negative		High negative
Road traffic noise	Area 6 – Manchester Ship Canal – medium importance	Permanent – increase in noise levels	Moderate negative		Moderate negative
Road traffic noise	Area 7 – Astmoor industrial estate – low importance	Permanent – increase in noise levels	Low negative		Low negative
Road traffic noise	Area 8 – residential areas adjacent to Bridgewater junction	Permanent – increase in noise levels	Moderate negative	Roadside noise barriers	low negative
Road traffic noise	Area 8 – Bridgewater Canal – medium importance	Permanent – increase in noise levels	Moderate negative		Moderate negative
Road traffic noise	Area 9 – residential areas adjacent to the Central Expressway	Permanent – increase in noise levels	Moderate negative	Roadside noise barriers	Low negative
Road traffic noise	Area 10 – residential areas adjacent to the Weston link to M56	Permanent – slight increase in noise levels	Low- negative		Low – Negative

Effect	**Receptor and Importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)	**Mitigation & Enhancement Measures**	**Residual Significance** (High, Moderate, Low and Positive/Negative)
Road traffic noise	Cavendish School – high importance	Permanent – slight decrease in noise levels	Low positive		Low positive
Road traffic noise	Hallwood Park Primary School – high importance	Permanent – slight decrease in noise levels	Low positive		Low positive
Road traffic noise	West Bank Primary School – high importance	Permanent – decrease in noise levels of about 6 dB	High positive		High positive
Road traffic noise	Weston Point Community School – high importance	Permanent – decrease in noise levels of about 6 dB	High positive		High positive
Road traffic noise	Woodside Primary School – high importance	Permanent – increase in noise levels of about 9 dB	High negative	Roadside barriers	Low negative

17.10 References

Ref 1 Land Compensation Act, 1973

Ref 2 Design Manual for Roads and Bridges, Volume 11 Part3, Section 7

Ref 3 Noise Insulation Regulations, 1975, as amended in 1988

Ref 4 Control of Pollution Act, 1974

Ref 5 Environmental Protection Act 1990

Ref 6 Planning Policy Guidance Note, PPG 24 – Planning and Noise

Ref 7 Regional Planning Guidance for the North West RPG

Ref 8 PR2 Noise Nuisance Halton Borough Council UDP, Chapter 4

Ref 9 Calculation of Road Traffic Noise, Department of Transport, Welsh Office, HMSO 1988

Ref 10 BS 5228 Noise and vibration control on Construction and open sites, Part 1 and 2:1997, Part 4:1992

Ref 11 BS 6472 Evaluation of human exposure to vibration in buildings (1 to 80 Hz) 1992

Ref 12 BS 7385 Evaluation and measurement for vibration in buildings Part 1 1990, Part 2 1993

Ref 13 Defra database of construction noise (http://www.Defra.gov.uk/environment/noise/research/index.htm)

Ref 14 North West of England Regional Spatial Strategy – The Secretary of State's proposed changes to the draft Regional Spatial Strategy 'The North West Plan' submitted by the North West Regional Assembly – Consultation Document March 2008