

6 Noise and vibration

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6 Noise and Vibration

6.1 Introduction

This chapter describes the effects that development will have on the environmental noise conditions in the area of the proposed development. The area considered is within the 'Redline' boundary as described in Chapter 3.0. The effects during the construction phase and the longer term post development effects (referred to as operation phase) are considered separately.

The chapter has been compiled by Buro Happold Limited with reference to information provided by other design team members, the Penwith District Council and relevant codes, standards and guidance. Reference is made to existing (baseline) conditions and to relevant legislation and guidance for assessment contained in existing planning policy.

Responding to material submitted by the development team, the draft scoping opinion provided by Penwith District Council (Andrew England, 2 July 07) identified noise and vibration as items to be covered within the environmental assessment of the development. The following issues have been considered:

- Road traffic and rail noise assessment (full PPG24 for both road and rail on those areas proposed for residential development)
- Construction site noise assessment and effects on residential dwellings. (detailed breakdown of the different construction phases and their effects on the ambient noise levels at existing dwellings)
- Industrial, retail and leisure activities and their effect on both existing and proposed dwellings (using BS4142 as these types of activities include the use of refrigeration units, extraction systems etc.) This includes assessment of activities which may be associated with the Wave Hub research and development businesses

Additionally this chapter includes consideration of noise from marine activities

6.2 Legislation and planning policy guidance

6.2.1 National planning policy and legislation to control noise

Planning Policy Guidance Note 24 (PPG24) – Planning and Noise, 1994

PPG24 outlines the considerations to be taken into account in determining planning applications both for noise sensitive development and for those activities that generate noise, and advises on the use of conditions to minimise the impact. The need for planning authorities to ensure developments do not cause an unacceptable

degree of disturbance is stated, with the provision that the planning system should not place unjustifiable obstacles in the way of development.

Guidance is given on the approach to assessment of noise from sources associated with industrial and commercial development and operational road traffic is identified as a noise source to be considered.

The wider use of PPG24 is to provide guidance on the development of residential areas near to existing or new noise sources. Noise Exposure Categories (NEC's) are described for day and night-time to assess whether or not it is appropriate to grant permission for the development of residential properties for a given noise climate. The categories (from A to D) relate to different noise bands depending on the source of the noise (i.e. road, rail, air, or mixed noise sources). Category A represents the circumstances in which noise is not normally a factor in determining the application. Category D relates to a situation in which the development should normally be refused.

Control Of Pollution Act 1974 (CoPA)

Legal powers to control construction noise are provided under the Control of Pollution Act 1974 (CoPA). The legislation introduces the concept of using Best Practicable Means (BPM) to minimise noise as defined in Section 72 of CoPA.

6.2.2 Regional planning policy

Policy 3 of Section One of the Cornwall Structure Plan 2004 requires that "Development must be compatible with the prudent use of natural and built resources and energy conservation". Noise is identified as a pollutant to be avoided in design.

Noise has not been identified as a specific issue within the Regional Spatial Strategy.

6.2.3 Local planning policy

The Penwith District Local Plan (adopted 2004) includes a number of policies in which noise is identified as a pollutant to be avoided or mitigated in design. For example Policy GD-3 'Provision of Services and Prevention of Pollution and Flooding' requires that developments incorporate safeguards to prevent noise pollution.

6.2.4 Guidance

6.2.4.1 Construction noise

British Standard BS 5228: Noise and Vibration Control on Construction and Open Sites' provides information and a code of practice for dealing with noise and vibration issues.

Parts 1 and 2:1997 contain basic information, describe a calculation method for prediction of noise and vibration with consideration of mitigation measures and set out the legal framework for noise control.

Part 4: 1992 has specific information about noise and vibration control applicable to piling operations.

BS5228 promotes 'best practice means' as an approach to control noise and vibration. It does not however provide noise limits.

There are no current national standards or guidelines that give noise limits for construction sites. Widely adopted custom and practice is to work to a weekday daytime (07:00 to 19:00 hrs) limit of $L_{Aeq(12hr)}$ 75dB at the façade of affected property (that is, *sound energy averaged over the sample period, T and deemed to include a reflection from the façade making the level 3dB higher than at an equivalent location in 'free field'*). Limits outside this period might typically be set at least 10 dB lower.

Specific obligations for construction noise and vibration control typically form part of 'Considerate Contractor' schemes that can be referenced and included within any agreement process.

It is common for contractors involved in major construction work to apply for prior consent for construction works under the procedure set out in Section 61 (s61) of CoPA 1974. The s61 application may contain method statements, plant information, predicted noise levels, noise monitoring regimes and other information sufficient for the local authority to give consent to the construction works. The advantage for the contractor is that once consent is awarded the Council cannot take action against the contractor (for example using a Section 60 notice) provided that the construction works comply with the information detailed in the s61 application.

Vibration arising from construction sites should also be addressed. BS7385:1990 'Evaluation and measurement for vibration in buildings', establishes the basic principles for carrying out vibration measurements and processing the data, with regard to evaluating vibration effects on buildings. The standard gives specific vibration limits that are considered to represent minimal risk to buildings as below.

Building / Structure Type	Intermittent vibration ppv (mm/s)	Continuous vibration ppv (mm/s)
Listed building or ancient monuments	5	2.5
Houses or houses converted into flats	5	2.5
Tower blocks, office blocks, steel framed factories, warehouse units and structures related to transport, power and water services	20	10
<p>Note: Damage threshold taken as cosmetic not structural</p> <p>Cosmetic damage most likely within first 20m of piling activities, at greater distance damage is less likely to occur.</p> <p>Likely levels of vibration at given distances can be predicted from existing piling vibration data.</p>		

Table 6— 1 Vibration Limits from BS7385

The vibration levels in terms of human perception of vibration are fairly high and people generally complain at vibration levels much lower than 5mm/s (often because of a perceived risk of building damage). BS6472:1992 'Evaluation of human exposure to vibration in buildings (1Hz to 80Hz)' provides threshold curve limits, with multiples corresponding to satisfactory levels of human response.

6.2.4.2 Operational plant noise

BS4142:1997 'Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas' is widely used for assessing the impact of noise from mechanical services plant. The assessment parameter is the 'rating level' L_R of the plant noise assessed at the position of residential properties. The rating level L_R is essentially the $L_{Aeq(T)}$ noise level with a +5dB penalty added if the noise has any distinguishable tonal or impulsive characteristics. The arithmetic difference between the rating level L_R of the plant noise and the background noise level, L_{A90} in the absence of the plant noise is determined and used as the indicator of the likelihood of complaint, with reference to the following guidance in the standard:

"The greater this difference the greater the likelihood of complaints. A difference of around +10 dB or more indicates that complaints are likely. A difference of around + 5 dB is of marginal significance. If the rating level is more than 10 dB below the measured background noise level then this is a positive indication that complaints are unlikely."

6.2.4.3 Road traffic noise

Department of Transport / Welsh Office Memorandum 'Calculation of Road Traffic Noise' (CRTN) (1998) describes procedures for calculating and measuring road traffic noise.

Guidance on impact assessment of traffic noise is provided within the IEMA Guidance Note No. 1 (Guidance for the Environmental Assessment of Road Traffic). The document recommends assessment where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%), and where specifically sensitive areas experience traffic flow increases of 10% or more. The guidance indicates that projected changes in traffic of less than 10% create no discernable environmental noise impact.

6.2.4.4 Rail noise

The document 'Calculation of Railway Noise 1995' (CRN), provides a methodology for predictions of the maximum facade levels expected from railway traffic. No changes to railway alignments or traffic intensity are proposed as part of development, but the impact of existing sources on new development must be assessed. Therefore this assessment aims to determine what effects the proposed development will have on noise levels at existing receptors in the area, and the extent to which existing levels of environmental noise in the area would constrain any new residential development.

6.2.4.5 Marine noise

There is no UK guidance procedure for assessment of noise from marine activities. Noise from private leisure use (for example jet skiing, power boating, movement of yachts under power) must each be considered on merit. Commercial activity (shore-based maintenance, activities on floating pontoons or boats) can be considered as an industrial case and assessed with reference to BS4142.

6.3 Methodology and assessment criteria

6.3.1 Construction noise and vibration

The noisy phases of construction are the initial activities including:

- Demolition of existing structures and breaking of materials
- Ground clearance and re-profiling
- Excavation (land and marine)
- Ground improvement techniques such as dynamic compaction
- Construction of foundations and other ground works including piling

Once the foundations have been completed the construction of buildings is a relatively quiet activity. Aspects of the work required in constructing roads, utilities infrastructure and buildings will all create some form of noise, but this will typically be of short duration and affect only the immediate vicinity of the works.

The assessment of the wider development as a whole is aimed at those activities likely to generate noise at a relatively high level over a wide area.

Construction noise estimation and assessment was carried out according to the methodologies of BS5228. The noise data provided in BS 5228 is becoming out-of-date, particularly as EC Directives have been reducing noise levels from construction plant. Therefore, while the calculations were carried out according to the method of BS 5228, input data for plant noise levels were taken from the DEFRA report 'Update of Noise Database for Prediction of Noise on Construction and Open Sites' and from measured data from other projects.

The potential impact of the works was considered by making an assessment of the construction noise excess over the pre-development ambient noise levels established through the baseline survey. The assessment was made for a selection of receivers representing noise sensitive functions within the local area such as housing and schools.

Table 6 – 2 contains assessment criteria for construction noise.

Negligible Impact	Daytime Noise levels greater than the ambient $L_{Aeq(T)}$ but less than 75 dB $L_{Aeq(T)}$ Vibration levels less than 1mm/sec.
Low Adverse	Daytime Noise levels greater than 70 dB $L_{Aeq(T)}$ but less than 75 dB $L_{Aeq(T)}$. Vibration levels greater than 1 mm/sec but less than 2.5mm/sec.
Medium Adverse	Daytime noise levels ≥ 75 dB $L_{Aeq(T)}$ but for no more than 10 days in any month. Vibration levels greater than 2.5mm/sec but less than 5mm/sec.
High Adverse	Daytime noise levels ≥ 75 dB $L_{Aeq(T)}$ for more than 10 days in any month. Vibration levels greater than 5mm/sec.

Table 6– 2 Assessment criteria for construction noise

6.3.2 Operational noise and vibration

6.3.2.1 General case

New commercial activities and sites included within the development plan can be expected to generate noise from plant and processes. For the majority of the development it is likely the sources of noise will be limited to

small scale building services plant (heating, cooling and ventilation equipment) in operation around normal working hours. With some care in selection and siting, and with noise levels limited in line with established guidance such as that in BS4142, well installed and maintained equipment of this type would not be expected to lead to noise concerns.

Operational noise from new plant can be assessed on a compliance / non-compliance basis with reference to an assessment in accordance with BS4142 and control through the planning process. Non-compliance will result in a high adverse impact, whereas compliance will result in a negligible impact. Design in accordance with planning provisions will ensure that there is no impact.

6.3.2.2 Wave Hub

The 'wave hub' maintenance facility has been identified as a possible source of noise from mechanical repair and fabrication activity. Only an outline indication of the proposed work was available at the time of preparing this report. Consideration was based on noise from operations being comparable to a light industrial unit carrying out vehicle maintenance with activities such as:

- metalwork fabrication, use of power tools
- mechanical test of components
- loading/unloading of units moving to or from dockside storage/ handling area

Any noise due to the types of work described above is likely to be properly mitigated where work is carried out in an enclosed workshop building. If this is not the case then more detailed assessment can be made in due course based on a similar situation and if required, controls on noise can be achieved through the planning process.

6.3.3 Noise from mixed sources

6.3.3.1 Road traffic noise

Over the period proposed for construction there will be changes (increases) in overall traffic flow on the road network serving the area as a result of general growth in vehicle numbers. This change is estimated from forecasts by central Government and applies irrespective of development taking place.

Alterations to traffic flows on the local road network are described in Chapter 8 elsewhere in this report.

Following the principles of CRTN, where a change in flow due to the proposals of greater than 10% was identified in the traffic modelling and forecasting, traffic noise was calculated as a relative change in noise proportionate to the estimated change in traffic flows.

6.3.3.2 Rail traffic noise

Checks on train noise were made as part of the noise survey undertaken for preparation of this statement. The measurements established typical wayside sound levels as Single Event Level (SEL) values, subsequently used in estimation of the environmental noise contribution from trains at a range of distances from the track in areas of proposed development.

6.3.3.3 Marine noise

Measurements of marine commercial and leisure activities were made as part of the noise survey undertaken for preparation of this statement, including measurements of ambient noise in marinas and similar waterside locations. The data in the survey provides an indication of the type and level of noise that might be expected from these proposed uses.

6.3.3.4 Assessment criteria for operational noise

Table 6 – 3 contains values for assessment of the impact of noise from mixed sources on the basis of the guidance derived from the Institute of Environmental Management and Assessment / Institute of Acoustics draft noise assessment guidelines.

Adverse	High:	+5dB(A)
	Medium:	+3dB(A) to +4.9dB(A)
	Low:	+1dB(A) to +2.9dB(A)
	Negligible:	-0.9dB(A) to +0.9dB(A)
Beneficial	Low:	-1dB(A) to -2.9dB(A)
	Medium:	-3dB(A) to -4.9dB(A)
	High:	-5dB(A)
Significance related to change in ambient noise level, $L_{Aeq(T)}$		

Table 6– 3 Noise assessment guidelines from Institute of Environmental Management and Assessment / Institute of Acoustics draft guidelines

6.4 Baseline conditions survey

Acoustic surveys evaluate the pre-development baseline conditions for environmental noise, with measurement of sound levels at locations around the area potentially affected by development impacts. The results of the survey are included as Annex 6

6.4.1 Noise sensitive receptors

Figure 6—1 below is marked to indicate locations and land use identified as potentially noise sensitive in both existing and proposed conditions.

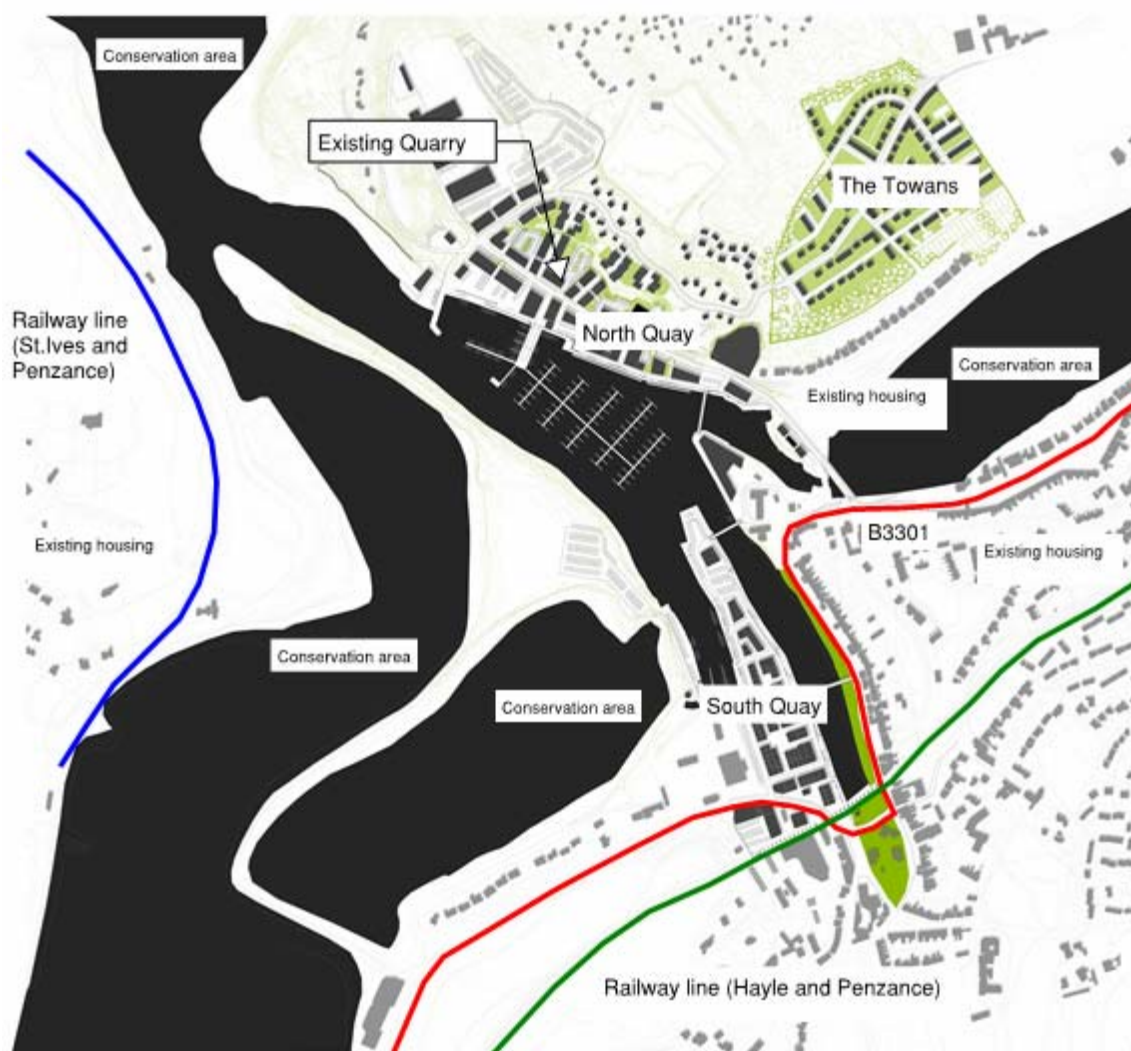


Figure 6— 1 Area of potential noise and vibration sensitivity

6.4.2 Survey design & method

Attended environmental noise surveys were conducted at Hayle on 11th and 12th June 2007 and on 10th and 11th July 2007.

The survey methodology was designed with reference to the type and extent of development proposed and in accordance with the guidance in BS 7445-1:1991. The measurement approach provided data for the various types of assessment required.

- PPG24 assessment: Measurement covering daytime (07:00-19:00), evening (19:00-23:00) and night time (23:00-07:00) periods. 5 minute or 15 minute sample periods logging every 15s
- Road traffic noise assessment: Measurements taken in 3 consecutive hours between the hours of 10:00 – 17:00. 20 minute sample periods logging every 1s
- Rail noise assessment: Measurements in both daytime (06:00-22:00) and night time (22:00-06:00) periods at locations close to the railway. Sampling manually operated to coincide with the train passes by logging every 1s

Additional measurements of ambient and activity noise levels were made to improve understanding of contributions to the noise climate.

Sample traffic flow measurements were recorded at locations alongside the B3301 using a hand tally counter to estimate total vehicle number and the proportion of cars/ motorcycles to heavy goods vehicles/ buses.

The measurement locations are described in outline below and indicated on Figure 6—2.

The surveys are fully described in the Environmental Noise Survey Report included as Annex 6.

Position Ref No.	Location
P1	Carnsew Pool
P2	South Quay (at northern point of south quay)
P3	South Quay near railway bridge
P4	North Quay Harbour side
P5	Kings Memorial Walk near car park for Copperhouse Pool
P6	Road Bridge for access to North Quay next to B3301
P7	North Quay Slipway opposite Fish Quay
P8	Roadside B3301 CRTN position in derelict garage site (10m from kerb side)
P9	North Quay small access road above Quarry
P10	Behind residents of Clifton Terrace
P11	Copperhouse Pool further along King George V Memorial Walk (B3301 shielded by buildings)
P12	South Quay 86m from railway bridge
P13	South Quay approx 150m from railway bridge
P14	South Quay CRTN position (10m from kerb side)
P15	South Quay 28m from Builders merchant
P15	South Quay 10m from Builders merchant
P16	North Quay Road CRTN position (10m from kerb side)
P17	Dynamite Quay near golf course and St. Ives to Penzance railway line
All positions were free field – i.e. > 3.5 m from major sound reflecting surfaces other than the ground	

Table 6– 4 Measurement locations



Figure 6– 2 Noise survey measurement positions

6.4.3 Results

A summary of the results is provided below in Table 6—5 Summary data from noise survey. Full measured results are included in Technical Appendix 6A.

Location		Start time	Duration	L _{Aeq (T)} [dB]	L _{AF10} [dB]	L _{AF90} [dB]
P1	Carnsew Pool	20:34:04	0:05:00	43.1	46.3	36.1
		06:35:53	0:15:00	42.5	46.6	36.1
		12:28:45	0:05:00	44.3	45.4	40.6
P2	South Quay Point	20:52:09	0:05:00	42.8	44.6	39.8
		06:12:32	0:15:00	45.3	46.4	41.9
		12:00:17	0:05:00	44.5	46.1	42.1
P3	South Quay, Southern end	21:04:44	0:05:00	53.7	56.8	47.8
		06:58:31	0:15:00	55.0	57.8	48.6
P4	North Quay harbour side	05:18:16	0:15:00	41.0	43.8	34.5
		07:43:14	0:15:00	52.6	54.9	45.1
		10:55:07	0:05:00	52.8	54.5	50.2
P5	KMW Copperhouse Pool	05:40:39	0:15:00	43.0	46.5	35.5
		08:04:45	0:15:00	51.6	54.1	45.9
		11:17:58	0:05:00	49.7	52.0	46.6
P6	Bridge beside 3301	07:20:46	0:15:00	64.9	67.8	48.5
		08:25:03	0:15:00	68.1	71.3	55.9
		11:27:24	0:05:00	67.8	71.3	56.3
P7	North Quay slip (opposite Fish Quay)	11:06:51	0:05:00	57.5	61.3	44.7

Table 6— 5 Summary data from noise survey

6.5 Assessment of potential impacts

6.5.1 Construction noise and vibration

Prediction of the noise generated by construction activity was based on the outline schedule provided by ING Ltd, (*construction programme 2-OCP rev 03b, 26/08/2007*). The assumptions made about the major activities over the various phases of development are identified below (sound power levels apply to maximum power operation)

The estimated noise levels associated with these phases of activity and calculated using the Activity LWA values are shown in Table 6-6.

Work Stage	Major noise producing activities	Equipment	No off	LWA each item	Summed LW _A	On	Activity LW _A *
Phase				dB 10 ^{-12W}	dB 10 ^{-12W}	%	dB 10 ^{-12W}
I	Dredge basin for marina (offshore dredging operation from specialist barge)	Bucket dredger	1	112	112.0	50	104
	Fill North Quay (spoil haulage and placement, compaction)	Excavators	2	107	110.0	50	103
		dumper	1	105.8	105.8	50	
	Excavate South Quay (excavation, spoil haulage, grading)	Excavators	2	107	110.0	50	104
		lorry	4	108.6	114.6	10	
	Pile North Quay building foundations (rotary & vibratory piling, concrete delivery & placement)	Piling rigs	2	107.4	110.4	50	105
		cranes	2	104.7	107.7	50	
		excavator	2	102.2	105.2	25	
	Pile South Quay building foundations rotary and vibratory piling, concrete delivery and placement)	Piling rigs	2	107.4	110.4	50	105

Work Stage	Major noise producing activities	Equipment	No off	LWA each item	Summed LW _A	On	Activity LW _A *
Phase				dB 10 ^{-12W}	dB 10 ^{-12W}	%	dB 10 ^{-12W}
		cranes	2	104.7	107.7	50	
		excavator	1	108.7	108.7	25	
	Construct South Quay (materials delivery, craneage, cutting and fixing)	excavators	2	108.7	111.7	75	106
		loading	2	104.4	107.4	25	
	Construct North Quay (materials delivery, craneage, cutting and fixing)	Excavators	2	108.7	111.7	50	105
		dumper	2	105.8	108.8	50	
	Fill south Quay (spoil haulage and placement, compaction)	Excavators	2	107	110.0	50	103
		dumper	1	105.8	105.8	50	
II	Construct South Quay Br (materials delivery, craneage, cutting and fixing)	delivery	2	105	108.0	25	104
		cranes	2	104.7	107.7	50	
		cutting/fixing	1	108.7	108.7	50	
	Complete marina dredging (offshore dredging operation from specialist barge), dolphin construction	dredging	1	112	112.0	50	104
	Complete (pile) marina pontoons (driven piling, concrete delivery and placement)	piling rig	1	122	122.0	50	114
		concreting	1	103.1	103.1	25	
		crane	1	104.7	104.7	50	

Work Stage	Major noise producing activities	Equipment	No off	LWA each item	Summed LW _A	On	Activity LW _A *
Phase				dB 10 ^{-12W}	dB 10 ^{-12W}	%	dB 10 ^{-12W}
	Construct North Quay (materials delivery, craneage, cutting and fixing)	delivery	2	105	108.0	10	104
		cranes	2	104.7	107.7	50	
		cutting/fixing	1	108.7	108.7	50	
III	Construct North Quay & cliffside (materials delivery, craneage, cutting and fixing)	delivery	4	105	111.0	10	104
		cranes	2	104.7	107.7	50	
		cutting / fixing	1	108.7	108.7	50	
IV	Excavate car park (excavation, spoil haulage, grading)	excavator	1	108.7	108.7	75	105
		loading	1	108.6	108.6	25	
		dumper	1	106.6	106.6	50	

* Activity LWA figure includes correction for % on time (10log T/Tref) and line of sight screening

Table 6– 6 Estimated noise levels associated with the phases of activity and calculated using the Activity LW_A values

			Estimated L_{Aeq} (12hr) dB *					
Work Stage	Major noise producing activities		North Quay	South Quay	Hilltop	Riviere fields	Estuary	Penpol terrace
Phase								
I	Dredge basin for marina (offshore dredging operation from specialist barge)		63	49.	57	50.	65.	51
	Fill North Quay (spoil haulage and placement, compaction)		70	50.	64	54	58	50
	Excavate South Quay (excavation, spoil haulage, grading)		51	63	51.	49	59	51
	Pile North Quay building foundations (rotary & vibratory piling, concrete delivery & placement)		72	52	66	56.	60	52
	Pile South Quay building foundations rotary and vibratory piling, concrete delivery and placement)		52	72	52	51	60	65
	Construct South Quay (materials delivery, craneage, cutting and fixing)		73	53	53	57	61	53
	Construct North Quay (materials delivery, craneage, cutting and fixing)		53	73	53	51	60	62
	Fill south Quay (spoil haulage and placement, compaction)		50	70	50	49	58	60
II	Construct South Quay Br (materials delivery, craneage, cutting and fixing)		51	71	51	50	59.	64
	Complete marina dredging (offshore dredging operation from specialist barge), dolphin construction		63	49	57	50	65	51
	Complete (pile) marina pontoons (driven piling,		74	60	68	60	75	61

Work Stage	Major noise producing activities	Estimated $L_{Aeq(12hr)}$ dB *					
		North Quay	South Quay	Hilltop	Riviere fields	Estuary	Penpol terrace
Phase							
	concrete delivery and placement)						
	Construct North Quay (materials delivery, craneage, cutting and fixing)	71	51	65	55	59	48
III	Construct North Quay & cliffside (materials delivery, craneage, cutting and fixing)	71	51	65	55	59	48
IV	Excavate car park (excavation, spoil haulage, grading)	72	52	66	56	60	52
* Detailed mitigation will be designed to ensure that agreed daytime $L_{Aeq(T)}$ values at receivers are met							

Table 6– 7 Predicted construction noise levels

The calculations assumed propagation over hard ground, line of sight screening (5dB benefit) and no meteorological corrections. A 3dB façade reflection allowance was included in all predicted values.

Table 6 – 8 contains distances assumed between the worksite acoustic source and the receiver.

Worksite	Receiver						
	North Quay	South Quay	Hilltop	Riviere fields	Estuary	Penpol Terrace	
Marina	60	300	120	280	500	250	
North Quay	25	250	50	150	500	250	
South Quay	250	25	250	300	500	60	
Riviere fields	150	250	50	25	500	300	

Table 6– 8 Assumed distances between the worksite acoustic source and the receiver

In practice the noise levels generated will be highly dependent on the specific plant selections, working practices and site layout adopted by a contractor. These estimated values provide a high-level view suitable for understanding the magnitude of potential for noise disturbance and for setting a control and mitigation strategy. Detailed mitigation will be designed to ensure that agreed daytime $L_{Aeq(T)}$ values at receivers are met. The assessment of individual work proposals should form a part of the ongoing development of the construction proposals.

The following conclusions can be drawn from the figures:

- Piling is likely to generate the highest noise levels with potential for disturbance over a significant area
- Quayside housing within the development will be particularly at risk of disturbance from dredging and piling works in later phases
- Impact from the works will be negligible or low adverse at most locations
- Medium or high adverse effects are associated with (impact) piling of pontoons and fill works to North and South quay
- There will be limited scope to use site screens and barriers to reduce noise propagation to areas of noise sensitive locations that are elevated with respect to the site

Risk of disturbance from vibration will depend to a high degree on the choice of piling method. Percussive piling can generate high levels of ground borne vibration. If limited to marine use the effects are likely to be only low to moderate impact. Rotary piling typically creates very little vibration and will only be of concern if used immediately adjacent to buildings that are sensitive to vibration.

The choice of rotary or percussive piling will include consideration of ground engineering and environmental considerations.

In periods when construction noise levels are at their greatest (piling, dredging) there may be temporary disturbance to wildlife. Review of the literature on the subject has not identified specific evidence of long term effects on sealife or birdlife, although coincidence of disturbance with breeding seasons would potentially be of greater concern than at other times of the year. Chapter 12 contains further detailed assessment of disturbance on ecological receptors.

Construction traffic, particularly bulk material movements, will include large and heavily laden vehicles using relatively quiet rural routes. As a long term average these movements are estimated at less than 35 vehicle movements per day, with just over twice this figure for peak periods of excavation. Access will primarily be via the B3301, with some traffic routed via North Quay for access to Riviere Fields and Hilltop.

At locations alongside the busier access routes (B3301) the period L_{Aeq} values attributable to construction traffic will not significantly affect ambient noise levels, although individual events may create short term noise

disturbance. On rural routes ambient noise levels at roadside locations may increase by between 3 and 5dB during the peak vehicle movement periods.

The most effective approaches to mitigation include good management of site transport and good neighbour liaison.

6.5.2 Noise from mixed sources

Road Traffic

Flows for the scheme used in assessment have been derived from the data provided by the design team. The design cases considered are:

- Current year 2007 (baseline)
- Opening year 2011 (with development case)

The 'opening year' is the assumed completion date of all work in all four phases. Figures for normal traffic growth in the absence of development are excluded, making increases due to development alone slightly conservative.

The anticipated changes in peak flow and noise level are set out in Table 6-9.

	Percentage increase		Noise increase in dB	
	AM 2011	PM 2011	AM 2011	PM 2011
B3301 (P8)	20.6	27.0	0.8	1.0
North Quay	211.0	238.4	4.9	5.3
B3301 (Penpol Terrace)	22.7	30.3	0.9	1.1
B3302	8.3	9.6	0.3	0.4
B3301 (Carnsew Road)	29.2	44.8	1.1	1.6
New residential road Hilltop (Lethlean lane)	61.5	62.1	2.1	2.1
South Quay	n/a	n/a	61.7	64.0
Increases are based on comparing development flows against background and committed background flows for that year except where highlighted in yellow these are new flows - $L_{Aeq}(1 \text{ hour})$ value calculation				

Table 6– 9 Anticipated changes in peak flow and noise level

Impact assessment based on the worst case peak hour change indicates low adverse impact on roads already carrying principal traffic flows. A high adverse impact is indicated on North Quay where access to parking and commercial space will increase flows substantially in comparison with the existing condition.

Traffic noise associated with access to South Quay is estimated at a ground level façade location 10m from the kerb with light car traffic at 20mph. In the peak hour the increase on existing ambient noise levels would be approximately 7dB.

Construction traffic

Increases in traffic levels due to construction vehicles will not cause significant increase in noise levels for road traffic volumes that are greater than 500 vehicles per hour. Construction vehicles (specifically heavy goods vehicles) will increase ambient noise levels in the areas currently having little exposure to traffic, for example North Quay.

Marine sources

Noise from marina and marine activities comparable to the Hayle proposal have been estimated through measurements at comparable locations (Falmouth) as described in Technical Appendix 6A.

Measurements on Hayle Pier indicated maximum short term levels from boat activity in the range 55 to 65 dB(A). Measurements at Falmouth produced slightly higher maximum levels (in the range 58 to 72 dB(A) but similar average values (50 to 60 dB $L_{Aeq(T)}$).

On the basis of this information no adverse impact is expected.

PPG24 assessment

Noise Exposure Categories (NEC's) for the development area have been calculated in accordance with the guidance of PPG24 assuming that noise is attributable to 'mixed sources'.

The results are shown in Figure 6—3.

A small proportion of the site area, alongside the railway and B3301, falls into NEC's B and C.

Where site areas are within NEC's B and C the impacts of the external noise environment will need to be taken into account in development and design of the buildings. Appropriate attention to detail layout and design of building construction and materials will be required to achieve acceptable internal ambient noise levels and to maintain the amenity of external spaces.

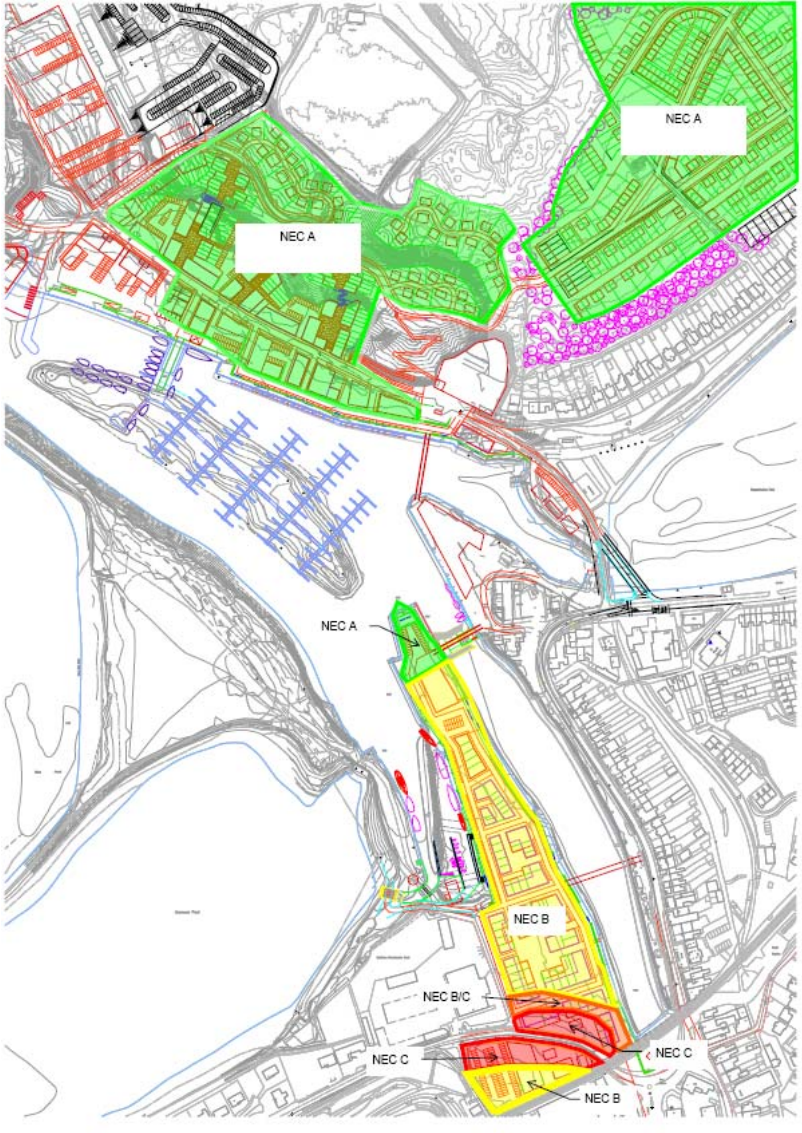


Figure 6— 3 Predicted PPG24 NEC's

6.5.3 Noise arising from cumulative impacts

The potential for cumulative impacts arising from interaction of the proposed scheme and other developments has been considered. Schemes including improvement to Foundry Square, the creation of park and ride at St Erth and planned employment spaces at Loggins Mill may all occur within a similar timeframe to Phase I works. However, in terms of construction noise and operational road traffic noise none of these schemes is assessed as creating any significant impact within the development area considered by this study.

6.5.4 Summary of impacts and significance

Predicted impacts for construction are as follows:

Assessment area	baseline condition	predicted condition (worst case)	Impact
	L _{Aeq} dB		
North Quay	53	74	Low adverse
South Quay	55	74	Low adverse
Hilltop	49	68	Negligible
Riviere Fields	41	60	Negligible
Estuary	45	75	Medium adverse
Penpol Terrace	68	65	Negligible

Table 6– 10 Predicted impacts for construction

The highest noise levels are related to use of impact or driven piling and occur at locations closest to the worksites. At this stage piling methods have yet to be confirmed so these estimates may be considered cautious with scope for reduction if quieter piling methods are acceptable.

Movement of construction traffic through Phillack, a relatively rural and quiet area, has potential to create an adverse impact, particularly during peak periods of bulk material movements.

Predicted impacts for operational road traffic are contained in Table 6 – 11.

Assessment area	predicted increase, dB	Impact (pre-mitigation)
B3301 (P8)	1.0	Low adverse
North Quay	5.3	High adverse
B3301 (Penpol Terrace)	1.1	Low adverse
B3302	0.4	Negligible
B3301 (Carnsew Road)	1.6	Low adverse
New residential road Hilltop (Lethlean lane)	2.1	Low adverse
South Quay	9.0	High adverse

Table 6– 11 Predicted impacts for operational road traffic

North and South Quays are indicated as having a high impact on the basis of change in noise level. However flows are still low in highway terms and change is measured against a very low base figure.

6.6 Mitigation

6.6.1 Construction noise impacts

Construction methods and detail design will be subject to compliance with planning constraints, relevant guidance and adopted codes of practice.

Specifications for construction work will include requirements to control noise and vibration in line with agreed limit values by measures including:

- Code of Construction Practice
- use of S61 agreements
- Considerate Contractor Scheme
- adherence to BS 5228 best practice guidance

Implementation on site will include mitigation measures such as use of noise control at source, limitation on work times and provision of screens, barriers etc where practicable. This will ensure that the noise levels generated are kept to the minimum possible values consistent with safe and effective working.

A traffic management system will be implemented to mitigate impacts from construction vehicle movements on the highway.

6.6.2 Road traffic noise

No mitigation is proposed for changes that are negligible or low adverse.

For sites where predictions indicate a medium or high adverse impact mitigation measures to be considered will include:

- limiting on vehicle speed
- selection of road surface materials consistent with limiting road noise
- development of layout to create maximum distance between traffic and noise sensitive locations

In areas of North and South Quay alongside the highway the building facades will be specified and detailed to reduce operational road traffic noise ingress.

Similar mitigation measures will be incorporated in locations exposed to railway noise above NEC A.

6.6.3 Marine noise

No mitigation measures are proposed for marine noise. Harbour management controls on use of equipment such as jet skis and limitations on speed for powered craft will provide control over ancillary noise sources.

6.7 Residual impacts

6.7.1 Construction noise

As described in section 6.6.1 construction noise assessments assume that best practical means are employed to limit noise from construction. Therefore construction noise impacts reflect the mitigated case and no further reduction is expected.

6.7.2 Road traffic noise

Design of residential facades exposed to road traffic noise will be developed to ensure appropriate standards of noise intrusion can be achieved within dwellings.

It is expected that operational traffic noise impacts will be negligible or low adverse after application of mitigation.

6.7.3 Marine noise

No mitigation is proposed for marine noise therefore marine noise impacts reflect the mitigated case and no further reduction is expected.

6.8 Monitoring

The inclusion of requirements for construction noise and vibration monitoring within specifications and contracts for works associated with development will provide a route for compliance checking. Examples of appropriate monitoring strategies and methods would include:

- long term unattended/ remote interrogation monitoring of ambient noise at critical locations during construction e.g. monitor within nearest ecologically sensitive area (Hilltop / Towans and on Penpol Terrace)
- supplementary attended sample measurements on a daily or activity specific basis for noise and vibration at sensitive locations
- programme of information / results sharing with ecologists to study noise and wildlife issues

6.9 Conclusions

An assessment of the noise and vibration impacts of the proposals was conducted with reference to baseline noise and vibration data as appropriate. The assessment identified a number of adverse impacts, associated with construction works and with increased (or new) traffic flows on roads

Low adverse residual impacts were established, associated with road traffic noise.

Limited areas of the development, close to the railway and principal roads, were identified as being within NEC C, indicating that particular attention would be required to achieve satisfactory internal ambient noise for housing use in those areas.

6.10 References

1. HMSO, *Planning Policy Guide 24, Planning and Noise*, HMSO Publications Centre, (1994)
(Section 6.1 – first bullet)
2. British Standards BS4142:1997, *Method for rating industrial noise affecting mixed residential and industrial areas*, London BSi (1997)

(section 6.1 3rd bullet)

3. HMSO, *Control of Pollution Act 1974*, HMSO Publications Centre, (1974)

(section 6.2.1 near the end)

4. Cornwall Structure Plan <http://www.cornwall.gov.uk/index.cfm?articleid=9111>, (October 2007)

(section 6.2.2)

5. Penwith District Council, *Penwith local plan 2004 – Local plan policies & proposals* (revised 2007)

(section 6.2.3)

6. British Standard BS5228: Part 1:1997 *Noise and vibration control on construction and open sites – Part 1. Code of practice for basic information and procedures for noise and vibration control*, London BSi (1997)

(section 6.2.4)

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11. HMSO Department of Transport (Welsh Office), *Calculation of road traffic noise*, HMSO Publications centre (1988)

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12. Institute of Environmental Assessment, *Guidance notes no. 1 – Guidelines for the environmental assessment of road traffic*, IEA (1993)

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(section 6.2.4)

14. Department of Environment Food and Rural Affairs, *Update of noise database for prediction of noise on construction and open sites*, HMSO (2005)

(section 6.3.1)

15. IEMA/IOA noise assessment guidelines

(section 6.3.3)

16. British Standards BS 7445 *Description and measurement of environmental noise –Part 1: Guide to quantities and procedures*, London, BSi (2003)

(section 6.4.2)