



REDCLIFFE WHARF

NOISE ASSESSMENT FOR PLANNING DISCHARGE

A1253 R03A

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1 Introduction

Ion Acoustics is appointed by Complex Development Projects and Generator SW to advise on noise issues affecting the proposed Redcliffe Wharf development in Bristol. The site has planning permission (Ref. 18/06659/F) for a mixed-use development with housing, offices and various other uses including restaurants with external seating areas and new boat moorings. This report is prepared in respect of discharging planning Condition 6 of the permission.

In awarding planning permission, Bristol City Council imposed various conditions relating to noise, including Condition 6 which must be discharged prior to commencement of construction. The site is affected by noise from road traffic and to a lesser extent by entertainment & commercial noise from the Thekla and from nearby restaurants. Noise from the Thekla was addressed in Ion Acoustics' "Thekla Noise Survey" report (A1253 R01A) following a survey carried out in February 2018. A further noise survey was carried out by Ion Acoustics in April 2018 to determine road traffic noise incident on the site as reported in report A1253 R02. Both reports were submitted with the planning documents.

Although these surveys are fairly old it is not thought that conditions have changed significantly and the Thekla survey was carried out in arrangement with Thekla's operators, and when they considered their noise levels would be at their highest. A further survey to assess Thekla's noise levels will be carried out at the end of January or early February following discussions with Thekla's owners, but at the time of writing (January 2024) a representative survey is not possible as there will be reduced use of the external deck and people outside generally.

Design criteria for noise are referenced in the planning condition. These include British Standards BS 8233:2014 & BS 4142: 2014.

2 Scheme Details

The development comprises the following buildings:

Building A (Mixed Use)

A three-storey building with a proposed A1/A2/A3 use on the ground floor with two floors of residential apartments above. There is a plant compound on the 2nd floor mostly contained within the pitch of the roof. There is a seating area on the wharf (west) side. The residential units above the A1/A2/A3 use are partly protected by external balconies.

Building B Offices

Building B is a new 5-storey office building. There is an external area on the raised ground floor outside and a roof terrace at level 3 also to the south. There is a plant compound at roof (Level 5) level with internal plantrooms and external plant areas generally concealed within roof pitches.

Building C, D & F (Mixed Use)

Buildings C, D & F are linked at the southern end of the site. Each building has a potential retail, food (A1/A2/A3) or business use B1a/b/c). There is also an external seating area associated with Building F.

Building E (Mixed Use)

Building E is a free-standing four storey building with an A1/A2/A3 use (two units) on the ground floor. There is a partly open external area at ground floor level, but this is entirely covered by the first-floor slab. There is a plant room within the roof at 4th floor level.

The existing development site is shown in Figure 1. This also shows the nearest existing off-site residential locations including the Customs House flats and housing on Redcliffe Parade. Figure 2 shows the proposed site layout and the external seating areas.



Figure 1 – Existing Site and surroundings. image © Google

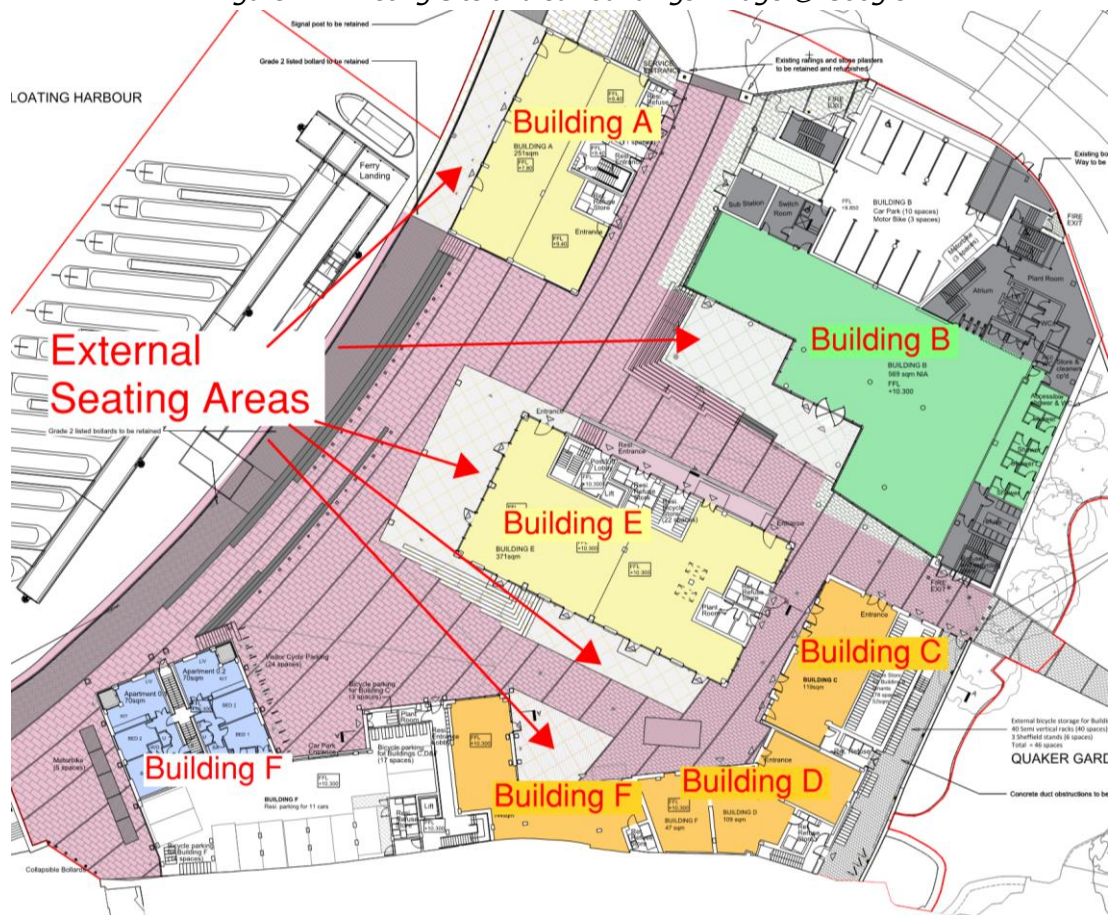


Figure 2 – Site Layout (from Alec French Architects)

3 Planning Conditions

In awarding planning permission for the Redcliffe Wharf development, Bristol City Council imposed a condition requiring a further assessment of noise. Specifically, Condition 6 states:

Noise Sensitive Premises Assessment

A detailed acoustic report on the existing noise climate at the development site will be submitted to and approved in writing by the Council prior to the commencement of the development hereby approved.

The details submitted shall specify the development phase(s) to which they relate. The report shall include a scheme of noise insulation measures for all residential accommodation. The noise insulation measures shall be designed to achieve noise insulation to a standard that nuisance will not be caused to the occupiers of residential accommodation by noise from the following:

- a) Music and customer noise from the nearby licensed premises over a weekend and from the licensed premises to be provided as part of the development.*
- b) Customers using the commercial / retail uses hereby approved (including customers in any outside area of the site).*
- c) Ventilation, refrigeration and air conditioning plant or equipment*
- d) Servicing (deliveries and refuse collections)*

The noise assessment shall be carried out by a suitably qualified acoustic consultant/engineer and shall take into account the provisions of BS4142: 2014 Methods for rating and assessing industrial and commercial sound and BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings or in accordance with the most up-to-date superseding documents / guidance.

The approved details shall be implemented in full prior to the first occupation in each phase, as approved under condition 2, of floor space to be dedicated to uses A1, A2 or A3 and maintained thereafter for the lifetime of the development.

Reason: to safeguard amenity against the potential for disturbance from noise.

The advice notes provided with the planning decision document state the following:

The recommended design criteria for dwellings are as follows:

Daytime (07.00 - 23.00) 35 dB L_{Aeq} 16 hours in all rooms & 50 dB in outdoor living areas.

Nighttime (23.00 - 07.00) 30 dB L_{Aeq} 8 hours & L_{Amax} less than 45 dB in bedrooms.

Where residential properties are likely to be affected by amplified music from neighbouring pubs or clubs, the recommended design criteria is as follows: Noise Rating Curve NR20 at all times in any habitable rooms

In this report the various noise sources described by sections 6a) to 6d) are described separately in following sections: 4, 5, 6 and 7. The applicable noise criteria are discussed in each section.

There are also a number of pre-occupation planning conditions that will control the timing of various activities these are:

Condition 15 Servicing Strategy

Condition 35 Hours of Use Management Plan for the commercial units

Condition 36 Outdoor Area Management Plan for the commercial area external seating areas

In addition, Condition 48 sets out a noise limit for plant affecting residential properties. This is discussed in Section 6.

4 Noise from Existing Licensed Premises

This section primary relates to music and customer noise from Thekla although there are other existing facilities nearby including the Harbour House (formerly Severn Shed) and Riverstation restaurants. These are closer to the site than Thekla, but do not have particularly high source levels. The wording of the condition makes it clear that music noise from any of the A3 uses associated with the development would be included. Customer noise from retail and commercial uses associated with the development are the subject of condition 6b.

4.1 Design Criterion

For music noise Bristol City Council commonly apply an internal noise limit of NR20 inside dwellings when considering applications near sources of music noise. This standard is referenced in the advice notes attached to the planning condition. Therefore, the NR20 standard is also adopted here. It is necessary for noise levels to be below the curve value in each octave frequency band within habitable rooms of dwellings during day or night.

4.2 Noise Survey

To assess noise from Thekla, a survey was carried out as reported in report A1253 R01A. A monitor was provided inside Thekla to check on internal source noise levels within the music venue and a further unattended monitor was set up outside at the Benjamin Parry Boathouse (see Figure 1) to log noise levels over the weekend. During the evening, attended measurements were carried out at various locations including on the Redcliffe Wharf site. For full details see report A1253 R01A. For ease of reference the relevant results are summarised below.

4.2.1 Benjamin Parry Boathouse

The results of the unattended measurements at the Benjamin Parry Boathouse are shown below in Figures 4 & 5 in terms of the L_{Aeq} , L_{AMax} and L_{A90} parameters. The noise levels logged inside the Thekla are overlaid for comparison.

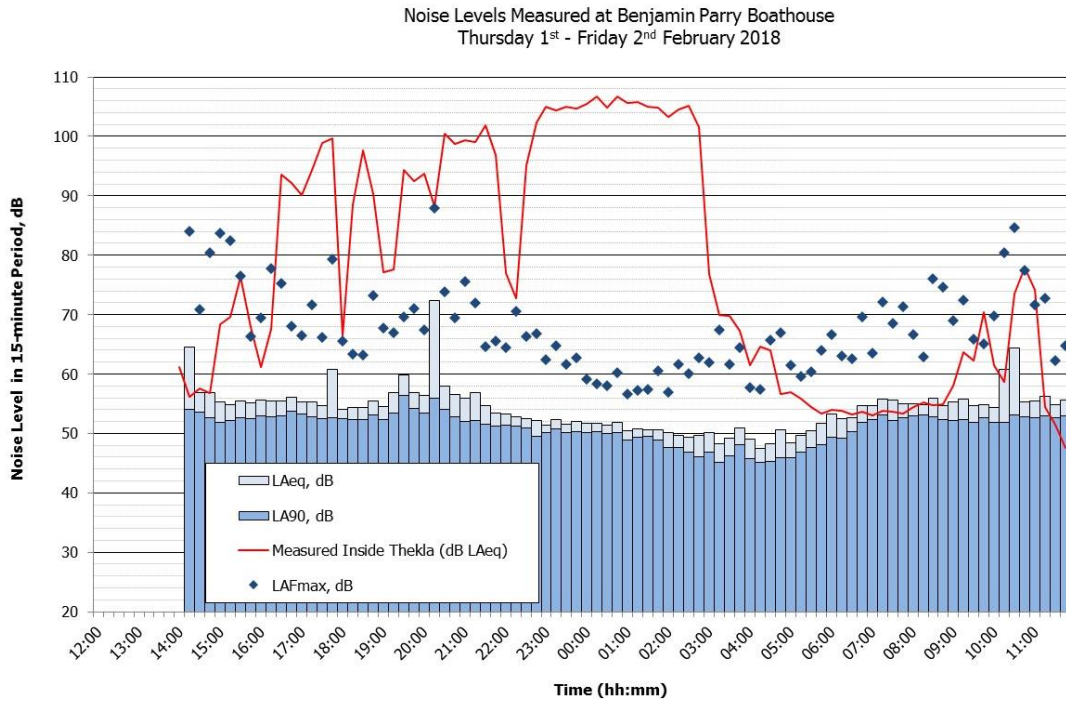


Figure 3: Noise Levels at the Boathouse 1st to 2nd February

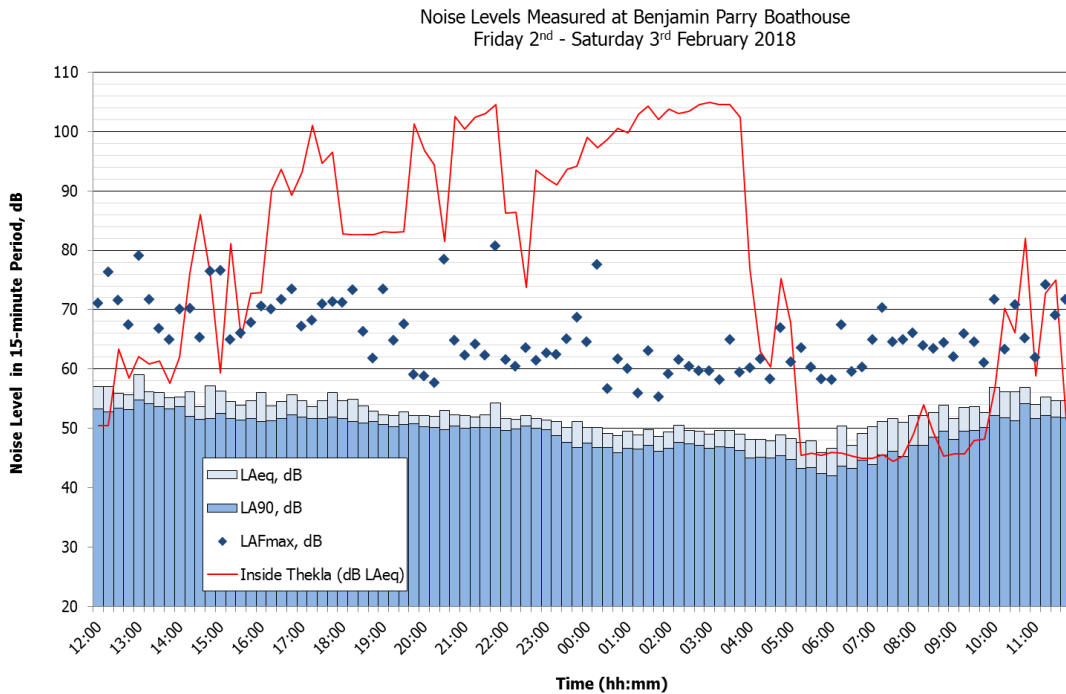


Figure 4: Noise Levels at the Boathouse 2nd to 3rd February

An important conclusion from these results is that there is no obvious correlation between the noise levels measured inside the Thekla and the external noise level measured at the Benjamin Parry Boathouse. The measurement location is away from roads, but the dominant noise source is distant traffic and there is a gradual reduction in noise (LA_{eq} and LA_{90}) through the evening and night and then a rise again from 06.00am onwards. This does not mean however that noise from the Thekla is

inaudible; music and customer noise was certainly audible at times. However, it demonstrates that noise from the Thekla does not dominate the noise climate, even at a position (the Benjamin Parry Boathouse) which is closer than the Redcliffe Wharf site and less affected by traffic noise.

4.2.2 Redcliffe Wharf Measurements

The attended measurements on the Redcliffe Wharf site are set out in Table 1 below together with observations made during the measurements. This position had a narrow view of the entrance to the Thekla on the Mud Dock between the boat and the Riverstation building. People were observed (seen and heard) by the entrance at times.

Table 1 – Attended Measurements at Redcliffe Wharf (RW)

Date /Time	L _{Aeq} (dB)	L _{A90} (dB)	Comments
1 Feb 21:12	50.4	48.6	There was no obvious noise from Thekla. At the start of the survey, the Redcliffe Way bridge over the harbour was closed to traffic because of construction works (which were not noisy, with the exception of diesel engines idling). Plant from the Riverstation and possibly Severnshed was also audible. There are party boats audible on the floating harbour. One crash of bottles from the Severnshed or Riverstation was heard just after the measurement at 21.27 hours.
1 Feb 23:30	48.9	46.9	Redcliffe Way bridge is now open to traffic. Traffic on bridge is audible. Lights go off at the Severnshed and Riverstation. Maybe less plant noise but some plant noise is still audible. Bass music noise from Thekla is audible. Can see people outside Thekla on Mud Dock.
2 Feb 00:31	49.1	46.9	Music and noise from people outside Thekla is now audible amongst other urban noises including traffic and plant noise. The measurements were paused a few times for conversations with people walking across the Redcliffe Wharf site.
2 Feb 02:21	47.7	44.9	Quieter; some people are still outside Thekla on the Mud Dock. Voices are occasionally audible. Some people leave and walk across Redcliffe Way Bridge. Music noise very quiet now. A songbird starts singing.
2 Feb 02:58	48.2	44.9	Some shouts from people outside the Thekla entrance and from people by the roundabout to Welsh Back. No music noise. Plant noise is audible. Birds are singing.
2 Feb 21:27	52.1	48.4	No music audible and no other noise from Thekla. Plant on Severnshed/Riverstation is audible with road traffic noise, people outside Severnshed.
2 Feb 23:33	50.1	46.7	No music audible and no other noise from Thekla. Plant noise, road noise but no people outside Severnshed and very few people on the streets now. There is a bottle pour outside Severnshed and noise from doors shutting.
3 Feb 01:57	47.9	44.3	Bass now clearly audible SPL max of approx. 72dB @ 31.5 Hz & 64dB @ 63Hz. There are some resonances audible from the ship's structure vibrating also.
3 Feb 03:02	49.9	43.9	Music noise is audible: 72dB @ 31.5Hz & 68dB @ 63Hz, songbirds have started.
3 Feb 03:42	48.5	43.6	Music noise: 60-68dB @63Hz 31.5Hz now less, no noise from outside the club.

Measured noise levels in absolute terms are not particularly high. The highest noise level logged during the attended survey on the Redcliffe Wharf site was 52.1 dB L_{Aeq} . This was thought to be mainly determined by traffic noise, since noise from Thekla was not audible during this time. Generally, therefore, traffic noise dominates the noise climate and there is a reduction in noise during the evening as traffic reduces.

Although it is nearly six years since the survey was carried out, it is not thought that noise from Thekla would have increased. Firstly, because internal noise levels were already fairly high, up to 106 dB(A) at times, and secondly because there are existing residents (on Merchants Quay and Redcliffe Parade West) which are already closer to the Thekla than the Redcliffe Wharf site. Therefore, Thekla's activities are already to some extent constrained by existing residents. Compared to the Merchant's Quay residents, traffic noise levels on the Redcliffe Wharf site are also higher and will therefore mask noise from Thekla to a certain extent.

4.3 Building Envelope Sound Insulation

The report A1253 R01A included indicative calculations for the building envelope sound insulation, but these have been revised as MVHR has now been confirmed for all residential blocks such that trickle vents are not required. Furthermore, a timber frame construction is now proposed. As the external wall is now lightweight construction, the build-up for the nearest façades to Thekla have been revised to provide enhanced sound insulation. The construction for wall type EW01 proposed for the scheme, as shown in the architects drawing is provided in Figure 5 below.

the Redcliffe Wharf site will in any case feature restaurants and noise from these is also addressed in the proposed building design. It is doubtful that residents choosing to live at this city centre development will be noise sensitive to the same extent as people in a suburban or purely residential development. Existing residents in the Customs House flats and the apartments at 25 Queens Square on the corner with Welsh Back are also already affected by this noise.

5 Noise from Retail and Commercial Premises within the Development

The development will feature, restaurants and retail facilities as well as offices etc.

Measures to reduce noise include the following:

- All floors with residential above retail/commercial units (Blocks A, E and F) will have a 300mm concrete slab on the ground floor. This will provide very good sound insulation, well in excess of the Building Regulations Part E requirements, and this ensure that sound transfer from the ground floor units through the floor above is well controlled. The sound insulation will be enhanced by a plasterboard ceiling in most cases, although that will be part of the tenant's fit-out. Despite this, it will not be possible for any of the bars or restaurants to have loud live music or operate at very high amplified music noise levels. It will be necessary for any bars or restaurants who wish to operate with music to have an electronic limiter set up to ensure no disturbance to any flats above. This is expected to be written into the lease or tenancy agreement.
- The north-west elevation of Building A is provided with a continuous strip of external balconies. This will shield noise from the external terrace as there is no direct line of sight from the residential façade to the seating area.
- The external area for Building E is entirely below the footprint of the residential slab above, so again, there is no direct line of sight.
- In addition, the hours of use of the commercial uses will be controlled Condition 35 "Hours of Use of Indoor Areas". This requires an Hours of Use Management Plan to be submitted and approved before commencement of the commercial uses.
- The operation of all external areas including the office terraces will be controlled by Condition 36 "Hours of Use of Outdoor Areas". An Outdoor Area Management Plan must be submitted and approved before commencement of the commercial uses.

6 Plant Noise Control

At this stage it is not possible to calculate the plant noise emissions levels as specific plant will be selected by individual tenants in the future. Therefore, plant limits are imposed for each building.

There are various plant compounds distributed around the development, mostly on the roofs with the plant areas concealed by the pitch of the roofs. According to planning condition No.48 noise from mechanical services plant should be 5dB below the background noise (LA₉₀). The wording of the condition is as follows:

48. Noise from plant & equipment affecting residential

The rating level of any noise generated by plant & equipment as part of the development shall be at least 5 dB below the pre-existing background level at any time at any residential premises.

Any assessments to be carried out and be in accordance with BS4142: 2014 Methods for rating and assessing industrial and commercial sound or the most up-to date superseding document / guidance.

Reason: to safeguard the amenity of surrounding development and of the occupiers of the development hereby approved.

Two noise surveys were carried out by Ion Acoustics in 2018. From these, it is possible to derive noise limits for the nearest noise sensitive receptors as set out below in Table 2. Photos of the measurement positions are provided in Appendix B.

Note that noise limits are also set to apply outside the residential units provided as part of the new development. Limits are set separately for the daytime, evening and night-time. It is envisaged that most of the plant associated with the office will need to meet the daytime limit. Noise from plant associated with possible restaurants or retail will have to meet the evening visits. It is not envisaged that much plant will be operational at night, but a night-time limit is also set. This could apply to any chiller units for retail or plant associated with server rooms in the offices etc or potentially for ASHPs.

Table 2 – Noise Limits for Entire Site

Receptor	Period	Measurement Location	Typical Background LA90 dB	Noise Limit (dB LAr)
Customs House Flats	Daytime	Measurement Position U1 in 2018 Survey	55 dB LA90	50 dB LAr
	Evening		52 dB LA90	47 dB LAr
	Night-time		45 dB LA90	40 dB LAr
Apartments within Development	Daytime	Benjamin Parry Boat House	52 dB LA90	47 dB LAr
	Evening	Attended on site	50 dB LA90	45 dB LAr
	Night-time	Attended on site	45 dB LA90	40 dB LAr
Redcliffe Parade	Daytime	Benjamin Parry Boat House	52 dB LA90	47 dB LAr
	Evening	Attended on site	50 dB LA90	45 dB LAr
	Night-time	Attended on site	45 dB LA90	40 dB LAr

From the noise limits in Table 2, a further set of noise limits have been derived to apply with the plant associated with Buildings A, B and E. The limits have been adjusted for distance to the source and for a hypothetical number of units. This is somewhat arbitrary but is likely to be fairer than simply apportioning the limits equally between the different buildings. Table 3 shows the limits at each receptor which apply for each specific block individually.

Table 3 – Noise Limits for Blocks A, B and E

Receptor	Period	Overall Limit	Block	Noise Limit (dB LAr)
Customs House Flats	Daytime	50 dB LAr	A	44
			B	47
			E	40
	Evening	47 dB LAr	A	41
			B	44
			E	37

Receptor	Period	Overall Limit	Block	Noise Limit (dB L _{Ar})
	Night-time	40 dB L _{Ar}	A	34
			B	37
			E	30
Building A Redcliffe Wharf	Daytime	47 dB L _{Ar}	A	42
			B	43
			E	41
	Evening	45 dB L _{Ar}	A	40
			B	41
			E	39
	Night-time	40 dB L _{Ar}	A	35
			B	36
			E	34
Building E Redcliffe Wharf	Daytime	47 dB L _{Ar}	A	40
			B	46
			E	42
	Evening	45 dB L _{Ar}	A	38
			B	44
			E	40
	Night-time	40 dB L _{Ar}	A	33
			B	39
			E	35
Building C, D, F Redcliffe Wharf	Daytime	47 dB L _{Ar}	A	29
			B	40
			E	42
	Evening	45 dB L _{Ar}	A	27
			B	38
			E	40
	Night-time	40 dB L _{Ar}	A	22
			B	33
			E	35
Redcliffe Parade	Daytime	50 dB L _{Ar}	A	35
			B	44
			E	42
	Evening	47 dB L _{Ar}	A	33
			B	42
			E	40
	Night-time	40 dB L _{Ar}	A	28
			B	37
			E	35

The noise limits are set in terms of the BS 4142 rating level (dB L_{Ar}) as a nominal free-field level at a position 1m from any residential window. The levels measured at 1m from the façade would then be around 3dB higher because of reflections from the façade. This rating limit includes a correction for any character penalties for tonality or intermittency etc.

There is no specific roof-top plant area provided for buildings C, D and F. However, it is possible there will be some wall-mounted extract fans. It is suggested that any plant is designed to meet a noise limit of 45 dB L_{Ar} at 1m from any louvre during the day and 40 dB L_{Ar} during the night.

7 Noise from Servicing Operations

The residential areas will be serviced by the standard waste and recycling collections which are typically once per week daytime hours Monday to Friday. The collection vehicles can drive onto the site and collect from the bin storage areas provided for each residential unit.

In addition, the retail / commercial or business units are expected to make their own arrangements for deliveries and rubbish collections. Condition 15 "Vehicular Access / Servicing Strategy" requires a strategy for servicing to be agreed by the local authority prior to the occupation of any building. This will include details on the hours for deliveries and waste collections etc.

In addition, it should be a requirement that bottles etc from restaurants or bars are not thrown into any external bins or skips at the end of a night as this can be a noisy activity. This again could be written into any lease agreement.

8 Summary

Ion Acoustics has provided a noise assessment to discharge Condition 6 of the consented residential development at Redcliffe Wharf, Bristol. This describes the measures adopted to control: a) music and customer noise from off-site entertainment venues; b) music and customer noise from retail and commercial areas provided as part of the development; c) plant noise from the development affecting any residential parts and d) noise from servicing activities.

The assessment is based on surveys carried out in 2018. However, it is not thought that the music noise from Thekla would have increased as the survey was chosen at the time to be representative of a loud evening and because entertainment noise is already constrained by other residential properties in the area. Enhanced sound insulation measures for the building envelopment (windows and façade) are provided to reduce noise inside any residential unit. In addition, the provision of MVHR ventilation will also mean windows can be kept closed as necessary.

A set of plant noise limits for the plant serving each block so that plant noise levels can meet the limits provided within Condition 48 of the development.

Various other measures to control noise are suggested. These will need to be written into any tenancy or lease agreements for retail, commercial or restaurant premises on the site.

As agreed by the owners of Thekla a further survey of noise from Thekla will be carried out to check noise levels as soon as conditions allow.

Redcliffe Wharf
Noise Assessment for Planning Discharge
Appendix A – Indicative Building Envelope Calculation



Building Envelope Sound Insulation Calculation According to EN 12354-3											
Redcliffe Wharf					Date	January					
Music Noise on Redcliffe Wharf					Room	Indicative Bedroom					
Incident noise levels											
	Term	Label	Octave band centre frequency (Hz)						dB(A)		
			63	125	250	500	1 k	2 k		4 k	
L _{eq,ff}	Measured L _{eq}	Redcliffe Wharf 3/2/18 01:57									
	Measured spectrum		64.4	54.2	46.1	43.3	43.8	38.0	34.2	48.1	
L _{max,ff}	Measured L _{max}	K	3	3	3	3	3	3	3		
		Location P1									
		M: Location P1: Adj Spectrum	73.3	65.8	57.5	67.9	69.1	62.9	57.7	71.6	
		K	6	6	6	6	6	6	6		
Room Details											
	Term	Derivation	Value	Term	Derivation	Value					
	V	Volume (m ³)	51.5	Sew	Sf - Swi	7.1					
	RT	RT (secs)	0.5	Srr	Area of ceiling (m ²)	0.0					
	Sf	Facade area (inc. window) (m ²)	19.5	S	Sf + Srr	19.5					
	Sr	Roof area		Ao	Ref Area for Dnew	10.0					
	Swi	Window area (m ²)	12.4	Attenuation to roof		10.0					
Sound Insulation Calculation elements											
	Term	Label/element	Octave band centre frequency (Hz)						Rw		
			63	125	250	500	1 k	2 k		4 k	
vent openings	D _{n,e}	Mech Vent	100	100	100	100	100	100	100	101	
	A ₀ /S x 10 ^{-Dn/10}	B	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
		L _{eq} Internal SPL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
window		L _{max} Internal SPL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	R _{wi}	Velfac G7 - 36dB Rw	21	21.7	23.1	34.1	38.5	39.4	41.1	36	
	S _{wi} /S x 10 ^{-Rwi/10}	C	0.005	0.004	0.003	0.000	0.000	0.000	0.000		
		L _{eq} Internal SPL	48.2	37.3	27.8	14.0	10.1	3.4	-2.1	26.0	
Primary wall		L _{max} Internal SPL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	R _{ew}	Redcliffe timber frame wall with 2x15mm sound	20	38	44	48	49	51	62	50	
	S _{ew} /S x 10 ^{-Rw/10}	D	0.004	0.000	0.000	0.000	0.000	0.000	0.000		
		L _{eq} Internal SPL	46.8	18.6	4.5	-2.3	-2.8	-10.6	-25.4	20.7	
Roof		L _{max} Internal SPL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	R _{rr}	None/Infinite	100	100	100	100	100	100	100	101	
	S _r /S x 10 ^{-Rrr/10}	E	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
		L _{eq} Internal SPL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
		L _{max} Internal SPL	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Calculated Internal Noise Levels											
L _{eq}	10 Log (B+C+D+E)	F	-20.6	-23.6	-25.1	-36.0	-40.3	-41.2	-43.1		
	A (furnished)	Room Absorption	16	16	16	16	16	16	16		
	10 log (S/A)	G	0.7	0.7	0.7	0.7	0.7	0.7	0.7		
L _{max}	Calc Tolerance	T	3	3	3	3	3	3	3		
	Internal L _{eq,2}	L+F+G+K+T	50.5	37.3	27.8	14.1	10.3	3.5	-2.1	27.1	
L _{max}	Calc Tolerance	T	3	3	3	3	3	3	3		
	Internal L _{max,2}	M+F+G+K+T	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
			24	21	19	11	10	5	-1	27.1	
		NR20	51	39	31	24	20	17	14		
		Excess	-0.5	-1.7	-3.2	-9.9	-9.7	-13.5	-16.1		



Measurement Position U1



Measurement Position A2





Benjamin Parry Boathouse

