

17 NOISE AND VIBRATION

17.1 INTRODUCTION

This section describes the existing noise environment in the locality of Falmouth Harbour and assesses potential noise impacts associated with the proposed harbour development. Ground borne vibration impacts are not considered for reasons that will be explained subsequently.

The assessment is based on a site visit and noise measurement survey of the existing noise environment, incorporating both qualitative assessment and quantitative measurement, supplemented by a desk-based assessment of potential future noise impacts arising from both the construction and operation of the proposed PFDI. The assessment of potential impacts includes consideration of off-site aspects associated with movements of construction-related traffic movements and subsequent movements of additional operational traffic on the public road network outside the port area.

A glossary of acoustic terminology is presented at Appendix F.

17.2 ASSESSMENT METHODOLOGY

17.2.1 *Study Area*

The study area comprises:

- the commercial and residential areas immediately adjacent to the port and extending out approximately 400 metres to encompass the residential areas overlooking, or with a direct view of, the port and which may potentially be subject to noise impacts arising from the construction and operation phases of the wharf development;
- the residential properties near Trefusis Beach, overlooking the port. These properties are approximately 700 metres from the area of Queens Wharf to be improved and approximately 550 metres from the western-most extent of the proposed dredge boundary.

Noise sensitive receptors in this assessment are principally residential properties and include the recently constructed Maritime Apartments close to the docks railway station.

17.2.2 *Baseline Data Collection*

Baseline noise data was gathered by Royal Haskoning during an attended noise measurement survey in September 2007.

Baseline on-site construction traffic data was derived from Section 2.3 of this report.

Source noise data for items of fixed and mobile construction equipment was obtained from Annex C of British Standard (BS) 5228: Part 1: 2009.

The location of potentially noise sensitive receptors was derived from examination of Ordnance Survey mapping, aerial imagery and observations during the noise measurement survey.

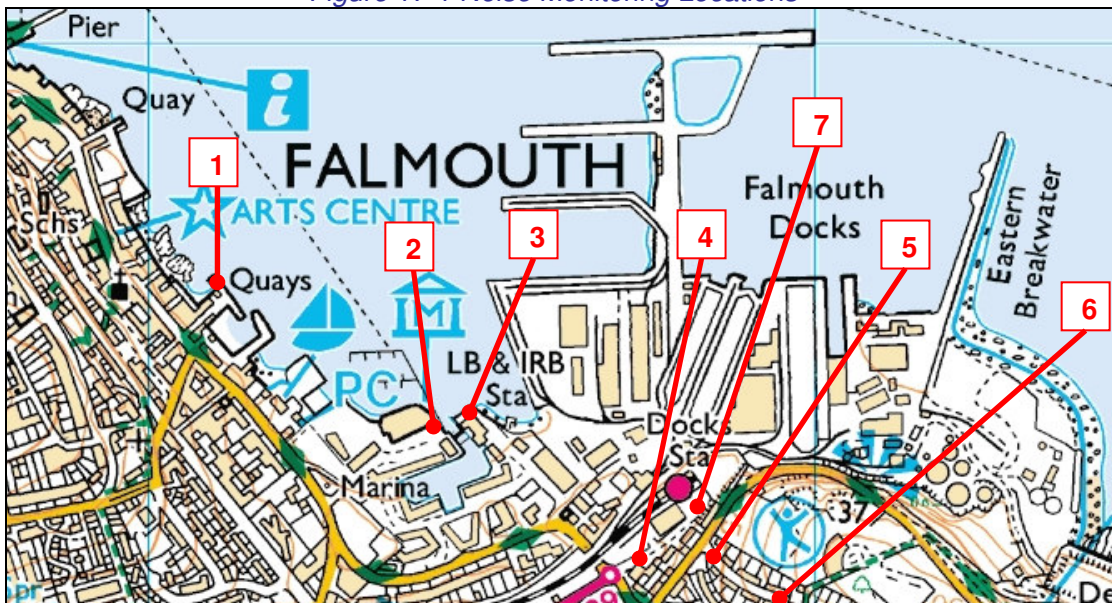
17.2.3 Survey

An attended noise measurement survey was conducted between the 5th and 10th September 2007. The purpose of the survey was to both quantitatively and qualitatively assess and measure the existing baseline noise levels in and adjacent to the port area. The survey included measurements close to potentially noise sensitive receptors around the port area, namely:

1. King Charles Quay;
2. Custom House Quay;
3. Port Pendennis (Tinnars Walk near Lifeboat Station);
4. Pendennis Rise;
5. Junction of Tredynas Road and Castle Drive;
6. Top (south-east) of Tredynas Road; and
7. Train station car park.

The locations are presented in Figure 17-1.

Figure 17-1 Noise Monitoring Locations



© Crown Copyright All Rights Reserved. License No 100026380

The noise measurement survey was conducted in accordance with current Best Practice methods using a UKAS calibrated Type 1 sound level meter, mounted on a tripod at a height of between 1.2 and 1.5 metres above the ground and placed at least 3.5 metres from any walls or building facades. The meter was field-calibrated before and after each set of measurements; no variation in calibration level was noted.

The measurements of existing noise levels were made during the weekday and weekend comprising both day and night time periods. Where possible noise measurements were made with and without a cruise liner in port; during the day time survey, measurements included the presence of a cruise liner berthed at County Wharf whilst at night time, measurements included the presence a large vessel berthed at Kings Wharf.

The results are summarised in Table 17-4 and the full results are presented at Appendix F.

17.2.4 *Assessment Criteria*

The assessment of noise impacts is based on legislation and guidance, and criteria relating to the sensitivity of the human ear, as described in the following paragraphs.

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

Section 60 of the COPA provides powers to local authority officers to serve an abatement notice in respect of noise nuisance from construction works. Section 61 provides a method by which a contractor can avoid such action by applying for consent to conduct construction activities in advance of their occurrence (a 'prior consent'). The prior consent is drawn up between the local authority and the contractor and may contain a range of agreed working conditions designed to minimise or prevent the occurrence of noise nuisance from construction activities.

Application for a Section 61 prior consent is a commonly used mitigation technique in respect of potential noise and vibration impacts from major construction works.

British Standard (BS) 5228: Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BSI, 2009)

This standard contains a description of the potential noise impacts arising from construction works and provides generic source noise data for typical items of construction plant found on construction sites.

The standard also presents a range of calculation methods for predicting construction noise levels affecting adjacent noise sensitive properties and suggested techniques for mitigating construction noise, including the application of generic best practice site management techniques, often referred to as Best Practicable Means (BPM). The calculation techniques take account of various factors that might affect the propagation of noise including the effects of varying types of ground conditions, screening effects by buildings, barriers or topography, and specifically cautions in the use of propagation calculations beyond 300 metres due to the varying effects of local meteorological conditions on noise propagation.

The predicted construction noise levels are given as decibel (dB) $L_{Aeq, 1h}$ (effectively the hourly average) noise levels or, in the case of construction traffic impacts, also as the maximum single-event noise level (dB L_{Amax}). All predicted construction noise levels are given as the external noise level at a potentially affected receptor building.

The Design Manual for Roads and Bridges, Vol. 11, Section 3, Part 7 Traffic Noise and Vibration (Highways Agency, 2008)

This guidance document is principally intended for use in assessing noise and vibration impacts arising from changes in traffic flows on new or significantly changed trunk roads including motorways. It can, however, be applied to any scheme having impacts on moderate to major roads outside the trunk road network. The guidance indicates that a change in total traffic flows of 25% on a road may give rise to a change in noise level of

approximately 1 dB which is a potentially perceptible change in noise levels. DMRB indicates that the actual calculation of road traffic noise levels should be conducted using Calculation of Road Traffic Noise (CRTN).

Calculation of Road Traffic Noise (CRTN) (DoT, 1988)

This guidance document provides a method for calculating noise levels arising from the movements of vehicles on roads. Originally intended to allow assessment of the requirement to provide sound insulation to residents affected by changes to roads, the guidance is the generic guidance in the United Kingdom for road traffic noise calculation. The calculation methods include various correction factors to take account of the percentage of heavy goods vehicles, road surfaces and inclination, screening by barriers, relative height of source and receiver etc. The calculated noise levels are given as the dB $L_{A10 (18\text{hour})}$ Annual Average Weekday Traffic (AAWT), that is, the linear average of the eighteen one-hour 10th percentile noise levels between 06:00 and midnight on a typical weekday.

Noise Impact Criteria

There are currently no stipulated criteria in the UK against which the potential significance of relative changes in noise level might be assessed. Partly this is because the impacts of noise are very subjective in addition to which the existing nature of a site and its existing context, may affect the relative perception of a particular noise level change by the local community.

In this instance, Falmouth itself is a relatively busy town and the port operates continuously, potentially making noise level changes less significant here than at Trefusis which is a much more tranquil environment. With this in mind, separate significance criteria were used for Falmouth and Trefusis.

The criteria are derived from research that demonstrated that whilst the human ear may detect noise levels changes as low as 1 dB under laboratory conditions, a 3 dB change is generally the lowest change in environmental noise level detectable by the human ear. The research also indicated that a 5 dB change may be clearly audible and, because of the way that the human hearing mechanism works, a 10 dB change is generally perceived as a doubling (or halving) of the noise in question. This then leads to the noise impact criteria presented in Table 17-1.

Table 17-1 Noise Impact Significance Criteria

Noise level change	Significance at Falmouth	Significance at Trefusis
0 to 0.9dB	Negligible	Negligible
1 to 2.9 dB	Negligible	Minor
3 to 4.9 dB	Minor	Moderate
5 to 9.9 dB	Moderate	Major
≥10 dB	Major	Severe

17.2.5 *Assessment Techniques*

Consultation

Consultation regarding the potential noise impacts of the development was undertaken with Mark Hitchen, Environmental Health Officer (EHO) at CDC. Consultation took the form of telephone calls and a formal consultation response letter from Mr Hitchen (reference: MHWK/200702054), dated 25 May 2007.

The response from CDC included a concern over noise from on-board ship-generator noise and from repair activities within the port area. Unfortunately, the on-board activities and operations of visiting cruise ships and other vessels are beyond the control of the Port Authority whilst activities within the port ship repair yards are beyond the scope of this assessment. However, the assessment showed that the relocation of berthing will have a beneficial impact in respect of the potential ship-board noise.

On-site Construction Noise

The noise from certain of the construction activities was assessed using the methods provided in BS 5228. In view of the large separation distance between the wharves and the residential areas combined with existing noise from vessel activity in the harbour, with contributions of noise from the existing intervening commercial port areas and general urban (traffic) noise, it was presumed that the general noise of plant equipment such as earth movers and the dredger would not be significantly audible for properties in and around Falmouth. The exceptions to this are breaking out of concrete and piling, the percussive nature of which are likely to be clearly audible in Falmouth. Noise level predictions in respect of properties within Falmouth were, therefore, only undertaken for these two specific activities.

In conducting the assessment, all ground surfaces were presumed to be hard and potentially noise-reflective. Water is generally a hard noise-reflective surface. In addition, no reduction in noise levels was presumed for screening by buildings. This was presumed on the basis that the potentially most affected properties are either elevated relative to the docks or have direct line of sight of the docks from the waterfront area and, therefore, do not benefit from such screening effects.

With regard to properties near Trefusis Beach the potentially quieter ambient environment dictated that, in addition to the piling and breaking out, capital dredging noise impacts at Trefusis be assessed. The properties are, however, 700 metres from the proposed new cruise quay. This significant separation distance combined with existing port and harbour noise indicated that general construction activity noise, whilst potentially audible, will not be significantly greater than existing daytime noise levels from the docks area. Accordingly, these receptors were not included in the assessment of dredging noise.

It was presumed that significant movements of vessels occur within the areas of Carrick Roads and that additional movements of dredgers and barges associated with the capital dredging activities would not give rise to any significant increase in ambient noise levels for properties to the west of St Mawes, which are located approximately 570 metres or further from the capital dredge area. Accordingly, these receptors were not included in the assessment of dredging noise.

The nature of the sediments and underlying lithology around the wharves is understood to be relatively soft; however it was conservatively presumed that percussive piling would be utilised for the construction of the cruise quay, occurring only during the day time. Detailed information regarding the proposed piling equipment to be used is not currently available so an assumed source noise level for such equipment of 113 dB L_{Aeq} at ten metres was used; this is based on previous experience of assessing similar waterfront redevelopment schemes. It was further presumed that the piling equipment would operate at full power for approximately 30% of the working day. All other equipment was conservatively presumed to be working at full power for 40% of the working day. It was presumed that the piling activities will occur between 08:00 and 18:00 Monday to Saturday with no working on Sundays or bank holidays and no overnight activity.

In setting an acceptable daytime construction activity noise limit at the surrounding properties it is normal practice in such assessments for an acceptable noise limit of between 70 and 75 dB L_{Aeq} to be set for construction activities of a temporary nature. Due to construction activities being inherently noisy, attempting to set noise limits based on existing background noise levels would be very restrictive and would be impractical for the appointed contractor. For the PFDI EIA, a conservative limit of 70 dB was used. Assessment of construction activities against existing background noise levels would be acceptable with regard to night time or quiet weekend periods when rest and sleep disturbance are critical issues; this was not the case for the cruise quay piling since it is presumed that only daytime construction activities will occur.

The typical plant equipment and their associated source noise levels are presented in Table 17-2.

Table 17-2 Presumed Typical Construction Plant and their Noise Levels

Operation	Plant	Source noise @ 10 m (dB L_{Aeq})	% on time
Piling	Piling activity	113	30
Dredging	Back-hoe dredger	77	40
	Loading barge	79	
	<i>Total:-</i>	<i>81</i>	
Breaking out	Breaker mounted on back-hoe	92	

Construction Traffic Noise

Heavy goods vehicles will be required to move concrete on-site from the batching plant in the eastern dock area to the Northern Wharf. In addition, vehicles will transport treated dredged material off-site to be disposed of. As yet there is no detailed TA data on the numbers of existing vehicles on the road outside the docks and so it is not possible to conduct a quantitative assessment. Therefore, qualitative observations regarding off-site construction vehicle movements are provided in this report.

It was assumed that all on-site construction-related vehicles, travelling between the wharf areas and the eastern dock areas, will move along the main length of the central

Western Wharf before passing around the southern end of the dry docks. The closest approach distance between this route and the recently constructed Maritime Apartments was taken to be approximately 20 metres with the apartments judged to be raised approximately 5 metres higher than the construction route. Section 16.4.2 indicates that a total of 1,766 one-way vehicle movements will pass along this route over 140 days. Presuming a eight-hour working day and a six-day week, this approximates to 12 to 13 one-way movements per day. This may have an impact at the Maritime Apartments and assessment of this element of the construction activities was quantitatively assessed, providing predictions of both the hourly average noise levels (dB $L_{Aeq, 1h}$) and the maximum event noise level for a single vehicle passage (dB L_{Amax}). The speed of these vehicles was taken to be 17 km/h, as this equates to the speed limit within the docks estate of 10 mph.

The source noise data for the construction-related on-site vehicle movements, derived from BS 5228, are presented in Table 17-3.

Table 17-3 On-site Construction Vehicle Noise Levels

Operation	Plant	Source noise @ 10 m (dB L_{Amax})
Dump truck on haul route to eastern docks	Drive-by dB L_{Amax} (empty truck)	87
	Drive-by dB L_{Amax} (full truck)	81

The next closest properties are those on Castle Drive, approximately 100 metres away. In view of the separation distance, the intervening topography and the busy commercial nature of the docks, it was presumed that the movements of construction-related vehicles, whilst potentially audible, will not give rise to day time noise levels of any significance and this element of the construction activities was not further assessed.

Movements of construction-related vehicles were not judged to be significant in respect of properties near Trefusis Beach and construction vehicle-related noise predictions were not made in respect of these receptors.

Operational Site Noise

There are unlikely to be significant adverse noise impacts from the operation of the proposed PFDI with the possible exception of public address system ('tannoy') noise. Detailed data on the intended public address system and its sound power level are not currently available so qualitative assessment was undertaken.

A potential significant beneficial impact will arise from the relocation of cruise ship berthing from County Wharf to the cruise quay along the combined Queens and Northern Wharves. For the purposes of quantitative assessment, the distance difference between the properties on Tinnors Walk and a berthed vessel was used to calculate the potential reduction in noise levels that will occur as a result of the relocation.

As vessels already moor at Empire Wharf there is not judged to be a significant impact at Trefusis of relocating ship berthing to the new cruise quay and no detailed assessment of noise impacts was conducted.

The data so far available indicate that the number of cruise vessels using the port will increase from 46 in 2008 to 68 in 2020. With regards to noise, this represents a potentially negligible increase: a doubling of the number of cruise vessels over a very short period of time might be expected to lead to a localised increase in noise levels of the order of 3 dB but, as this lesser increase is spread over a period of a year, the impact will be diminished.

The project description also indicates that maintenance dredging of the approach channel and deep water berth will not be required, so no noise impact will occur.

Operational Traffic Noise

The Arup (2008) report indicates a significant increase in passenger numbers which may result in increased traffic to and from the docks and increased noise associated with the eastern docks car parking areas.

At this time, detailed data on the existing levels of traffic using the public roads and the car parks are not available and quantitative assessment was not possible. Qualitative observations of potential impacts were therefore conducted.

17.2.6 Assessment of Impact Significance

Impact significance has been assessed using the methodology set out in Section 1.4.3 and terminology set out in Table 1-1.

17.3 BASELINE ENVIRONMENTAL CONDITIONS

Falmouth Docks is an existing source of noise (see Section 16.3.1). Of the potentially noise sensitive receptors, the locations can be divided into two clearly distinct environments within Falmouth itself: waterfront Falmouth (see Section 16.3.2) and suburban Falmouth (see Section 16.3.3). Trefusis Beach represents a third and completely different environment (see Section 16.3.4). Measured noise data recorded during the survey are described in Section 16.3.5.

17.3.1 Falmouth Docks

The docks estate, located east of Falmouth town centre, operates as a commercial port for cruise, cargo handling and ship repair. On the whole, the activities are continuous (i.e. 24 hours a day). The areas immediately surrounding the docks comprise a mix of residential suburban / urban, commercial and industrial uses.

17.3.2 Waterfront Falmouth

Noise measurement locations 1 to 3 (see Figure 17-1) are located on the waterfront and are mainly subject to noise from the activities within the local marinas and the movements of small to medium sized vessels in the harbour. The closest residential properties to the quayside are those at Port Pendennis at the end of Tinnors Walk, approximately 630 metres from the proposed work areas at Queens Wharf and potentially only 60 metres from vessels that currently moor up at County Wharf. Intermittent private leisure craft moving within the harbour, often with very noisy

outboard engines, contribute significantly to the existing daytime noise levels, particularly at the weekend.

The occasional movement of large cruise vessels to and from County Wharf contribute significantly to the existing noise environment for waterfront areas of Falmouth and ship-board diesel generator exhaust noise of the berthed vessels was a significant contributor to the noise levels at all three locations, the perceived audibility decreasing with distance.

The existing night time noise environment at all three noise measurement locations was relatively steady comprising an even contribution of noise from both the docks and the town, urban noise with occasionally elevated noise levels from the movement of cars on Falmouth High Street, late night revellers, and the sound of water lapping at the quayside. Night-time measurements were also taken with a large vessel berthed at the Kings Wharf, during which ship-board generator noise was clearly audible at all waterside locations.

17.3.3 Suburban Falmouth

Noise measurement locations 4 to 7 (see Figure 17-1) are south of the docks and comprise mostly suburban residential areas overlooking the port, some from an elevated position. The closest residential receptors are the recently completed Maritime Apartments, the upper storeys of which will overlook the docks; the apartments are approximately 610 metres from Queens Wharf and approximately 20 metres from the centre-line of the haul route to be used for movements of fill material within the docks estate.

The main contributors to the existing daytime noise environment in this area are local traffic on nearby roads and maintenance activity noise and generator 'hum' from the dry docks area. The character and level of the docks-generated noise was highly variable and dependant on the type of works taking place. The on-board diesel generator exhaust noise from cruise vessels berthed at the County Wharf was distantly audible at these locations but was qualitatively judged to not make a significant contribution to the existing ambient noise levels.

The primary contributor to the night-time noise environment at these locations was generator / maintenance activity noise from the dry docks area, which was relatively steady at night. The other main contribution to the ambient noise was from occasional traffic on local roads. At Pendennis Rise an extractor fan mounted on the external façade of the "Ocean Bowl" building operated intermittently throughout the day and night and when operating was qualitatively judged to make a significant contribution to the existing ambient noise levels for the neighbouring properties.

17.3.4 Trefusis Beach

The area was not visited during the site visit and survey, but examination of Ordnance Survey mapping and aerial imagery indicates that the area is generally semi-rural. Its proximity to Falmouth suggests that it will be subject to many of the same sources of noise but at a very much reduced level. The most significant source of noise at these locations is likely to arise as the result of the large numbers of small private leisure craft in the harbour at the weekends.

Noise measurements were not conducted in this area but our experience of conducting noise surveys in such areas indicates that background noise levels will be in the region of 35 to 45 dB L_{A90} during the day and between 25 and 40 dB L_{A90} at night. Therefore, for the purposes of this assessment daytime background noise levels were presumed to be a median value of 40 dB L_{A90}.

The receptors around Trefusis Beach are considered principally in relation to potential noise from dredging, piling and breaking out of the old concrete wharf surface.

17.3.5 Measured Existing Noise Levels

A summary of the existing noise levels recorded during the noise measurement survey are presented in Table 17-4. Note that, on the whole, these noise levels are presented for information only, as insufficient operational activity detail is available to allow detailed quantitative assessment of operational noise relative to existing noise levels to be conducted. This data may be subsequently utilised should further assessment be required and once more detailed information is made available.

Table 17-4 Summary of Existing Measured Noise Levels

Location	Time	dB L _{A90}		dB L _{Aeq}	
		Boat in	Boat out	Boat in	Boat out
King Charles Quay	Weekday	51	42	52	45
	Sunday	49	46	50	50
	Night	45	38	46	39
Custom House Quay	Weekday	59	38	60	46
	Sunday	57	46	56	45
	Night	-	-	-	-
Port Pendennis	Weekday	61	43	62	46
	Sunday	56	49	57	52
	Night	43	38	43	39
Pendennis Rise	Weekday	45	45	49	49
	Sunday	-	46	-	49
	Night	37	36	39	37
Tredynas Road	Weekday	42	39	57	57
	Sunday	-	43	-	57
	Night	37	41	38	42
Top (SE) Tredynas Road	Weekday	40	-	42	-
	Sunday	-	39	-	41
	Night	-	42	-	43
Docks railway station car park	Weekday	Non recorded due to construction noise			
	Saturday	45	-	47	-
	Night	-	42	-	43

17.4 POTENTIAL IMPACTS DURING THE CONSTRUCTION PHASE

17.4.1 Impact on Noise due to On-site Construction

The results of the predictive assessment of weekday daytime piling, dredging and concrete-breaking noise activities are summarised in Table 17-5. Locations at the top of

Tredynas Road and the railway station are not included as daytime weekday noise levels were not recorded at these locations. For the purpose of this impact assessment, the measurement location at the junction of Tredynas Road and Castle Drive can be taken to be representative of the other 2 locations due to their relative proximity. Table 17-6 presents the results of the predictive assessment of the construction noise levels relative to the suggested construction noise limit of 70 dB L_{Aeq}.

Table 17-5 Predicted Receptor Noise Levels from Construction Activities

Receptor (and Distance)	Activity and receptor noise level (dB L _{Aeq})		
	Piling	Dredging	Breaking Out
King Charles Quay (770 m)	70	38	50
Custom House Quay (650 m)	72	40	52
Port Pendennis (630 m)	72	40	52
Pendennis Rise (610 m)	72	40	52
Tredynas Road (770 m)	70	38	50
Trefusis (700 m)	71	39	51

The assessment predicted that the piling activity would have negligible adverse impact around Falmouth and a potentially minor adverse impact for properties near Trefusis Beach. The other construction activities were predicted to have no impact on the surrounding residents.

Mitigation and Residual Impact

There are numerous generic mitigation options for mitigating piling noise, the most successful being the enclosure of the pile and ram by 'bellows'. In practice, however, this mitigation has been shown to create significant difficulties for piling contractors dealing with soft ground conditions in ensuring that piles are being driven straight. It may be possible for quieter piling techniques such as vibro-piling or pile-pressing to be used, but the application of these techniques will be dictated by the advice of the appointed contractor.

Of greater significance with regard to perceived mitigation, is the importance of undertaking community liaison. Experience has shown that local residents may be very tolerant of very high noise levels provided they have been forewarned of the occurrence of the activities, their reason and the potential duration, and are given details of a contact telephone number to call in the event of a perceived disturbance. Any such complaints should be followed up and the resolution, if any, communicated to the complainant. In this way, trust in the developer and the appointed contractor is created.

Agreement over working hours and conditions should be agreed with the local Environmental Health Department by way of a Section 61 prior consent, to include hours of working and construction methods, including piling, to be employed. In addition, a general application of best practice site management techniques, often referred to as Best Practicable Means (BPM), should be employed to minimise or avoid adverse impacts from construction-related noise. A detailed discussion of BPM can be found in BS 5228-1 and The Control of Pollution Act 1974,

With mitigation in place and successfully implemented by the appointed contractor, there was predicted to be a negligible residual impact when piling works take place during

construction. No mitigation measures are required for other works and no residual impact was predicted.

Table 17-6 Predicted Construction Noise Impacts

Location	Suggested noise limit (dB L _{Aeq})	Piling noise (dB L _{Aeq})	Difference + impact significance	Dredging noise (dB L _{Aeq})	Difference + impact significance	Breaking out noise (dB L _{Aeq})	Difference + impact significance
King Charles Quay	70	70	0 (none)	38	-32 (none)	50	-20 (none)
Custom House Quay		72	+2 (negligible)	40	-30 (none)	52	-18 (none)
Port Pendennis		72	+2 (negligible)	40	-30 (none)	52	-18 (none)
Pendennis Rise		72	+2 (negligible)	40	-30 (none)	52	-18 (none)
Tredynas Road		70	0 (none)	38	-32 (none)	50	-20 (none)
Trefusis		71	+1 (minor)	39	-31 (none)	51	-19 (none)

17.4.2 Impact on Noise due to Construction Traffic

Noise will be generated by construction traffic on site (i.e. within the docks estate) and off site (i.e. on the local road network).

On site, Table 17-7 presents the results of the predictive assessment of construction-related traffic movement noise within the docks estate that will affect the Maritime Apartments.

Table 17-7 On-site construction traffic impacts

Operation	Source driveby L _{Amax} @ 10 m	Receptor distance (m)	Angle of view (°)	Vehicles /hr	Speed (km/h)	Receptor noise levels (dB)	
						L _{Aeq, 1 hour}	L _{Amax}
Dump truck drive-bys	87 (empty), 81 (full)	20	120	1-2 (empty), 1-2 (full)	17	59	81

Table 17-7 shows the difference between single event noise levels and the time-averaging effect, including as it does significant periods of no vehicle noise. The L_{Aeq, 1hour} noise level is significantly below the 70 dB construction noise limit and was therefore predicted to cause no noise impact. However, the calculation of dB L_{Amax} noise level shows an exceedance of the construction noise limit of +11 dB. Whilst the quantitative assessment predicted a potential major impact, it is necessary to view the result in terms of the following factors:

- a high noise level will not necessarily occur with every vehicle passage;
- the events are intermittent and short-lived with significant periods of quiet in between thus potentially slightly reducing the impact;
- the 70 dB construction noise limit is set with regard to a time-averaged noise level, in this case over the presumed ten-hour working day. Inherently noisy construction activities will inevitably lead to occasional events of elevated noise level and while they can be taken into account, these unusual occurrences should not be used exclusively to assess the noise impact.

In view of these extenuating factors, while the time-averaged noise level predicted no impact, it was considered more reasonable to suggest that the passing vehicle movements may give rise to a predicted minor impact on the Maritime Apartments and adjacent properties.

Off site, a quantitative assessment of traffic related noise is not possible without a TA to establish baseline and predicted traffic numbers. However, qualitatively, it was inferred that the movements of a large number of construction-related vehicles taking treated dredged material off-site may lead to a moderate or major adverse impact for local residents, the impacts being most noticeable on existing roads with low levels of heavy goods vehicle traffic.

Mitigation and Residual Impact

To address the noise impact of traffic on site and as identified in Section 16.4.1, community liaison can be a significant mitigating factor that should be applied to this impact. In addition, as the haul route is within the docks estate, FDEC should ensure that the surface of the haul road is maintained in good condition to prevent adverse noise caused by vehicles jolting over surface irregularities. A slow speed limit is enforced within the docks estate (10 mph) and this will aid in minimising the potential for disturbance as increased speed can lead to increased vehicle noise. The application of BPM would be expected as would any additional agreements included in a Section 61 prior consent. This may include controls on the timing or nature of movements of off-site construction traffic with a view to minimising disturbance. With the mitigating measures adopted, it was predicted that there would be a negligible adverse residual impact.

To address the noise impact of traffic off site, it is recommended that a TA is conducted in order to refine the impact assessment on traffic noise, and, if necessary, to derive suitable mitigation measures to reduce the residual impact to acceptable levels. With the findings of the TA in place and mitigating measures adopted, it was predicted that there would be a minor adverse residual impact.

17.5 POTENTIAL IMPACTS DURING THE OPERATIONAL PHASE

17.5.1 *Impact on Noise due to Cruise Vessels*

Quantitative assessment of cruise operational impacts is only possible with regard to the impact of relocating cruise vessel berthing from County Wharf to the new cruise quay to be based alongside the combined Queens and Northern Wharves. Relocation will mean that cruise vessels will be situated approximately 590 metres away from the properties on Tinnars Walk, compared to 60 metres separation distance to County Wharf. In practice, this will reduce noise levels associated with the berthed cruise vessels by a magnitude of up to 20 dB. This is a significant magnitude of noise reduction for these residents, which equates to a predicted moderate beneficial impact.

Mitigation and Residual Impact

No mitigation measures are recommended and a moderate beneficial residual impact will remain.

17.5.2 *Impact on Noise due to Cruise Quay Operations*

Qualitatively, noise from vessels' public address systems may have adverse impacts, particularly for the properties around Trefusis Beach. The level of noise increase can not be quantified at this time, but this type of noise can be perceived to be very intrusive and can give rise to a severe reaction from local residents. The impact will be intermittent but may occur regularly when vessels are present. Given the potential intrusiveness of this type of noise, there was predicted to be an intermittent minor to moderate adverse impact.

During the noise survey, the public address systems of cruise vessels docked at County Wharf could be heard to a degree at all of the monitoring positions, most notably at Tinnars Walk and Custom House Quay. With the relocation of the cruise vessels to

Queens/Northern wharf, it is likely that the public address systems will still be audible but the intrusiveness of the noise will be diminished to receptors in Falmouth; potentially by up to 20 dB. This significant reduction in receptor noise level was predicted to result in a moderate beneficial impact.

This assessment did not consider emergency warning systems which, by their very nature, need to be loud. There is no public address system in the docks estate, and it is not considered that one will be required under the proposed PFDI.

Mitigation and Residual Impact

It is recommended that cruise vessel operators are provided with some guidance on the use of their onboard public address systems. The guidance should advise that the use of public address systems be minimised during the day (e.g. avoid unnecessary messaging and background music) and especially during the night, alternatives be used where possible (e.g. walkie-talkies between crew), and the volume be lowered as much as possible. The guidance should be provided to an assigned crew member with the responsibility to implement the measures appropriately. For example, some cruise vessel operators (e.g. Royal Caribbean) have an assigned environmental officer onboard their vessels.

Assuming the guidance is produced and adopted by the operators of the visiting cruise vessels, there was predicted to be a minor adverse residual impact.

17.5.3 *Impact on Noise due to Operational Traffic*

As described in Section 2.4, it is expected that the PFDI will generate increasing numbers of day calls and turnaround calls and increasing numbers of passengers. Passengers will contribute to an increase in vehicles on the local road network; notably coaches taking passengers on excursions.

A quantitative assessment of traffic related noise is not possible without a TA to establish baseline and predicted traffic numbers, but it was predicted that up to a moderate adverse noise impact could arise as a result of the movements of extra vehicles on the roads.

Mitigation and Residual Impact

It is recommended that a TA is conducted in order to refine the impact assessment on traffic noise and, if necessary, to derive suitable mitigation measures to reduce the residual impact to acceptable levels.

With the findings of the TA in place and mitigating measures adopted, it was predicted that there would be a minor adverse residual impact.