

M77 DBFO O&M

Year 1 – Traffic Noise Assessment

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Executive Summary

MouchelParkman Services Limited was engaged by Raynesway Construction Southern on behalf of Connect Road M77/GSO to provide Design Support Services in relation to the M77 extension from Malletshaugh in East Renfrewshire to Fenwick in East Ayrshire, together with the Glasgow Southern Orbital link from the M77 to East Kilbride.

MouchelParkman conducted a noise survey at 51 locations from the GSO road at East Kilbride to Fenwick on the M77 on behalf of Connect Road Operators. The findings are detailed within this report.

Two properties, [Redacted] and [Redacted] are recommended for an 18 hour noise measurement and comparison with pre-construction sound levels in accordance with the Noise Insulation (Scotland) Regulations 1975.

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1 Introduction

1.1 Project client

MouchelParkman Services Limited were engaged by Raynesway Construction Southern on behalf of Connect Road M77/GSO to undertake noise measurements at properties identified in the DBFO Contract Documents (The M77(Fenwick to Malletsheugh)/Glasgow Southern Orbital DBFO Project, Appendix 1/9 Cont, Table 9/2 Noise control stations – M77), appendix A. The noise measurements and assessment are required as part of a 12 month noise survey after the opening of the M77 and GSO roads.

1.2 Scheme

The M77/DBFO project was opened to traffic in April 2005. The contract documents include the requirement to undertake noise surveys in accordance with 'Memorandum on the Noise Insulation (Scotland) Regulations 1975 Regulations 3 and 6' (MNIR). The methodology and survey are presented in sections 2 and 4 respectively of this report. The instrumentation used is recorded in appendix C. A glossary of terms can be found in appendix D.

The extents of the noise survey included the GSO road from East Kilbride to Junction 5 of the M77 and from Junction 5 of the M77 to a point where the M77 terminates and the A77 near Fenwick, see location plans in appendix E.

1.2.1 Locations

Noise measurements were taken at 51 predetermined locations required by the contract. A list of the noise locations can be seen in appendix A.

1.3 Expert Consultants

MouchelParkman Services Ltd consulted Hamilton and McGregor (acoustic division) to help determine best practice for the noise assessments and to review the results of the measurements.

1.4 Landowners

A letter was drafted to the occupiers of each noise assessment location to explain the need for road traffic noise survey so as to assess the noise impact of the GSO and M77 roads 12 months after their opening. The letter explained how the noise survey would be conducted. A letter drop was conducted on Wednesday 12th April and Thursday 13th of April covering all the noise assessment locations in the contract documents, appendix A.

1.5 Previous Information

No information has been made available to MouchelParkman Services Ltd regarding noise levels in the study area prior to construction of the scheme. The noise levels immediately before construction need to be compared with the survey results to assess whether the 'specified level' (68 dB) had been exceeded and that there was a

change in noise level greater than 1 dB. This would be used to assess eligibility for insulation work/compensation under the Noise Insulation (Scotland) Regulations 1975. In the absence of this data no conclusion on eligibility can be reached.

2 Survey Methodology

2.1 Method

The noise measurements were undertaken on weekdays during the period of 18 April 2006 and 27 April 2006.

The MNIR permits a shortened measurement methodology to undertake traffic noise surveys. This approach was adopted for the survey. The MNIR advises that road traffic noise measurement periods lasting 15 minutes are sufficient at each location. 'For busy main roads it is usual to find that, apart from the morning and evening peak flows, there is a period between 10 am and 4 pm when the flow could be comparatively uniform. If in doubt in any particular case a check on traffic flow will be needed. Assuming however that this point is established a sample should be taken lasting 15 minutes and containing at least 200 readings. The L₁₀ result so obtained would normally be about 2 dB(A) above that obtained from a survey covering the period 6 am to midnight.' The memorandum also states that, 'The measurement should be at the most exposed part of the most affected window of the façade of the building facing the traffic noise.'

The sampling period set out in the MNIR under paragraph 9.e. states that 'for busy roads it is usual to find that, apart from the morning and evening peak flows, there is a period between 10 am and 4 pm when the flow could be comparatively uniform.' It is important to measure the noise levels during a period where the noise level is uniform to gain a reading that can be factored to represent a L_{10 18hour} level which is required by the Noise Insulation (Scotland) Regulations 1975.

At each measurement location, a pole mounted microphone was supported by a tripod and located at the most exposed window. The microphone was protected by a windshield. Measurements were taken from the most exposed window to the road (M77 or GSO), 1 metre from the façade of the property.

The instrumentation used during the survey is listed in Appendix C. Each meter was calibrated at the start and end of the monitoring session, using a calibrator itself calibrated within the last three months using a system which has in the last year been NAMAS calibrated by an accredited laboratory. No significant drift in calibration occurred during the monitoring.

The sound level meters (SLMs) employed were set to monitor A-weighted noise levels. Each was pre-programmed to record the L_{Aeq} and L₁₀ amongst other indices.

The weather was conducive to noise monitoring throughout the period of the survey, i.e. dry with wind speeds less than 5 m/s.

Noise measurements were taken for 15 minutes at each location in appendix A. The measurement data is presented in appendix B.

3 Land Owners Comments

3.1 Comments

3.1.1 [Redacted], Wednesday 3rd May

[Redacted] contacted MouchelParkman Services Ltd on Wednesday the 3rd of May to determine if a noise assessment had been conducted at her premises. It was confirmed that a noise assessment had been conducted at the northern most extent of her premises which would be the closest to the GSO road. [Redacted] requested another survey of [Redacted] as she considered the noise level to be considerably greater at upper floor level.

The upper window of [Redacted] would not be the most exposed window to the GSO road, but would be one of the most exposed windows to a local road which would connect with the GSO road.

3.1.2 [Redacted], Tuesday 9th of May

[Redacted] contacted MouchelParkman Services Ltd on Tuesday 9th of May to question the relevance and accuracy of the noise survey. [Redacted] requested a copy of the MNIR. A copy of the MNIR was subsequently sent to [Redacted] on the 9th of May.

3.2 Common concerns

The majority of property owners who made contact with MouchelParkman Services Ltd were disappointed that the noise survey would not be conducted during peak traffic times.

As noted in section 2 of the report the noise measurements were carried out during a time period where the traffic noise was constant in order to gain a factored value for the L_{10 18 hour} noise level.

3.3 Additional Properties

3.3.1 [Redacted] Titwood Road

An additional property was tested ([Redacted], Titwood Road) due to confusion with addresses. [Redacted], Titwood Road is no longer known as [Redacted] the address formally known as [Redacted] has access from Hazelden Road not Titwood Road.

3.3.2 [Redacted]

[Redacted] was retested at 17:10 on the 26th of April 2006 upon the request of [Redacted]. The additional survey was conducted from the south western extent of the building facing the M77.

4 Results and Discussion

4.1 Results

The results of the noise survey were adjusted in accordance with the MNIR by the subtraction of 2 dB to simulate a $L_{1018 \text{ hour}}$ noise level.

The results are tabled in appendix B.

4.2 Discussion

The measurement data shows that four corrected (-2dB) noise level measurements are in excess of the level ($L_{10} 18 \text{ hour} = 68 \text{ dB(A)}$) set out in the Noise Insulation Regulations 1975. The properties are:

Location	L_{Aeq} (dB)	L_{A10} (dB)
[Redacted]	76.2	79.3
[Redacted]	70.5	72.8
[Redacted]	67.7	69.9
[Redacted]	65	69.9

Table 1. Properties over 68 dB after adjustment

In addition, sound level measurements taken at Glaister Bridge and [Redacted] are close to L_{A10} 68 dB.

Glaister Bridge has a factored L_{A10} of 66.9 dB (unfactored 68.9 dB). The result would be greater than expected for the distance away from the M77 and could be explained by observing the L_{90} result from the same test at 53.3 dB and the L_{Aeq} at 64.2. A difference of over 4 dB between the L_{A10} and L_{Aeq} suggests that intermittent noise could be attributed to a greater than expected L_{A10} sound level. This would be correlated with notes made at the time indicating that Glaister Bridge is next to a trafficked local road which provided maximum noise levels over 70 dB.

The measurement undertaken in accordance with the MNIR measurement methodology at Glaister Bridge was conducted a second time producing a factored L_{A10} reading of 66 dB in accordance with the MNIR.

The three properties, [Redacted] would not be classed as dwellings or residential buildings and would not qualify for eligibility under regulation 7. (1). (a) and (b) of the 'Noise Insulation (Scotland) Regulations 1975.

5 Conclusion

Two properties, [Redacted] and [Redacted] would be recommended for further study. Further study would include an $L_{10\ 18\ \text{hour}}$ noise assessment and comparison with pre-construction sound levels.

Appendix A

Station	Location	Setup	Time	Date
M77 1	[Redacted]	Upper, western extent, south.	15:50	25/04/06
M77 2	[Redacted]	Upper, western extent, west	10:25	21/04/06
M77 3	Kilmaurs Road	Lower, eastern extent, north	10:00	21/04/06
M77 4	Langside Fenwick	Lower, central, south	16:30	25/04/06
M77 5	Little Fenwick	Upper, eastern extent, south	12:10	20/04/06
M77 6	[Redacted] Stewarton Road, Fenwick	Lower, central, west.	15:20	25/04/06
M77 7	Glaister Bridge	Upper, north eastern extent, east	15:10	20/04/06
M77 8	[Redacted] Rysland Drive, Fenwick	Lower, central, west	14:30	25/04/06
M77 9	[Redacted] Blackfauld Gardens, Fenwick	Lower, northern extent, west	14:55	25/04/06
M77 10	Townend	Lower, northern extent, west	15:15	24/04/06
M77 11	[Redacted]	Lower, western extent, east	14:40	20/04/06
M77 12	[Redacted]	Upper, Eastern extent, south west	14:00	25/04/06
M77 13	[Redacted]	Upper, central, south	15:30	20/04/06

Station	Location	Setup	Time	Date
M77 14	[Redacted]	Lower, central, west	14:40	24/04/06
M77 15	[Redacted]	Upper, south	11:00	21:04:06
M77 16	[Redacted]	Lower, western extent, south	13:00	25/04/06
M77 17	[Redacted]	Lower, southern extent, west	13:00	24/04/06
M77 18	[Redacted]	Lower, southern side, south	12:35	24/04/06
M77 19	[Redacted]	Lower, central, west	13:25	24/04/06
M77 20	[Redacted]	Lower, south eastern extent, south west	14:10	24/04/06
M77 21	[Redacted]	Lower, south west side, central, west	11:50	24/04/06
M77 22	[Redacted]	Lower, southern extent, east	11:30	24/04/06
M77 23	[Redacted]	Upper, central, east	10:40	24/04/06
M77 24	[Redacted]	Lower, northern extent, east	10:00	20/04/06
M77 25	[Redacted]	Upper, central west	12:10	25/04/06
GSO 1	[Redacted] Mearnskirk	No. 2 south wood court, upper, western extent, south	12:00	21/04/06
GSO 2	[Redacted] M'kirk	Lower, central, southern extent	12:45	21/04/06
GSO 3	[Redacted], Titwood Road	Lower, back northern extent,	11:30	25/04/06

Station	Location	Setup	Time	Date
		east		
GSO 4	[Redacted] Titwood Road	Lower window, kitchen, north	12:20	18/04/06
GSO 5	[Redacted]	Upper, central, north	13:20	21/04/06
GSO 6	[Redacted]	Lower, south western extent, south	10:00	24/04/06
GSO 7	[Redacted]	Lower, western extent, south	15:30	19/04/06
GSO 8	[Redacted]	Upper, north eastern extent, north east	14:00	21/04/06
GSO 9	[Redacted]	Lower, north western extent, north west	14:40	21/04/06
GSO 10	[Redacted]	Lower, central, north.	14:55	21/04/06
GSO 11	[Redacted]	Upper, western extent, south nr wood cabin	14:00	18/04/06
GSO 12	[Redacted]	Lower window, end of northern extension, north.	15:30	21/04/06
GSO 13	[Redacted]	Ground, kitchen, south	14:30	18/04/06
GSO 14	[Redacted]	Upper, western extent, north	14:30	19/04/06
GSO 15	[Redacted]	Lower, eastern extent, south	15:25	18/04/06

Station	Location	Setup	Time	Date
GSO 16	[Redacted]	Lower, central, south.	14:00	19/04/06
GSO 17	[Redacted]	Upper eastern extent, north	13:25	19/04/06
GSO 18	[Redacted]	Upper, central, north	13:00	19/04/06
GSO 19	[Redacted]	Lower, north	12:25	19/04/06
GSO 20	[Redacted]	Upper, central, north east	12:00	19/04/06
GSO 21	[Redacted]	Upper, north	11:30	19/04/06
GSO 22	[Redacted]	Upper, east towards viaduct	10:30	19/04/06
GSO 23	[Redacted]	Upper, east towards viaduct	11:00	19/04/06
GSO 24	[Redacted]	Upper, west towards viaduct	10:15	25/04/06
GSO 25	[Redacted]	Lower, west towards viaduct	10:50	25/04/06
GSO 26	[Redacted]	Upper, east towards viaduct	10:00	19/04/06
Additional	[Redacted], Titwood Road	Lower, facing north	10:50	27/04/06
Additional	[Redacted]	Lower, facing south west	17:10	26/04/06

Key

Setup: Lower – Describes the window location (upper is first floor)

Eastern extent – Describes the particular end of the façade

North – Describes the perpendicular direction to the façade

Appendix B

Station	Location	Sound Levels 15 Minute Measurements (dB)		
		L _{Aeq}	L _{A10}	Adjusted L _{A10}
M77 1	[Redacted]	57.2	59	57
M77 2	[Redacted]	78.2	81.3	79.3
M77 3	Kilmaurs Road	64.7	63.6	61.6
M77 4	Langside Fenwick	59.9	61.6	59.6
M77 5	Little Fenwick	57.6	59.1	57.1
M77 6	[Redacted] Stewarton Road, Fenwick	63.9	65.9	63.9
M77 7	Glaister Bridge	64.2	68.9	66.9
M77 8	[Redacted] Rysland Drive, Fenwick	64.6	66.8	64.8
M77 9	[Redacted] Blackfauld Gardens, Fenwick	64.6	66.3	64.3
M77 10	Townend	46.1	48	46
M77 11	[Redacted]	58.6	60.6	58.6
M77 12	[Redacted]	59	61.2	59.2
M77 13	[Redacted]	57.5	59.3	57.3
M77 14	[Redacted]	66	66.4	64.4
M77 15	[Redacted]	53.4	55.5	53.5
M77 16	[Redacted]	63.6	65.8	63.8
M77 17	[Redacted]	59.9	61.6	59.6
M77 18	[Redacted]	59.5	61.1	59.1
M77 19	[Redacted]	54.4	56.6	54.6
M77 20	[Redacted]	59.2	61.1	59.1
M77 21	[Redacted]	58.8	60.7	58.7
M77 22	[Redacted]	57.6	59.6	57.6
M77 23	[Redacted]	60.1	62.3	60.3
M77 24	[Redacted]	69.7	71.9	69.9
M77 25	[Redacted]	72.5	74.8	72.8
GSO 1	[Redacted], Mearnskirk	51.4	53.6	51.6
GSO 2	[Redacted], M'kirk	53.3	55.1	53.1
GSO 3	[Redacted], Titwood Road	52.7	55	53
GSO 4	[Redacted], Titwood Road	56.1	58.5	56.5
GSO 5	[Redacted]	60.9	63.8	61.8
GSO 6	[Redacted]	58.4	60.8	58.8
GSO 7	[Redacted]	56.6	59.2	57.2
GSO 8	[Redacted]	58.4	58.3	56.3

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M77 DBFO
Noise Assessment

Station	Location	Sound Levels 15 Minute Measurements (dB)		
		L _{Aeq}	L _{A10}	Adjusted L _{A10}
GSO 9	[Redacted]	48.6	50.9	48.9
GSO 10	[Redacted]	48.5	50.4	48.4
GSO 11	[Redacted]	48.7	51.3	49.3
GSO 12	[Redacted]	58.3	61.4	59.4
GSO 13	[Redacted]	56.5	58.9	56.9
GSO 14	[Redacted]	48.4	51	49
GSO 15	[Redacted]	54	56.6	54.6
GSO 16	[Redacted]	53.2	55.2	53.2
GSO 17	[Redacted]	54.2	57	55
GSO 18	[Redacted]	57.2	59.8	57.8
GSO 19	[Redacted]	58.8	60.5	58.5
GSO 20	[Redacted]	57.1	57.6	55.6
GSO 21	[Redacted]	65.5	68.9	66.9
GSO 22	[Redacted]	62.7	64.7	62.7
GSO 23	[Redacted]	60.9	64.4	62.4
GSO 24	[Redacted]	63.8	64.6	62.6
GSO 25	[Redacted]	62.8	65.4	63.4
GSO 26	[Redacted]	67	71.9	69.9
Additional	[Redacted], Titwood Road	56.8	59.6	57.6
Additional	[Redacted]	60.7	62.3	60.3

Appendix C

Equipment Used	Type	Serial Number
Norsonic AS Sound Level Meter	131	1312716
Norsonic acoustic calibrator	1251	125127881
Norsonic Microphone	131	1312716

Appendix D

Glossary of Terms

- 1 Decibel (dB): The range of audible sound pressures is approximately 0.00002 Pa to 200 Pa. Using decibel notation presents this range in a more manageable form, 0 dB to 140 dB.

Mathematically:

Sound pressure level (dB) = $20 \log (p_t / p_o)$

Where $p_o = 2 \times 10^{-5}$ Pa
- 2 'A' Weighting dB (A): The human ear does not respond uniformly to different frequencies. A-weighting is commonly used to simulate the frequency response of the ear.
- 3 L_{Aeq} : Equivalent Continuous sound Level. A notional steady sound level which would cause the same A-weighted sound energy to be received as that due to the actual, possibly fluctuating, sound level over a given period of time.
- 4 L_{A10} : The A-weighted noise level exceeded for 10 % of the measurement period. A unit generally used in the assessment of road traffic noise.
- 5 L_{A90} : The A-weighted noise level exceeded for 90 % of the measurement period. This unit is generally used to describe the background noise climate.
- 6 L_{Amax} : The highest value of sound pressure level that occurs during a given time period.

Appendix E