



REDCLIFFE WHARF

THEKLA NOISE SURVEY
16th April 2018

Report for:	CDP
	Generator SW
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1 Introduction

Ion Acoustics is appointed by CDP and Generator SW to advise on noise issues affecting a site at Redcliffe Wharf, Bristol. The site has planning permission for a mixed-use development with housing, offices and various leisure uses including restaurants with external seating areas and a new mooring area.

The site is in an urban area of Bristol on the floating harbour and is affected by noise from road traffic on Redcliffe Way, Redcliffe Hill and the roundabout connecting the two. In addition, concerns have been raised about noise from the Thekla music venue which is on a ship moored at the Mud Dock across the water from the development site, with the nearest part of the site approximately 100 metres from the stern of the ship. In particular, there are concerns that the new development may give rise to complaints about Thekla activity which could impact on its current use. The Thekla is used for live music and for nightclub events. The deck forward of the bridge is used as a smoking area. A baseline noise survey for the proposed development site was carried out in 2017 by Hoare Lea, but this did not address noise from the Thekla.

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:

"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." ...

The condition lists other noise sources in parts b), c) and d). These will be addressed in subsequent reports.

This report describes a new noise survey carried out after the granting of the planning permission over the period 1st to 3rd February 2018 to determine noise levels from Thekla impacting the development site and an existing residential location, Redcliffe Parade. The survey was carried out on two dates agreed with the DHP Family (operators of the Thekla) as being representative of the louder events taking place. Noise monitoring positions were agreed with the Thekla and their noise consultant, Pace Consultants, as well as with the environmental health team at Bristol City Council. A glossary of noise terminology is provided in Appendix A.

2 Scheme Description

The site is shown in Figure 1 below together with the following measurement positions:

- On Redcliffe Wharf (RW) at a position representing the closest apartments in building F;
- Redcliffe Parade West which is at a higher elevation and overlooks the Thekla (RP);
- On the 1st floor balcony of the Benjamin Parry Boathouse (BP);
- On a floating jetty in the harbour (Jetty).

In addition, a noise monitor was set up inside the Thekla.

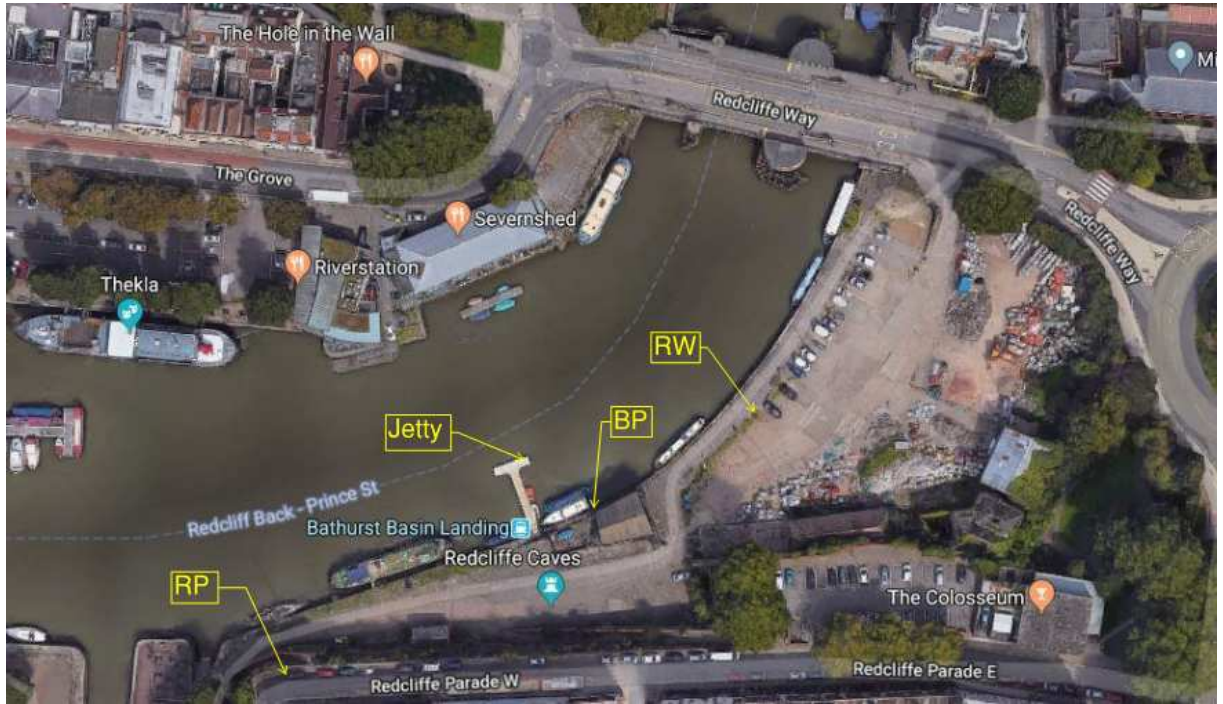


Figure 1: Site Location Plan and Measurement Positions © Google Maps

A plan of the development site is shown below in Figure 2.

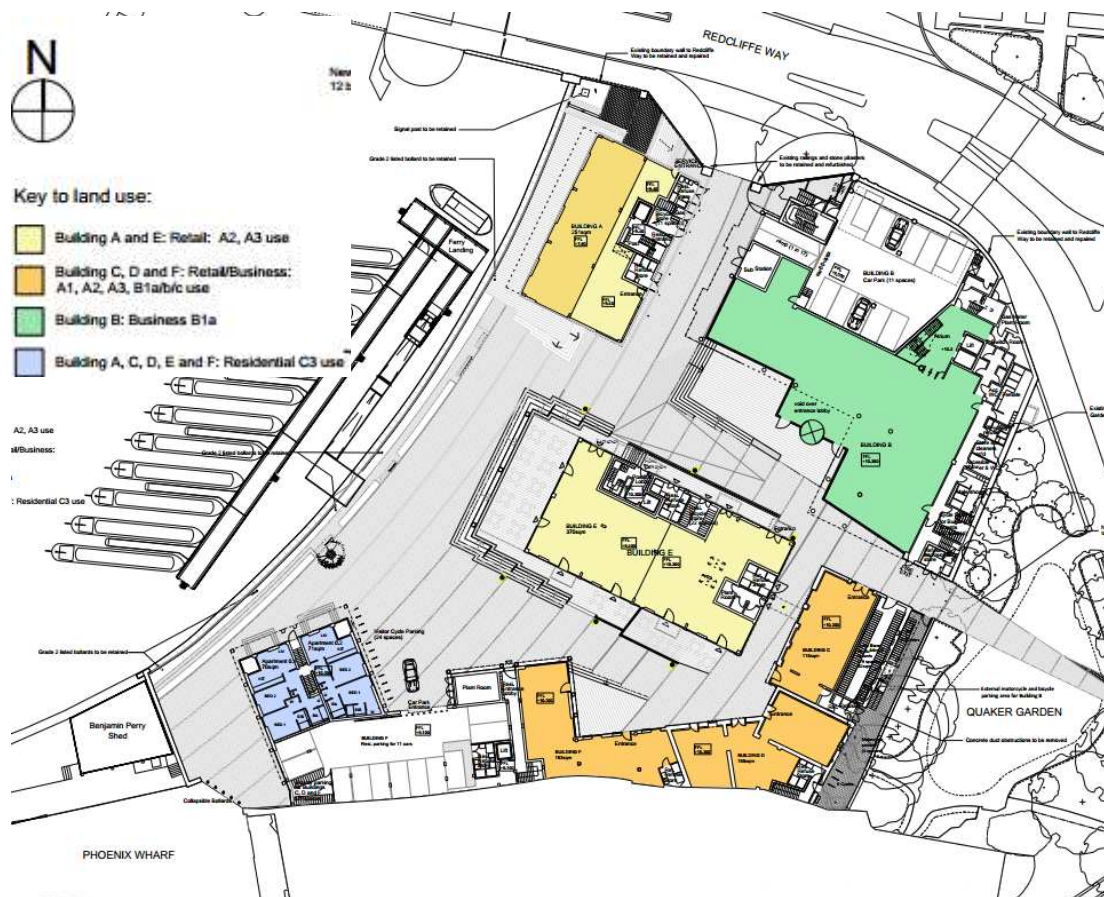


Figure 2: Proposed Site Layout

3 Noise Survey

The noise survey was carried out over the period, 1st to 3rd February 2018 with attended measurements made during the nights of 1st/2nd and 2nd/3rd February. The attended measurements were made at three positions: on the Redcliffe Wharf site, at Redcliffe Parade West, and on a floating jetty in the harbour. Two unattended measurement locations were also included: on the Benjamin Parry Boathouse and inside the Thekla. The measurement positions are shown in Figure 1 above. The unattended monitors were collected on 5th February but the Saturday night and Sunday data has not been analysed.

On both evenings there was live music followed by a club night from around 23.00 hours. On the Thursday the club night was for students finishing at 03.00 hours, while on Friday night, a Dubstep showcase took place with various DJs finishing at 04.00.

The measurements on Thursday night were carried out by Gavin Irvine and the Friday night measurements by Chris Borak. Mark Curtis from Bristol City Council met Gavin Irvine on Thursday night and made his own measurements and observations at Merchants Quay across the water from the side of the boat and on the Redcliffe Wharf site.

3.1 Equipment Details

The attended measurements were made using a Norsonic Type 140 mounted on a tripod and set to log noise levels in 15-minute periods. The unattended measurements were made using Rion NL-52 sound level meters set to log various noise parameters in consecutive 15-minute periods. The equipment was calibrated with a Brüel & Kjær Type 4231 calibrator.

3.2 Weather Conditions

Weather conditions during the survey were conducive to noise monitoring with dry conditions and no more than light-winds. It was fairly cold especially during the night. On both nights there was a gentle north-westerly breeze, which would tend to increase noise from the Thekla at Redcliffe Wharf.

3.3 Thekla Measurements

Permission to log noise levels inside the Thekla was obtained and a microphone was set up inside in an unobtrusive position on a perforated cable tray fitted close to the ceiling. The measurement position is not representative of the noise exposure of a typical audience member. In theory, a measurement made close to the ceiling, like this, would be 6dB higher than the level in the middle of the room due to the pressure doubling effect. Nevertheless, the measurements provide a general indication of noise levels inside the Thekla and can be used to determine the timings of the noisier periods.

3.4 Benjamin Parry Boathouse

The Benjamin Parry Boathouse has a 1st floor balcony by an external staircase overlooking the Floating Harbour. This was identified as a location to leave an unattended noise monitor to log noise levels over the entire survey period. The boat house is used by guide and scout groups during the evening and sporadically during the day for maintenance activities. The measurement position is shown in Figure 3 below with the Thekla opposite. The Riverstation and Severnshed restaurants can also be seen including the roof-top plant for the Riverstation.

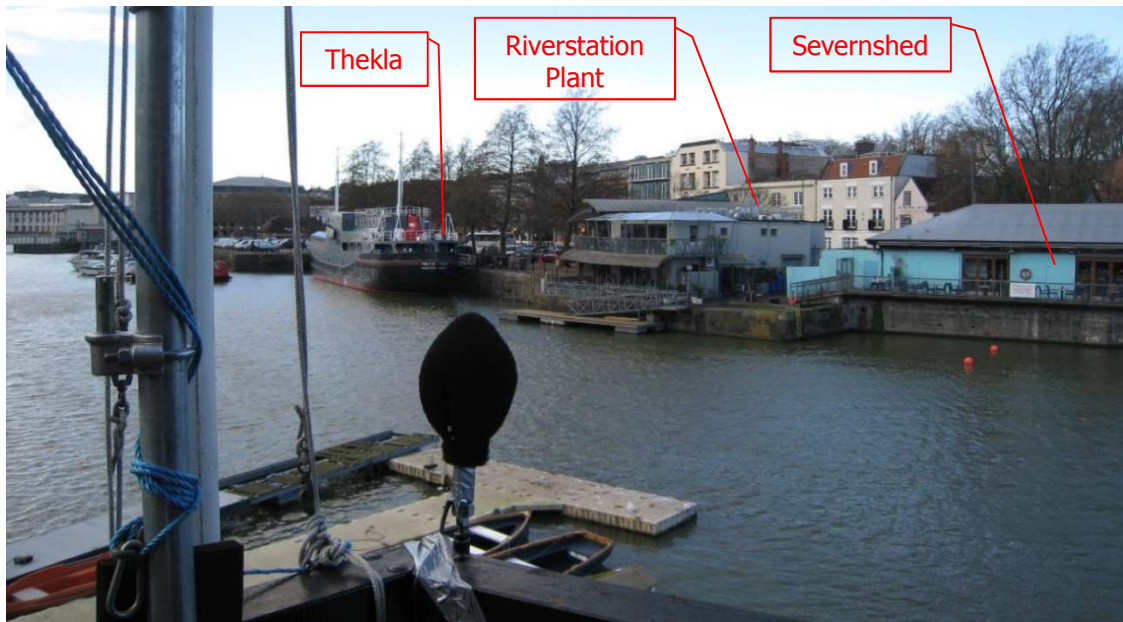


Figure 3: Benjamin Parry Boathouse Monitoring Position

4 Survey Results

The results of the surveys are provided below. Appendix B provides details of the attended measurements in octave frequency bands.

4.1 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.

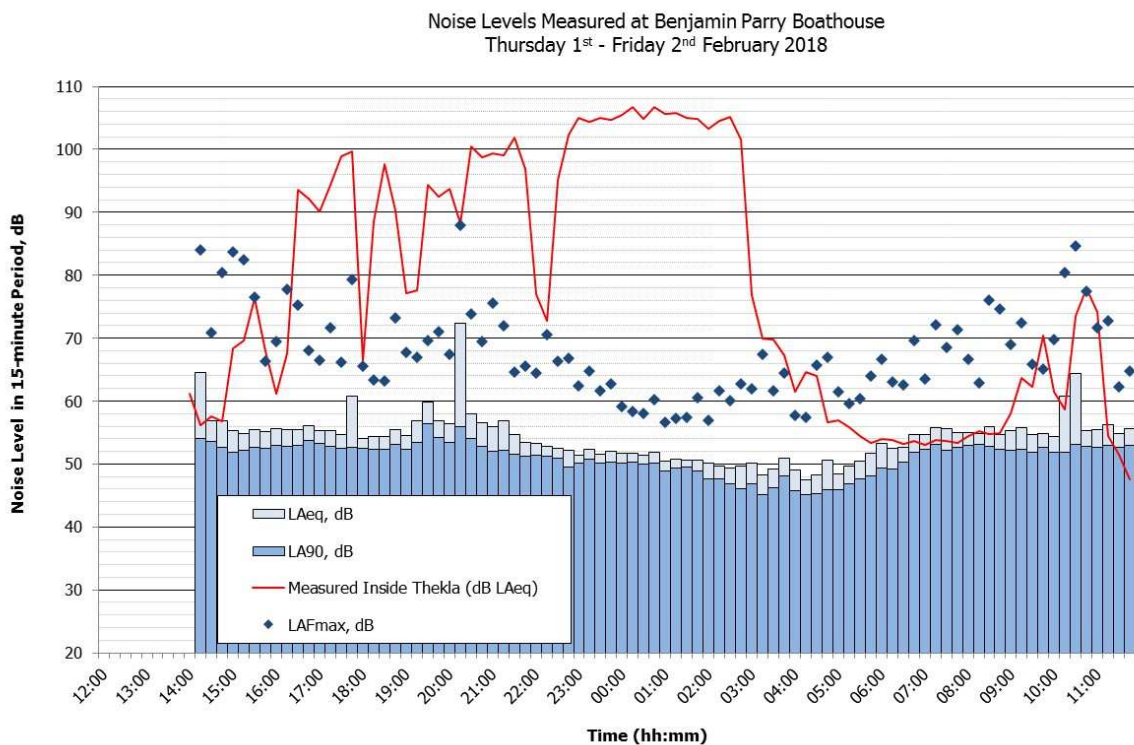


Figure 4: Noise Levels at the Boathouse 1st to 2nd February

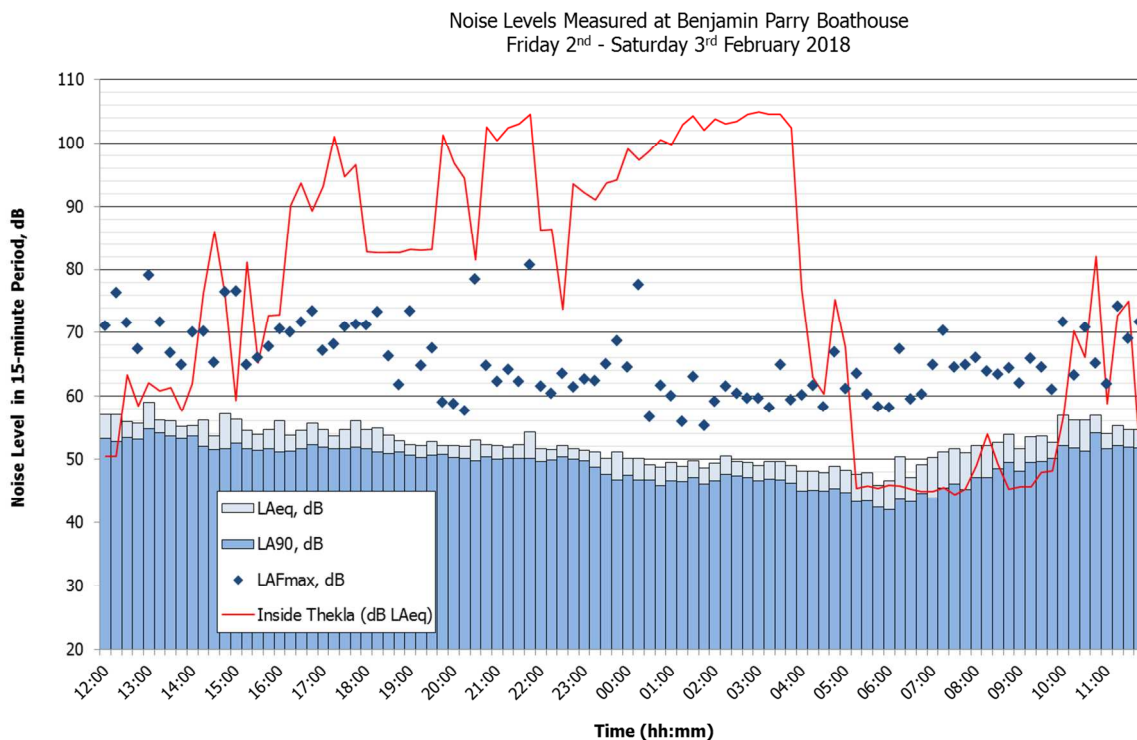


Figure 5: Noise Levels at the Boathouse 2nd to 3rd February

The Boathouse was in use during the Thursday night and there was some noise associated with that use on Thursday evening only. People were noted as leaving at 21.36 hours. Noise levels on the Thursday night prior to this are slightly elevated.

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 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 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 Boathouse) which is closer than the Redcliffe Wharf site and less affected by traffic noise.

4.2 Redcliffe Wharf Measurements

The attended measurements at Redcliffe Wharf 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 song bird 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, song birds 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.

4.3 Redcliffe Parade Measurements

The measurements at Redcliffe Parade West are set out in Table 2 below. This location overlooks the side of the Thekla and the outside deck area can be clearly seen. The outside deck is shielded by glazed sides, but nevertheless noise is clearly audible from people at times.

Table 2 – Attended Measurements at Redcliffe Parade West (RP)

Date /Time	L _{Aeq} (dB)	L _{A90} (dB)	Comments
1 Feb 21:31	51.7	49.9	Traffic noise, plant noise from the Riverstation and church bells at St Mary Redcliffe are audible. Can hear voices and bursts of laughter from the deck of the Thekla. Can just hear faint music noise at end of the period.
1 Feb 23:11	51.5	49.9	A boiler flue from a houseboat on the south side of the harbour was heard and the measurement position was move westwards to reduce its effect. There are a lot of people on deck and noise is now more significant with shouts noted with maximum levels of 61.5, 58 and 55.6 dB(A). Some bass music audible too without prominent beats.
2 Feb 00:06	53.3	51.3	Noise from people on the deck is now significant. Some traffic noise is audible. At 00.13 hours happy birthday is sung with levels up to 62 dB(A).
2 Feb 02:40	48.4	45.2	Deck is now assumed empty or at least there is no noise from it. People are leaving in different directions. Music noise is still audible and songs can be made out - Wonderwall and Perfect Day. Music noise is more distinct here than at Redcliffe Wharf. Birds are starting to sing.
2 Feb 22:23	50.2	47.5	No music audible, distant plant and traffic noise, some vehicles on the Grove opposite, voices from Ostrich Inn at Bathurst Basin, boiler flue on houseboat in floating harbour.
3 Feb 00:08	50.0	46.7	Music and some noise from Thekla smoking area is audible. Beats can be heard but it is faint. Low frequencies only.
3 Feb 02:18	49.6	46.9	Music noise is now dominant in this location including lots of rattling and resonances from ship structure: 70-74 dB at both 31.5 Hz & 63 Hz.
3 Feb 03:21	49.9	46.8	Music noise is louder than on Redcliffe Wharf site and, Music noise: 69-74dB at 63Hz, 31.5Hz now less.

4.4 Measurements on the Floating Jetty

The measurements on the floating jetty are set out in Table 3 below. During the late evening swans mounted the pontoons to roost for the night and later measurements were therefore abandoned at this position.

Table 3 – Attended Measurements on the Floating Jetty

Date /Time	L _{Aeq} (dB)	L _{A90} (dB)	Comments
1 Feb 23:47	51.4	50.0	Music noise is more audible here with crowd noise and plant noise.
2 Feb 00:53	51.6	49.6	Music and crowd noise from Thekla. During the measurement swans mount the pontoons to roost for the night. The meter was paused to minimise this.
2 Feb 21:47	53.8	49.8	Music noise faintly audible approx. 60-63dB at 63Hz, bottles binned outside Riverstation at 21:52, Plant noise from Riverstation and Severnshed, music noise stops at 22:00.
2 Feb 22:04	51.4	49.5	Background noise levels from traffic and plant noise, no music or other noise from Thekla.
2 Feb 23:50	49.7	46.6	No music audible at the beginning of measurement and no other noise from Thekla, a small group of people gather near Thekla at 23:58, can faintly hear music towards the end of the measurement.

5 Discussion

Although music noise and noise from various shouts from people outside Thekla were audible at Redcliffe Wharf, noise from Thekla did not dominate the noise climate at the Redcliffe Wharf site. The higher noise levels from Thekla for both customer noise and bass music noise were measured at a location of existing housing, on Redcliffe Parade West. At one point on Thursday night, it is thought that noise from people on the deck did raise noise levels at the Redcliffe Parade West monitoring position. And bass music from the Friday night dubstep event was thought to influence noise levels at Redcliffe Parade during the early hours of Saturday morning. It is likely that noise levels at Merchant's Quay overlooking the Thekla, would be similar to that measured at Redcliffe Parade West.

Mark Curtis from Bristol City Council advised that people noise was considerably more noticeable at Merchant's Quay than on the Redcliffe Wharf site but that subjectively he considered that music noise was more noticeable at Redcliffe Wharf. With all of the attended measurements, direct comparisons between the sites are not possible as the measurements were not taken at the same time.

A feature of the Friday night dubstep event was an intermittent low frequency buzzing caused by resonances of the ship's structure. This was heard at Redcliffe Parade and on the Redcliffe Wharf site, but not observed on the Thursday night.

We are advised by Mark Curtis of BCC that complaints have been received in the past from noise from the Thekla, but this is thought to mainly relate to people living on the house boats on the mud dock. These are much closer to Thekla than the residential buildings. It is not thought that there are any ongoing complaints from the current operation. The presence of the existing residents may constrain the Thekla's operation to some extent, although it is unlikely they would chose to operate at higher noise levels.

It is possible that warmer temperatures during the spring, summer and autumn may encourage more people out on deck, but the deck was certainly busy on the Thursday evening. In any case, noise levels from Thekla were less prominent on the Redcliffe Wharf site. This is also because of the orientation of the boat. Noise from the deck is shielded by the bridge and radiation from the side of ship is also reduced by the orientation. Some noise from people was audible from the entrance to the boat, but most of the Redcliffe Wharf site will be shielded from this location from the Riverstation and Severnshed.

At all locations 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 dB L_{Aeq} (Table 1). 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.

Nevertheless external noise levels exceed the World Health Organisation noise limits¹ for sleep disturbance (45 dB L_{Aeq}). This is based on an internal noise limit of 30 dB L_{Aeq} and openable windows. With windows shut and acoustic trickle vents or an MVHR system (mechanical ventilation heat recovery) system provided for ventilation, it will easily be possible to achieve the 30 dB L_{Aeq} internal noise limit.

¹ World Health Organisation Guidelines for Community Noise <http://apps.who.int/iris/handle/10665/66217>

In addition, an internal noise limit of NR20 will be targeted in respect of music noise from the Thekla. NR20 is an internal noise limit commonly applied by Bristol City Council when considering applications near sources of music noise. An indicative calculation indicating compliance with the NR20 noise limit is provided in Appendix C. This indicates that compliance can be achieved with a relatively modest window specification with windows achieving 36 dB R_w and an acoustic trickle vent rated at 36 $D_{n,ew}$.

Noise levels closer to the Redcliffe Way are much higher. The Hoare Lea noise survey indicates a night-time noise level of 59 dB L_{Aeq} on the façade of the closest building (A) overlooking Redcliffe Way. It is doubtful that noise from Thekla will be audible at this location.

Other potentially disturbing noise sources include late night bottle pours from the Severnshed and from the Riverstation and noise from shouts from people on the street. Bottle pours are prominent, but are short-lived and would only occur on a few occasions each evening. The Redcliffe Wharf site will in any case feature restaurants and noise from the late night economy will need to be addressed in respect of the development's own premises. It is doubtful that residents choosing to live at this development will be noise sensitive in the same way as people in a suburban or purely residential development.

6 Summary

In summary therefore, noise levels from Thekla, though audible, will not be a significant issue for the Redcliffe Wharf site. In fact there are existing residential locations with higher noise levels from the Thekla in respect of both music noise and customer noise.

Music noise and noise from shouts from people at the entrance and leaving the venue were audible on the Redcliffe Wharf site at certain times, but in overall terms, noise from road traffic and from plant noise was the most significant factor. The design of the Redcliffe Wharf site will address noise from Thekla but will also need to address the traffic noise sources and noise from the commercial premises proposed for the Redcliffe Wharf site. These measures will ensure that noise from the Thekla does not disturb future residents of Redcliffe Wharf and protect the continuing operation of the Thekla.

Appendix A – Glossary of Noise Terms

dB – Decibel.	The unit used to describe noise levels. It is a logarithmic ratio of the sound pressure relative to a reference level.
A-Weighting	A frequency weighting applied to the measured sound spectrum which adjusts the spectrum shape to simulate the frequency response of the hearing system to sound levels of varying frequencies. A weighted sound levels are referred to as dB(A).
L_{eq}	This is a quasi-average noise level which includes all the sound energy during the measurement period averaged out across the period. It is typically used to describe the ambient noise level. The A weighted value is the L_{Aeq} .
L_{90}	A statistical parameter used to describe the sound levels over the measurement period. This is the level exceeded for 90% of the measurement period and is used to describe the steady underlying background noise level in the absence of short-term events. The A weighted Level is the L_{A90} .
L_{Amax}	The L_{Amax} is the highest A-weighted noise level during a measurement period.
L_{01}	This is the level exceeded for 1% of the measurement time. This is used to indicate more typical maxima. The L_{max} is the highest level during a measurement period, but can often be a very short term single event (and is not always representative of the typical maxima).
NR	The Noise Rating (NR) is an alternative method of rating a noise spectrum. It comprises a family of curves in 1dB steps as defined for example in BS 8233: 2014. The NR value is the lowest curve which is not exceeded by the noise spectrum under consideration. Typically, for plant noise, the NR level is 5 to 6 dB lower than the A-weighted level.

Appendix B – Octave Band Data from Attended Measurements

Date (dd/mm/yy hh:mm:ss)	Duration (mm:ss)	Location	LAeq (dB)	LA90 (dB)	Leq Spectrum							
					31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1.0 kHz	2.0 kHz	4.0 kHz
01/02/18 21:12:09	15:00	RW	50.4	48.6	63.1	60.5	55.6	50.3	47.2	46.3	40.6	33.2
01/02/18 23:30:26	15:00	RW	48.9	46.9	61.8	61.9	53.9	49.0	45.6	44.8	39.1	31.0
02/02/18 00:31:07	15:00	RW	49.1	46.9	59.9	61.9	54.6	48.6	45.7	45.1	39.3	31.5
02/02/18 02:21:49	15:00	RW	47.7	44.9	61.3	59.5	54.4	48.2	43.5	43.1	37.8	34.2
02/02/18 02:58:24	15:00	RW	48.2	44.9	56.3	55.2	50.3	46.9	44.4	44.5	40.2	32.1
02/02/18 21:27:14	15:00	RW	52.1	48.4	62.6	61.6	59.8	53.7	48.2	47.4	41.7	35.0
02/02/18 23:33:15	15:00	RW	50.1	46.7	63.7	60.6	54.0	49.6	46.4	46.3	41.0	34.9
03/02/18 01:57:12	15:00	RW	47.9	44.3	66.3	64.4	54.2	46.1	43.3	43.8	38.0	34.2
03/02/18 03:02:35	15:00	RW	49.9	43.9	64.3	66.8	54.6	44.6	41.0	41.8	45.8	38.5
03/02/18 03:42:40	15:00	RW	48.5	43.6	62.4	65.0	54.1	45.5	41.1	42.3	43.1	36.6
01/02/18 21:31:57	15:00	RP	51.7	49.9	62.6	59.3	55.0	51.9	49.0	47.8	42.1	32.8
01/02/18 23:11:58	15:00	RP	51.5	49.9	57.8	63.0	54.6	49.6	49.3	47.7	41.6	32.8
02/02/18 00:06:14	15:00	RP	53.3	51.3	57.6	64.0	56.8	49.8	50.9	49.5	44.0	34.7
02/02/18 02:40:29	15:00	RP	48.4	45.2	54.1	59.2	57.0	47.9	45.1	43.5	38.1	30.3
02/02/18 22:23:59	15:00	RP	50.2	47.5	57.7	54.9	52.5	49.0	47.2	46.6	40.8	34.1
03/02/18 00:08:25	15:00	RP	50.0	46.7	60.5	61.1	52.8	48.2	47.5	46.1	40.6	30.9
03/02/18 02:18:08	15:00	RP	49.6	46.9	68.9	71.5	56.2	46.7	45.9	44.7	38.3	31.8
03/02/18 03:21:37	12:07	RP	49.9	46.8	66.2	70.0	57.8	47.7	44.7	43.9	42.2	34.7
01/02/18 23:47:41	15:00	Jetty	51.4	50.0	60.1	64.3	60.4	51.6	48.6	46.4	40.2	32.9
02/02/18 00:53:38	15:00	Jetty	51.6	49.6	61.3	65.3	61.2	50.4	48.7	46.3	40.3	34.0
02/02/18 21:47:15	15:00	Jetty	53.8	49.8	61.6	62.1	58.8	53.1	49.9	47.6	46.0	44.0
02/02/18 22:04:05	15:00	Jetty	51.4	49.5	61.6	60.4	57.1	51.9	48.6	46.8	40.9	34.6
02/02/18 23:50:26	15:00	Jetty	49.7	46.6	59.5	62.6	54.9	49.3	46.1	45.4	40.1	34.3

Appendix C - Indicative Calculation to Achieve NR20

		63	125	250	500	1000	2000	4000		
Building Envelope Sound Insulation Calculation According to EN 12354-3										
Redcliffe Wharf		Date 03/04/2018								
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 3/2/1801:57								
	Measured spectrum	L: Redcliffe Wharf 3/2/1801:57: Adj Spectrum	64.4	54.2	46.1	43.3	43.8	38.0	34.2	48.1
		K	3	3	3	3	3	3	3	
L _{max,ff}	Measured L _{max}	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)	54.0	Sew	Sf - Swi	7.9				
	RT	RT (secs)	0.5	Srr	Area of ceiling (m ²)	0.0				
	Sf	Facade area (inc. window) (m ²)	13.5	S	Sf + Srr	13.5				
	Sr	Roof area		Ao	Ref Area for Dnew	10.0				
	Swi	Window area (m ²)	5.6	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}	Greenwood 1600DN	30	33.4	39.4	42.5	38.2	32.5	31.1	36
	A ₀ /S x 10 ^{-Dn/10}	B	0.001	0.000	0.000	0.000	0.000	0.000	0.001	
		L _{eq} Internal SPL	35.0	21.4	7.3	1.4	6.2	6.1	3.7	14.0
		L _{max} Internal SPL	43.9	33.0	18.7	26.0	31.5	31.0	27.2	36.1
window	R _{wi}	Velfac G7 - 36dB Rw	23	21.7	23.1	34.1	38.5	39.4	41.1	36
	S _{wi} /S x 10 ^{-Rwi/10}	C	0.002	0.003	0.002	0.000	0.000	0.000	0.000	
		L _{eq} Internal SPL	42.5	33.6	24.1	10.3	6.4	-0.3	-5.8	21.6
		L _{max} Internal SPL	54.4	48.2	38.5	37.9	34.7	27.6	20.7	40.0
Primary wall	R _{ew}	Example Wall from BS8233 (Brick and Block)	36	40	44	45	51	56	58	51
	S _{ew} /S x 10 ^{-Rew/10}	D	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
		L _{eq} Internal SPL	31.0	16.8	4.7	0.9	-4.6	-15.4	-21.2	7.5
		L _{max} Internal SPL	42.9	31.4	19.1	28.5	23.7	12.5	5.3	28.4
Roof	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										
	10 Log (B+C+D+E)	F	-25.3	-24.9	-26.7	-36.5	-37.6	-33.3	-32.2	
	A (furnished)	Room Absorption	17	17	17	17	17	17	17	
	10 log (S/A)	G	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	-1.1	
L _{eq}	Calc Tolerance	T	3	3	3	3	3	3	3	
	Internal L _{eq,2}	L+F+G+K+T	44.1	34.2	24.3	11.7	11.2	9.6	7.0	23.0
L _{max}	Calc Tolerance	T	3	3	3	3	3	3	3	
	Internal L _{max,2}	M+F+G+K+T	56.0	48.8	38.7	39.3	39.5	37.5	33.5	44.3
			18	18	16	9	11	11	8	23.1
		NR20	51	39	31	24	20	17	14	
		Excess	-6.9	-4.8	-6.7	-12.3	-8.8	-7.4	-7.0	