SRL

Project

Manchester University
Nitrogen and Chemistry Extension
(Nitrogen storage facility)

Prepared for

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Summary

SRL Technical Services Limited has been commissioned by Halliday Meecham on behalf of the University of Manchester to assess noise emissions from proposed new plant associated with a nitrogen storage facility as part of a re-fit of the Chemistry Building.

The proposed plant consists of three compressors which are ducted to the atmosphere via external ductwork on the roof of a single storey annex. The nearest noise sensitive receptors are residential properties on Upper Brook Street and Glenbarry Close. Existing noise levels have been measured at these locations during the day, evening, night and early morning time periods. Predicted noise levels from the proposed plant has been assessed against these survey results.

Noise from the proposed plant, after taking into account distance, acoustic features of the plant, and screening from the Chemistry Building, is predicted to be at least 5dB lower than the measured background level, in all octave bands, at the noise sensitive receptors. This is what Manchester City Council's planning guidance requires.





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Contents

Summary 3

1.0 Introduction 5

2.0 Survey 5

3.0 Noise Criteria 5

4.0 Assessment 5

5.0 Conclusions 13

Appendix A - Survey Details 14

Appendix B - Measured background noise levels 17

Appendix C - Calculation of plant noise levels at receivers 20

Appendix D - Noise Measurement Parameter Definitions 22

1.0 Introduction

SRL Technical Services Ltd have been commissioned to do a noise survey and assessment of plant proposed to be installed at the Chemistry Building, University of Manchester. The plant consists of three compressors ducted to the atmosphere via roof top flues.

The main sources of noise in the area are Upper Brook Street, a main road and other operating plant on the Chemistry Building and neighbouring University buildings.

2.0 Survey

Existing noise level data has been obtained through manned measurements at the nearest noise-sensitive receptors and near the Chemistry Building itself during different periods of the day and night.

Technical details of the survey are given in Appendix A. Full results are given in Appendix B.

3.0 Noise Criteria

Regarding external plant, Manchester City Council has the following advice for planning applications on their website:

> *"Externally mounted ancillary plant, equipment and servicing should be acoustically treated in accordance with a scheme designed so as to achieve a noise level of 5dB below the existing background (LA90) in each octave band at the nearest noise sensitive location.".*

Section 3.6.1.5 of Manchester City Council's noise guidance document also states that where use of equipment generates high noise levels over a short period of time (e.g. bangs) on a regular basis, these should be controlled to not exceed LAmax 60 dBA at the façade of nearby noise sensitive premises.

4.0 Assessment

The proposed new nitrogen storage facility plant to be installed in the annex of the Chemistry Building consists of three compressors which are ducted to the atmosphere. Figure 1 shows the location of the plant. It is understood that the plant will operate 24 hours a day. Assessments have been made to the residential properties at Glenbarry Close and Upper Brook Street. A site plan showing these receptors can be found in Appendix A.

The methodology set out in BS 4142:2014 "Methods for rating and assessing industrial and commercial sound" provides a way of assessing noise from new noise sources against the existing noise climate. When comparing the noise source against existing background levels, BS 4142 highlights that certain acoustic features (tonality, impulsivity, intermittency etc) can increase any significance of impact and penalties are applied to the noise level of the plant. Reduction in level due to distance and screening are also taken into account to form the 'rating level' at the noise sensitive receptor.

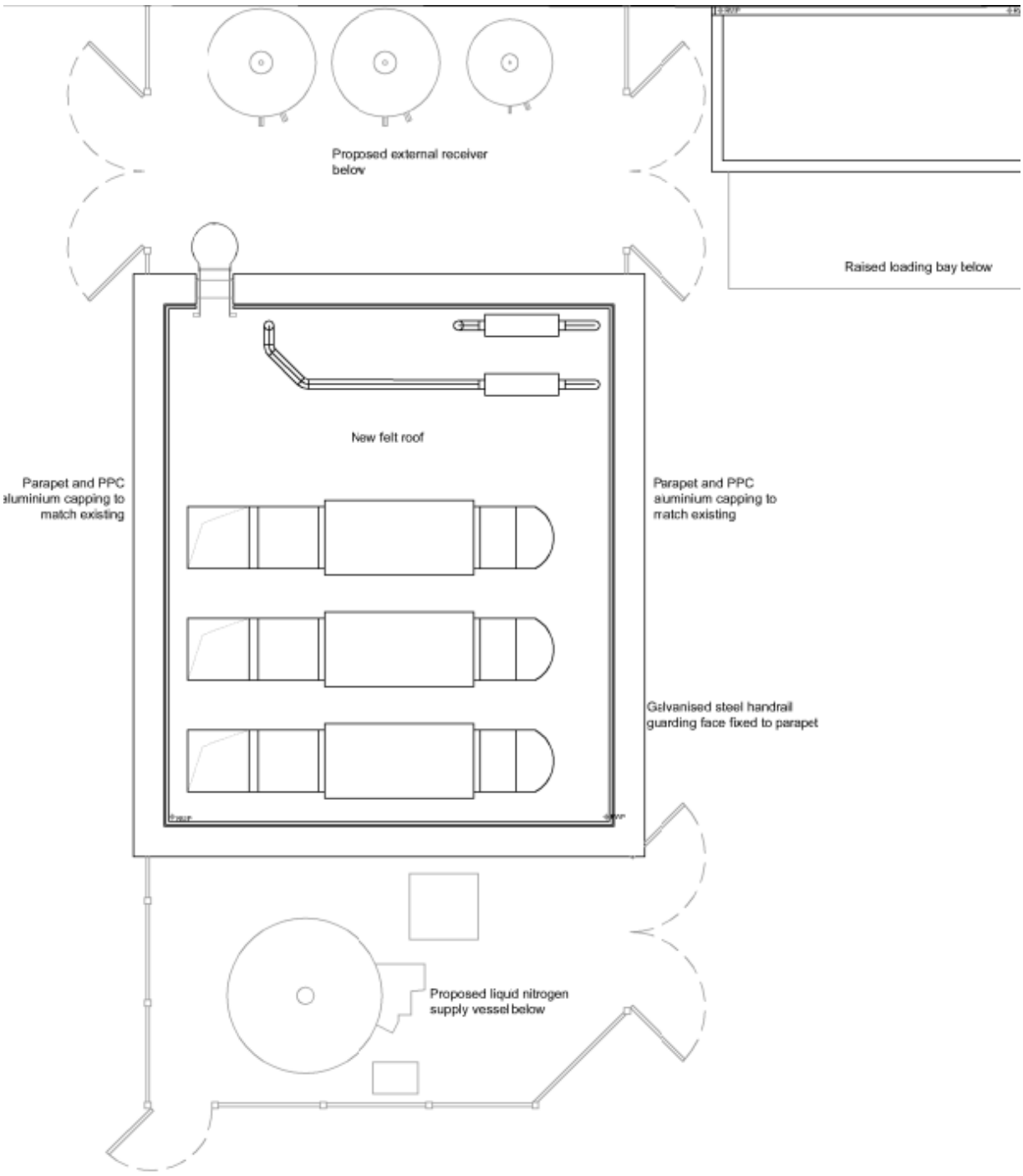

Figure 1: Extract of annex drawing showing location of compressor ductwork.

Table 1: Octave band sound power levels for compressor exhausts

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Outlet Sound Power Levels (dB)	72	75	69	66	64	54
Correction for three generators (dB)	+5	+5	+5	+5	+5	+5
***Acoustic feature correction (dB)**	0	0	0	0	0	0
Corrected Sound Power Levels (dB)	80	83	77	74	72	62

* It was not possible to assess any tonal features of the plant in operation as there is neither similar plant already installed on site or sufficient data provided to make an objective assessment.

4.1 Assessment to Glenbarry Close

Tables 2-5 shows the noise from the compressors assessed to residences at Glenbarry Close, approximately 139m from the plant. Calculation of L_{eq} levels at the receiver positions is presented in Appendix C.

Table 2: Assessment to Glenbarry Close (day)

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Rating level of plant at Glenbarry Close (dB)	5	5	-4	-10	-15	-28
Typical measured L_{90} at Glenbarry Close [Day] (dB)	60	56	53	52	47	38
Difference (dB)	-55	-51	-57	-62	-62	-66

Table 3: Assessment to Glenbarry Close (Evening)

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Rating level of plant at Glenbarry Close (dB)	5	5	-4	-10	-15	-28
Typical measured L_{90} at Glenbarry Close [Evening] (dB)	57	53	49	49	44	38
Difference (dB)	-52	-48	-53	-59	-59	-66

Table 4: Assessment to Glenbarry Close (Night)

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Rating level of plant at Glenbarry Close (dB)	5	5	-4	-10	-15	-28
Typical measured L_{90} at Glenbarry Close [Night] (dB)	55	50	47	44	39	37
Difference (dB)	-50	-45	-51	-54	-54	-65

Table 5: Assessment to Glenbarry Close (Early morning)

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Rating level of plant at Glenbarry Close (dB)	5	5	-4	-10	-15	-28
Typical measured L_{90} at Glenbarry Close [Early Morning] (dB)	55	51	48	45	41	37
Difference (dB)	-50	-46	-52	-55	-56	-65

4.2 Assessment to Upper Brook Street

Tables 6-9 show the noise from the compressors assessed to residences at Upper Brook Street, approximately 130m from the plant. Calculation of L_{eq} levels at the receiver positions is presented in Appendix C.

Table 6: Assessment to Upper Brook Street (day)

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Rating Level of plant at Upper Brook Street (dB)	5	5	-4	-10	-15	-28
Typical measured L_{90} at Upper Brook Street [Day] (dB)	60	59	57	60	54	43
Difference (dB)	-55	-54	-61	-70	-69	-71

Table 7: Assessment to Upper Brook Street (Evening)

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Rating Level of plant at Upper Brook Street (dB)	5	5	-4	-10	-15	-28
Typical measured L_{90} at Upper Brook Street [Evening] (dB)	58	55	52	53	47	39
Difference (dB)	-53	-50	-56	-63	-62	-67

Table 8: Assessment to Upper Brook Street (Night)

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Rating Level of plant at Upper Brook Street (dB)	5	5	-4	-10	-15	-28
Typical measured L_{90} at Upper Brook Street [Night] (dB)	56	54	50	47	43	37
Difference (dB)	-51	-49	-54	-57	-58	-65

Table 9: Assessment to Upper Brook Street (Early morning)

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
Rating Level of plant at Upper Brook Street (dB)	5	5	-4	-10	-15	-28
Typical measured L_{90} at Upper Brook Street [Early Morning] (dB)	56	54	49	48	44	37
Difference (dB)	-51	-49	-53	-58	-59	-65

5.0 Conclusions

The University of Manchester is proposing to install three compressors within a single storey annex at the Chemistry Building. These compressors will be ducted to the atmosphere via external ductwork on the roof. A noise survey has been done to obtain existing background noise level data during different times of the day and night at nearby noise sensitive receptors. These levels have been compared to the calculated rating levels of the plant at these receptors.

The rating levels of the plant are predicted to be at least 5dB lower than the measured background levels, in all octave bands, at the noise sensitive receptors. This is what Manchester City Council's planning guidance requires.

Appendix A - Survey Details

A1. Location of Survey

University of Manchester Chemistry Building, Brunswick Street

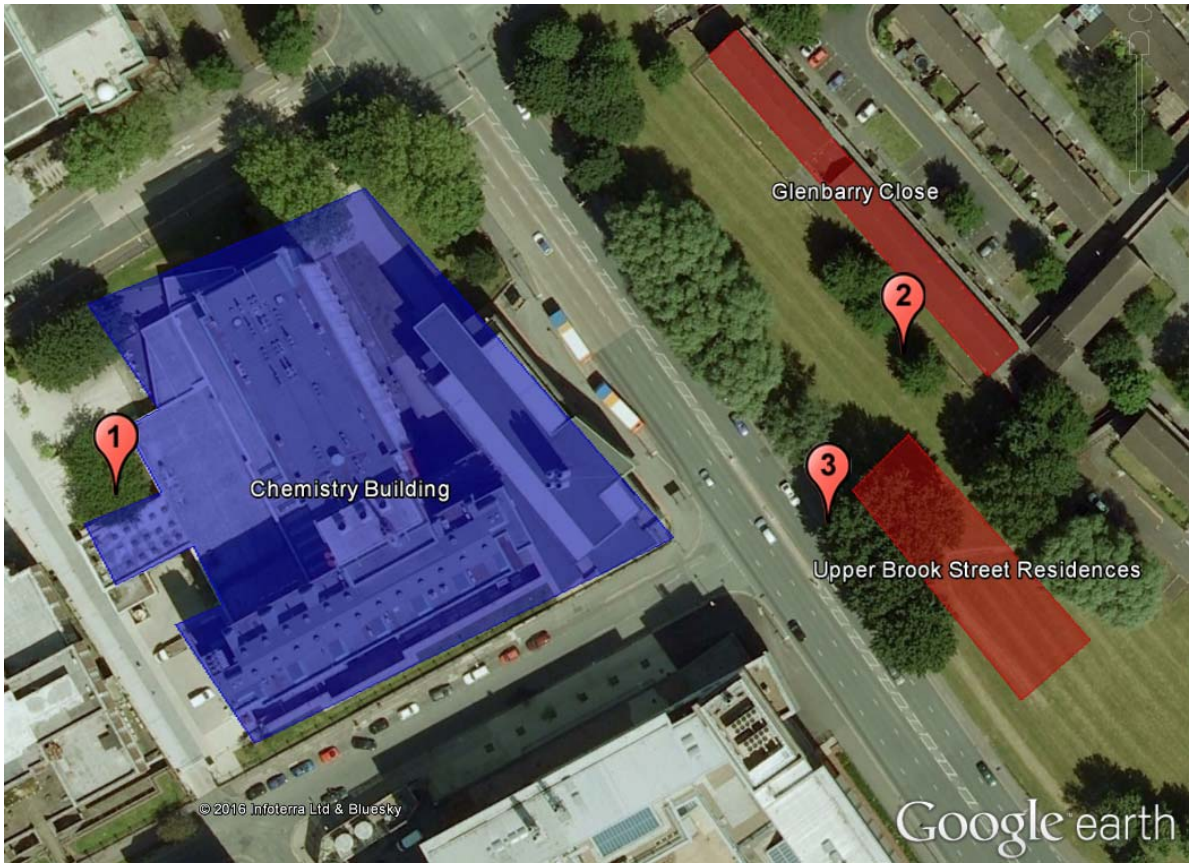

Figure 2: Aerial photograph of the site, with measurement locations and noise sensitive receivers (red) N.B. Residences at Position 3 were not built at the time of this photograph. Image: Google

A2. Date & Time of Survey

Day time survey - 14:31 to 16:44 on Thursday 31 March 2016

Evening survey - 20:17 to 21:34 on Tuesday 12 March 2016

Night time survey - 03:00 to 03:40 Wednesday 13 April 2016

Early morning survey - 05:00 to 05:40 on Wednesday 13 April 2016

A3. Personnel Present During Survey

All surveys: Jago Edwards (SRL)

A4. Weather Conditions during Survey

Daytime survey - Sunny, warm with some cloud cover and little wind. Weather reports for the area indicate that the temperature ranged from 10˚C to 12˚C.

Evening, night and early morning survey - Cool, some cloud cover and little wind. Weather reports indicate the temperature ranged from 2˚C to 8˚C.

A5. Instrumentation

B&K Type 2250 Sound Level Meter (SRL 2250 Purple, SRL No. 519) (serial No. 2559287)

B&K Type 4189 Microphone (SRL No: 519) (serial No. 2573767)

B&K Type ZC-0032 (serial No. 5843)

B&K Type 4231 Calibrator (SRL No:520) (serial No:2564290)

A6. Calibration Procedure

Before and after the survey the measurement apparatus was check calibrated to an accuracy of ±0.3 dB using the type 4231 Sound Level Calibrator. The Calibrator produces a sound pressure level of 93.8 dB re 2 x 10-5 Pa at a frequency of 1 kHz. No significant drift was observed.

A7. Survey Procedure

Ambient noise levels were monitored at various positions around the site as shown on Figure 1. The measurements are tabulated in Appendix B, and explanations of the parameters used are listed in Appendix D.

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Appendix B - Measured background noise levels

B1. L_{90} Octave Band Levels - Day time

Pos	Time	63	125	250	500	1k	2k	4k	8k	(A)
1	14:31	64	58	54	50	48	43	36	21	53
	14:37	64	58	54	50	47	42	35	21	53
	15:24	63	58	54	50	48	42	35	21	53
	15:30	63	57	54	50	48	42	35	21	53
	16:13	64	58	54	50	48	42	35	20	53
	16:44	66	59	55	50	47	42	34	20	54
2	14:55	67	60	56	54	53	47	39	24	57
	15:01	66	60	56	53	52	47	38	23	56
	15:40	66	61	58	55	54	49	40	24	58
	15:46	66	60	58	54	54	49	40	25	58
	16:23	66	60	57	53	52	48	39	24	57
	16:35	66	61	58	54	53	49	40	24	58
3	15:09	69	60	58	56	58	53	41	28	62
	15:15	67	60	59	57	60	54	43	29	63
	15:57	69	62	59	57	60	55	44	29	63
	16:03	67	61	60	58	62	57	45	30	65

B2. L_{90} Octave Band Levels - Evening

Pos	Time	63	125	250	500	1k	2k	4k	8k	(A)
2	20:17	65	58	55	51	52	48	39	23	56
	20:23	64	58	56	52	52	48	39	24	56
	20:43	65	58	55	51	51	47	40	24	59
	20:49	63	57	54	49	50	45	38	23	61
	21:09	63	57	53	49	49	44	38	23	56
	21:15	65	58	53	49	50	45	38	23	54
3	20:29	65	59	58	54	56	50	40	27	60
	20:35	65	59	57	55	58	52	41	27	58
	20:57	65	59	57	54	56	50	41	27	53
	21:02	64	58	56	52	55	49	40	26	54
	21:22	64	58	56	52	53	47	39	25	57
	21:28	63	58	55	52	53	47	39	25	56

B3. L_{90} Octave Band Levels - Night

Pos	Time	63	125	250	500	1k	2k	4k	8k	(A)
2	03:00	61	54	50	46	44	39	37	22	50
	03:14	62	55	50	47	44	39	37	22	50
	03:28	62	55	50	47	44	39	36	22	50
3	03:07	61	55	54	49	47	41	37	22	52
	03:21	62	56	54	50	47	43	37	23	53
	03:35	62	55	53	50	48	42	37	25	52

B4. L_{90} Octave Band Levels - Early Morning

Pos	Time	63	125	250	500	1k	2k	4k	8k	(A)
2	05:00	62	55	50	47	45	42	38	23	51
	05:13	62	55	51	48	45	41	37	22	51
	05:28	62	55	50	47	46	41	37	22	51
3	05:06	61	55	53	50	47	42	38	25	52
	05:21	62	56	54	49	48	44	37	25	53
	05:35	62	55	53	50	50	44	39	25	53

Appendix C - Calculation of plant noise levels at receivers

C1. Glenbarry Close

Table 10: Assessment to Glenbarry Close

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
A. Corrected Sound Power levels (dB) **(from Table 1)**	77	80	74	71	69	59
B. Correction for conversion from Sound Power to Sound Pressure, and Distance attenuation (dB)	-51	-51	-51	-51	-51	-51
C. Correction for screening by the Chemistry building itself (Δ=9.18) (dB)	-21	-24	-27	-30	-33	-36
D. Rating level at Glenbarry Close (A+B+C=D) (dB)	5	5	-4	-10	-15	-28

C2. Upper Brook Street

	Octave Band Centre Frequency (Hz)					
	125	**250**	**500**	**1k**	**2k**	**4k**
A. Corrected Sound Power levels (dB) **(from Table 1)**	77	80	74	71	69	59
B. Correction for conversion from Sound Power to Sound Pressure, and Distance attenuation (dB)	-50	-50	-50	-50	-50	-50
C. Correction for screening by the Chemistry Building itself (Δ=9.18) (dB)	-21	-24	-27	-30	-33	-36
D. Rating Level at Upper Brook Street (A+B+C=D) (dB)	5	5	-4	-10	-15	-28

Appendix D - Noise Measurement Parameter Definitions

L_{A90} - The "A" weighted sound pressure level that is exceeded for 90% of the measurement period. It is commonly used as the "Background Noise Level".

L_{Aeq} - The "A" weighted equivalent continuous sound pressure level. A representation of a continuous sound level containing the same amount of sound energy as the measured varying noise, over the measurement period. This may be thought of as the "average" sound level.

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