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Dear Guy,

St Marys Freight Hub - Updated Noise and Vibration Impact Assessment
Noise Barrier Locations

1.0 Introduction

AECOM Australia Pty Ltd (AECOM) was commissioned by Urbanco on behalf of Pacific National to undertake a Noise and Vibration Impact Assessment of the construction and operation of the proposed St Marys Freight Hub (the Proposal).

In response to a request for additional information from the Department of Planning, Industry and Environment dated 27/03/2020, AECOM has updated the operational SoundPLAN model to replace the previously proposed site barrier (2.4 m high) (previous site barrier) with a noise barrier located just inside the southern boundary of the Sydney Trains corridor (Camira Street barrier), north of Camira Street, St Marys. This new barrier has been modelled at three heights, 2.4 m, 3.0 m and 3.6 m.

This letter presents the project noise trigger levels, the noise levels with the previous site barrier, with the Camira Street barrier modelled at 2.4 m, 3.0 m and 3.6 m high and a discussion of the performance of the noise barriers.

2.0 Operational noise criteria

The project noise trigger levels applicable at the nearby residential properties have been derived in the *St Marys Freight Hub - Noise and Vibration Impact Assessment - Post Exhibition Version* (60593074-RPNV-02_D, 11 February 2020) (NVIA Report). The project noise trigger levels for Noise Catchment Area 2 (NCA2) are summarised below.

Table 1 Summary of project trigger levels – Site industrial noise $L_{Aeq(15min)}$

Location	Time of day	Project noise trigger levels L_{Aeq}, dB(A)
NCA 2	Day	44
	Evening	44
	Night	42

Table 2 Night-time sleep disturbance screening levels – Site industrial noise L_{Amax}

Location	Sleep disturbance screening levels, dB(A)	
	$L_{Aeq,15min}$	L_{AFmax}
NCA 2	42	52

Table 3 Project amenity noise levels – Rail noise $L_{Aeq(period)}$

Type of receiver	Indicative noise amenity area	Time of day	Project amenity noise level, $L_{Aeq\ (period)}$ dB(A)	
			Recommended	Maximum
Residential receivers	Suburban	Day	55	60
		Evening	45	50
		Night	40	45

3.0 Operational noise modelling

The operational noise model discussed in the *St Marys Freight Hub - Noise and Vibration Impact Assessment - Post Exhibition Version* (60593074-RPNV-02_D, 11 February 2020) has been updated to include a barrier (2.4, 3.0 and 3.6 m high) located just inside the southern boundary of the Sydney Trains corridor, north of Camira Street (Camira Street barrier). This barrier replaces the one previously proposed to be located at the southern boundary of the site (previous site barrier).

4.0 Results

The resultant noise levels are presented below for properties in the vicinity of Camira street.

4.1 Site operational L_{Aeq} noise results

Table 4 and Table 5 present $L_{Aeq(15min)}$ noise levels at the residential receivers within NCA2 from operational activities within the site as detailed in section 6.2.1 of the NVIA report. Light blue shading indicates where the project noise trigger level is exceeded.

Table 4 L_{Aeq} noise levels with different barrier options – Daytime, Neutral weather

Address	$L_{Aeq(15min)}$ noise levels, dB(A)					Reduction in noise levels compared with previous site barrier, dB		
	Criterion	Camira Street barrier			Previous site barrier			
		2.4 m	3 m	3.6 m		2.4 m	3 m	3.6 m
43 Kalang Ave	44	45	45	44	45	-0.5	0.0	0.5
47 Kalang Ave	44	45	45	44	45	-0.3	0.5	1.6
49 Kalang Ave	44	46	43	41	48	1.9	4.5	6.9
1 Camira St	44	48	45	42	48	0.4	3.2	5.9
3 Camira St	44	48	46	44	49	0.3	2.5	5.0
5 Camira St	44	47	45	43	48	1.0	3.3	5.2
7 Camira St	44	47	45	43	48	1.1	3.5	5.5
9 Camira St	44	47	44	43	48	1.2	3.6	5.4
11 Camira St	44	48	45	43	48	0.5	2.9	5.2
13 Camira St	44	47	45	43	48	1.0	3.5	5.5
15 Camira St	44	46	44	41	48	2.1	4.6	6.8
75 Carinya Ave	44	49	45	43	49	0.1	3.5	6.2

Table 5 L_{Aeq} noise levels – Night-time, Inversion westerly wind

Address	$L_{Aeq(15min)}$ noise levels, dB(A)					Reduction in noise levels compared with previous site barrier, dB		
	Criterion	Camira Street barrier			Previous site barrier			
		2.4 m	3 m	3.6 m		2.4 m	3 m	3.6 m
43 Kalang Ave	42	44	44	44	44	-0.5	-0.1	0.4
47 Kalang Ave	42	44	43	43	44	-0.3	0.4	1.4
49 Kalang Ave	42	43	40	38	45	2.1	4.8	6.9
1 Camira St	42	45	43	40	46	0.4	3.1	5.7
3 Camira St	42	46	44	41	46	0.3	2.3	4.6
5 Camira St	42	45	43	41	46	0.9	2.8	4.6
7 Camira St	42	45	43	40	46	0.9	3.1	5.3
9 Camira St	42	45	43	41	46	0.9	3.0	4.7
11 Camira St	42	45	43	40	45	0.6	2.8	5.0
13 Camira St	42	45	42	40	46	1.0	3.2	5.1
15 Camira St	42	44	41	39	46	1.9	4.6	6.6
75 Carinya Ave	42	46	43	40	46	-0.1	3.3	5.9

4.2 Rail operational L_{Aeq} noise results

Table 6 presents $L_{Aeq(9hr)}$ noise levels at the residential receivers within NCA2 from rail activities associated with the site as detailed in section 6.2.3 of the NVIA report. Light blue shading indicates where the project noise trigger level is exceeded.

Table 6 L_{Aeq} rail noise levels – Night-time, Inversion westerly wind

Address	$L_{Aeq(15min)}$ noise levels, dB(A)					Reduction in noise levels compared with previous site barrier, dB		
	Criterion	Camira Street barrier			Previous site barrier			
		2.4 m	3 m	3.6 m		2.4 m	3 m	3.6 m
43 Kalang Ave	40	37	37	37	38	0.3	0.6	0.8
47 Kalang Ave	40	39	38	38	39	0.5	0.9	1.2
49 Kalang Ave	40	38	37	34	40	1.7	2.8	5.9
1 Camira St	40	32	31	31	32	0.3	0.7	1.2
3 Camira St	40	32	32	32	33	0.2	0.5	1.0
5 Camira St	40	34	33	33	34	0.2	0.3	1.0
7 Camira St	40	34	33	33	34	0.2	0.5	1.2
9 Camira St	40	35	35	34	36	0.3	0.6	1.1
11 Camira St	40	35	35	34	36	0.3	0.7	1.2
13 Camira St	40	37	36	35	37	0.4	0.7	1.6
15 Camira St	40	37	36	34	38	0.8	1.4	3.6
75 Carinya Ave	40	31	30	29	31	0.2	0.7	1.5

4.3 Site operational L_{Amax} noise results

Table 7 presents L_{Amax} noise levels at the residential receivers within NCA2 from operational activities within the site as detailed in section 6.2.1 of the NVIA report. Light blue shading indicates where the L_{Amax} sleep disturbance level is exceeded.

Table 7 L_{Amax} noise levels – Night-time, Inversion westerly wind

Address	$L_{Aeq(15min)}$ noise levels, dB(A)					Reduction in noise levels compared with previous site barrier, dB		
	Criterion	Camira Street barrier			Previous site barrier			
		2.4 m	3 m	3.6 m		2.4 m	3 m	3.6 m
43 Kalang Ave	52	54	54	54	54	0.0	0.0	0.0
47 Kalang Ave	52	55	55	55	55	0.0	0.0	0.0
49 Kalang Ave	52	54	54	53	54	0.2	0.2	1.0
1 Camira St	52	49	49	49	51	1.6	1.9	1.9
3 Camira St	52	52	50	49	52	0.3	2.2	2.4
5 Camira St	52	51	51	50	51	0.2	0.3	0.6
7 Camira St	52	50	50	50	50	0.0	0.1	0.2
9 Camira St	52	52	52	52	52	0.1	0.1	0.2
11 Camira St	52	51	51	51	52	0.2	0.2	0.3
13 Camira St	52	53	53	53	53	0.1	0.2	0.4
15 Camira St	52	54	53	52	54	0.2	0.4	2.1
75 Carinya Ave	52	48	48	48	52	4.3	4.3	4.4

4.4 Rail operational L_{Amax} noise results

Table 8 presents L_{Amax} noise levels at the residential receivers within NCA2 from wheel squeal associated with rail movements within the site as detailed in section 6.2.3 of the NVIA report. Light blue shading indicates where the L_{Amax} sleep disturbance level is exceeded. It should be noted that these results do not include any noise reduction from proposed mitigation measures such as rail lubricators to reduce curve squeal. It is also understood that Pacific National will be implementing engineering design changes as part of refurbishment works to widen the gauge along the rail curve. This will alleviate the wheel flange pushing outwards on the rail when the wagons try to straighten on the curve.

Table 8 L_{Amax} rail noise levels wheel squeal – Night-time, Inversion Westerly Wind

Address	$L_{Aeq(15min)}$ noise levels, dB(A)					Reduction in noise levels compared with previous site barrier, dB		
	Criterion	Camira Street barrier			Previous site barrier			
		2.4 m	3 m	3.6 m		2.4 m	3 m	3.6 m
43 Kalang Ave	52	60	60	57	60	0.0	0.0	3.0
47 Kalang Ave	52	61	61	59	61	0.0	0.4	2.5
49 Kalang Ave	52	59	56	54	60	0.7	3.8	6.0
1 Camira St	52	53	53	53	53	0.0	0.0	0.0
3 Camira St	52	54	54	54	54	0.0	0.0	0.0
5 Camira St	52	55	54	54	55	0.0	0.4	0.4
7 Camira St	52	55	55	55	55	0.0	0.0	0.1
9 Camira St	52	56	56	54	56	0.0	0.0	1.5
11 Camira St	52	56	56	54	56	0.0	0.0	1.7
13 Camira St	52	57	56	52	57	0.0	1.0	4.3
15 Camira St	52	57	54	52	58	1.0	4.1	6.1
75 Carinya Ave	52	55	54	53	55	0.0	0.0	0.4

4.5 Existing Rail operational L_{Aeq} noise results

Table 9 presents indicative $L_{Aeq(15hr)}$ noise levels at the residential receivers within NCA2 from existing passenger rail movements on the main western railway line. These $L_{Aeq(15hr)}$ levels were modelled from existing passenger rail movements on this line using the Calculation of Railway Noise (CoRN) algorithm, however a detailed calibration was not undertaken as these movements are not related to the proposed facility and therefore were not part of the NVIA report. However, the reported insertion losses of the barriers are considered to be robust.

Table 9 Existing L_{Aeq} rail noise levels – Daytime, Neutral weather

Address	$L_{Aeq(15min)}$ noise levels, dB(A)					Reduction in noise levels compared with previous site barrier, dB		
	Criterion	Camira Street barrier			Previous site barrier[1]			
		2.4 m	3 m	3.6 m		2.4 m	3 m	3.6 m
43 Kalang Ave	N/A	48	46	45	52	4.6	6.0	6.9
47 Kalang Ave	N/A	49	47	46	55	5.9	7.7	8.8
49 Kalang Ave	N/A	52	50	48	61	8.6	11.0	12.8
1 Camira St	N/A	53	50	48	61	8.6	11.0	12.8
3 Camira St	N/A	52	50	48	61	9.0	11.3	13.0
5 Camira St	N/A	51	49	48	61	9.3	11.4	13.1
7 Camira St	N/A	52	50	48	61	8.8	11.1	12.9
9 Camira St	N/A	53	50	48	61	8.1	10.6	12.5
11 Camira St	N/A	53	50	49	61	8.1	10.6	12.5
13 Camira St	N/A	52	50	48	61	9.0	11.4	13.2
15 Camira St	N/A	52	50	48	61	9.2	11.5	13.3
75 Carinya Ave	N/A	54	51	49	61	7.6	10.3	12.2

Notes:

1. The previous site barrier does not provide any noise reduction from existing rail movements to residents in NCA2

5.0 Discussion

5.1 Site operational L_{Aeq} noise

With the Camira Street barrier in place instead of the previous site barrier the L_{Aeq} noise levels from the site would be reduced at residential receivers within NCA2. The predicted reductions in noise levels for the Camira Street barrier compared with the previous site boundary barrier are presented in Table 10 for the daytime under neutral weather conditions. The reductions in noise levels for the Camira Street barrier compared with the previous site barrier are presented in Table 11 for the night-time under worst weather conditions.

Table 10 Reduction in noise levels for Camira Street barrier during the daytime under neutral weather conditions

Height of Camira Street barrier	Reduction in noise levels compared with previous site barrier, dB		
	Lowest	Highest	Average
2.4 m	-0.5	2.1	0.7
3.0 m	0.0	4.6	3.0
3.6 m	0.5	6.9	5.0

Table 11 Reduction in noise levels for Camira Street barrier during the night-time under worst weather conditions

Height of Camira Street barrier	Reduction in noise levels compared with previous site barrier, dB		
	Lowest	Highest	Average
2.4 m	-0.5	2.1	0.7
3.0 m	-0.1	4.8	2.8
3.6 m	0.4	6.9	4.7

The Noise Policy for Industry (NPfI) states, in section 4.2, that if the predicted noise level is within 2 dB of the project noise trigger level then the significance of the residual noise level is 'negligible'. The NPfI notes that the exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls. From Table 4 and Table 5 it can be seen that with the Camira Street barrier at 3 m high the L_{Aeq} noise levels would be essentially compliant with the project noise trigger levels at all receivers within NCA2.

5.2 Rail operational L_{Aeq} noise results

From Table 6 it can be seen that during the night-time under worst weather conditions the L_{Aeq} noise levels would comply at all receivers with either the previous site barrier or the Camira Street barrier. The reductions in noise levels for the Camira Street barrier compared with the previous site barrier predicted for the 2.4 m, 3.0 m and 3.6 m barriers are presented in Table 12.

Table 12 Reduction in noise levels for Camira Street barrier during the night-time under worst weather conditions

Height of Camira Street barrier	Reduction in noise levels compared with previous site barrier, dB		
	Lowest	Highest	Average
2.4 m	0.2	1.7	0.5
3.0 m	0.3	2.8	0.9
3.6 m	0.8	5.9	1.8

5.3 Site operational L_{Amax} noise results

From Table 7 it can be seen that with the previous site barrier the L_{Amax} noise levels at most receivers within NCA2 would be within 2 dB of the sleep disturbance level. Relocating the barrier to Camira Street would provide negligible reductions in L_{Amax} noise levels at most receivers, however reductions of around 2-4 dB would be achieved at 1, 3 and 15 Camira Street and 75 Carinya Avenue with a barrier height of 3.6 m. Notably L_{Amax} noise levels at these receivers would effectively comply with the L_{Amax} sleep disturbance level with the previous site barrier.

5.4 Rail operational L_{Amax} noise results

It can be seen from Table 8 that with the previous site barrier the L_{Amax} sleep disturbance levels would be exceeded at most receivers around Kalang Avenue/Camira Street due to curve squeal. However, it should be noted that this does not take into account the effect of the proposed rail lubricators and engineering design changes outlined in section 4.4 of this letter.

The receivers at the western side of NCA2 would be exposed to the highest levels. The Camira Street barrier provides negligible reductions in L_{Amax} noise levels at most receivers when the height is 2.4 m. A 3 m high barrier at Camira Street provides around a 4 dB insertion loss at 49 Kalang Avenue and 15 Camira Street with negligible insertion losses at other receivers. A 3.6 m high Camira Street barrier provides around a 6 dB insertion loss at 49 Kalang Avenue and 15 Camira Street, a 4 dB insertion loss at 13 Camira Street and around a 3 dB insertion loss at 43 and 47 Kalang Avenue. Notably the receivers which would experience the highest insertion losses are those at the western side of NCA2.

5.5 L_{Aeq} existing rail noise

From Table 9 it can be seen that a 2.4 m high Camira Street barrier would provide noise reductions of around 5-9 dB for residential receivers within NCA2 for existing rail noise. A 3.0 m high Camira Street barrier would provide insertion losses of around 6-12 dB whilst an additional 0.6 m in height would increase the average insertion loss by almost 2 dB for residential receivers within NCA2. The further reductions in noise levels for the 2.4 m, 3.0 m and 3.6 m Camira Street barrier compared with the previous site barrier are presented in Table 13.

Table 13 Reduction in noise levels for Camira Street barrier during the daytime under neutral weather conditions

Height of Camira Street barrier	Reduction in noise levels compared with previous site barrier[1], dB		
	Lowest	Highest	Average
2.4 m	4.6	9.3	8.1
3.0 m	6.0	11.5	10.3
3.6 m	6.9	13.3	12.0

Notes:

1. The previous site barrier does not provide any noise reduction from existing rail movements to residents in NCA2

6.0 Conclusion

In response to a request for additional information from the Department of Planning, Industry and Environment dated 27/03/2020, AECOM has updated the operational SoundPLAN model to replace the previously proposed southern site boundary barrier with a noise barrier located just inside the southern boundary of the Sydney Trains corridor, north of Camira Street, St Marys. This new barrier has been modelled at three heights, 2.4 m, 3.0 m and 3.6 m.

In response to a request for additional information from the Department of Planning, Industry and Environment dated 27/03/2020, AECOM has updated the operational SoundPLAN model to replace the previously proposed site barrier (2.4 m high) with a noise barrier located just inside the southern boundary of the Sydney Trains corridor, north of Camira Street, St Marys. This new barrier has been modelled at three heights, 2.4 m, 3.0 m and 3.6 m. The 3.0 m barrier was included in the modelling in addition to the 2.4 m and 3.6 m barriers to ensure an optimal barrier height was determined.

The assessment found that the Camira Street barrier would be more effective in reducing site operational L_{Aeq} noise levels at residential receivers within NCA2 with the 3 m barrier being the optimal height. With a 3 m high barrier the L_{Aeq} noise levels from site operations would effectively comply with the project noise trigger levels at all receivers during the night-time under worst weather conditions.

With a minimum 3 m high Camira Street barrier no at-property treatments would be required to meet the requirements of the NPfI.

L_{Aeq} noise levels from rail movements associated with the site comply at all receivers with either the previous site boundary or the Camira Street barrier.

L_{Amax} noise levels from site operations effectively comply with the sleep disturbance trigger level with either barrier.

A 3.6 m high Camira Street barrier was found to reductions of around 3-6 dB at four receivers for rail wheel squeal noise. With a 3.6 m barrier L_{Amax} noise levels may still exceed the sleep disturbance trigger levels at the majority of around Kalang Avenue/Camira Street. It is noted that no noise reduction from mitigation measures to address curve squeal have been included in this assessment. Recent research into curve squeal mitigation of freight traffic in Sydney found that the use of rail lubricators could reduce L_{Amax} noise levels by around 20 dB. [1]

The Camira Street barrier was found to be effective in reducing existing rail L_{Aeq} noise levels at nearby receivers, with a 3 m high barrier providing an average insertion loss of 10 dB. It is noted that a noise barrier should achieve an insertion loss of around 5 dB to be considered reasonable.

[1] J. Jiang, D. Hanson, D. Anderson *Rail Lubrication Trial for Mitigating Curve Squeal,* World Congress Rail Research, 2013

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Yours faithfully

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