

January 27, 2015

AECOM
4th Floor, 30 Leek Crescent
Richmond Hill, ON
L4B 4N4

Attn: Mrs. Joanne Wang

**Re: TTC McNicoll Bus Garage
Responses to Toronto Public Health Noise Health Questions
Novus File: 13-0054**

Novus Environmental Inc. (Novus) was retained by AECOM on behalf of the Toronto Transit Commission (TTC) to prepare an environmental noise assessment for the proposed McNicoll Bus Garage (Facility) located on McNicoll Avenue, east of Kennedy Road in the City of Toronto, Ontario.

This letter outlines our responses to the Toronto Public Health (TPH) comments provided in their December 23, 2014 email regarding with the subject “TPH Comment McNicoll Bus Garage EPR (Noise).” A copy of the TPH email can be found as Attachment A. In the email, TPH requests that predicted noise levels for the project be compared against a number of health effect criteria.

1.0 Criteria

In Ontario, applicable sound level limits are outlined in Ministry of the Environment and Climate Change (MOECC) Publication NPC-300. Publication NPC-300 criteria were developed by the MOECC in order to minimize the possibility of annoyance and “adverse effects” (as defined in the *Environmental Protection Act*) from stationary industrial and commercial noise sources, such as the proposed bus garage. A comparison of facility noise impacts versus Publication NPC-300 guidelines has been completed, and can be found in the Novus Report “TTC McNicoll Bus Garage TPAP, Environmental Noise Assessment, Toronto, ON” completed as part of the TPAP process. The Novus report shows that with the inclusion feasible noise mitigation measures, the NPC-300 noise guidelines will be met.

There are a number of other criteria which have been developed internationally, which relate to the health effects of noise. These criteria can be divided into three categories:

1. Disease
2. Annoyance
3. Sleep Disturbance

Modelled noise predictions have been calculated with and without the proposed facility for comparison against these criteria. We understand that the criteria generally represent “no effect levels”, and are thus very conservative.

Modelled noise levels have been calculated for each face (N, E, S, and W) of the Mon Shoeng Long Term Care Facility, and the Mon Sheong Court building. **Figure 1** shows the receptor façade locations.

2.0 Disease

Table 1 (attached) presents a comparison of predicted build and no-build sound levels versus published criteria for disease-related health effects, namely ischemic heart disease and hypertension. The criteria are from the Health Council of the Netherlands, and are based on potential public health impacts from large airports.

Noise levels with and without the project are well below the 70 dBA L_{eq} (16h, 6am-10pm) criteria. The maximum increase due to the project will be 1.2 dB. Thus, health impacts from the project in terms of an increase in measurable disease outcomes are highly unlikely.

3.0 Annoyance

Table 1 also provides a comparison with annoyance criteria published by the World Health Organization (WHO) and Health Canada.

The WHO criteria of 50 and 55 dBA for annoyance in outdoor amenity areas are exceeded for both the existing “no-build” condition, and with the project in place (cumulative impacts). However, the increase in noise levels due to the project is only 2.8 dB. In terms of human perception, an increase in noise level of this magnitude would generally be considered to be imperceptible.

Health Canada recommended that the effect of increase noise from a project be assessed in terms of its effect on the percent of people “highly annoyed” with noise in their environment, and recommends that projects should not result in an increase of more than 6.5 % in the number of highly annoyed individuals. The maximum predicted increase resulting from this project is less than 1%.

Therefore, in terms of noise annoyance, the project is unlikely to result in an adverse effect.

4.0 Sleep Disturbance

Table 1 also provides a comparison versus a number of published sleep disturbance thresholds, including criteria for sleep disturbance, increased movement, use of sleep aids, and insomnia. As with the other criteria discussed, the limits are based on sound levels outside of the building, in the plane of an open window. The sleep disturbance criteria can be broken down in to three ranges:

- 40 to 45 dBA L_{eq} Night (11pm to 7 am)

The sleep disturbance criteria in this range are based on “no effect” levels; thus, no measurable effect would be observed for outdoor noises meeting these limits. As can be seen in **Table 1**, both “without project” no-build noise levels and cumulative “with project” noise levels exceed these limits. In fact, 40 to 45 dBA night-time sound levels are not met in the majority of urban environments, and are more typical of noise levels one would receive in rural areas.

The change in sound levels due to the project ranges from 0 to 2.1 dB, which would generally be considered imperceptible.

- 55 dBA L_{eq} Night (11pm to 7 am)

Recognizing the difficulties of meeting the “no effect” guidelines in an urban environment, WHO has adopted 55 dBA as in interim target for sleep disturbance under their Nighttime Noise Guidelines for Europe. As shown in **Table 1**:

- a) Approximately 40% of the facades meet the interim target
- b) Only 25% of the facades exceed the interim target by more than 3 dB
- c) For the 60% of the facades where the interim target is exceeded, the sound levels are driven by existing ambient noise levels, and not from noise due to the bus garage project. For these facades, the maximum increase in noise due to the project is only 0.2 dB.

The proposed project has no effect on -whether the interim target is met.

- 60 dBA L_{eq} Night (11pm to 7 am)

Passchier-Vermier et al. and the Health Council of the Netherlands have recommended that night-time noise levels be less than 60 dBA to avoid sleep pattern disturbance and effects on mood the next day.

The 60 dBA criterion is met at all but two facades, and is only exceeded at two locations by a maximum of 0.7 dB. At these two locations, the excess of the criteria is completely due to non-project related ambient noise levels. The increase in noise levels due to the project is 0 dB.

5.0 Summary and Conclusions

Based on the above, noise from the proposed project is unlikely to have a measureable effect on health.

We trust that this information will be helpful. If you have any further questions, please do not hesitate to contact us.

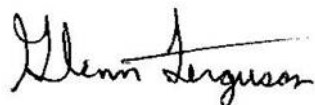
Sincerely,

Novus Environmental Inc.



R. L. Scott Penton, P.Eng.
Principal / Acoustical Specialist

Intrinsic Environmental Sciences Inc.



Glenn Ferguson, Ph.D., QPRA
Vice President – Eastern Region / Senior Scientist

References

Health Canada. 2010. Useful Information for Environmental Assessments.

Health Council of the Netherlands. 1999. Public health impacts of large airports.

Passchier-Vermeer, W., Passchier, W.F. 2000. Noise exposure and public health. *Environmental Health Perspectives*, 108(1), 123-131.

WHO. 1999b. *Guideline for Community Noise*. Edited by B. Berglund, T. Lindvall and D.H. Schwela. Geneva.

WHO. 2009. *Night noise guidelines for Europe*.

Tables

Table 1: TTC McNicoll Bus Garage Noise Assessment - Comparison Versus Health Effects Thresholds

Health Effect	Threshold/ Guideline	Reference	Period	Secenario	Outdoor Living Area	Mon Sheong Long Term Care						Mon Sheong Court											
						Building Façade						Building Façade											
						N		E		S		W		N		E		S		W			
min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max								
DISEASE																							
Hypertension	70 L _{Aeq, 16hr} (06-22 hr)	Health Council of the Netherlands. 1999. Public health impacts of large airports.	6am-10pm	Without Project	-	56.3	61.4	58.4	66.7	64.5	66.6	54.5	63.0	51.0	63.9	56.8	63.2	64.0	68.0	64.9	68.1		
				Cumulative	-	56.7	61.5	57.9	66.7	64.5	66.6	54.6	63.0	52.2	63.9	57.3	63.3	64.0	68.0	64.9	68.1		
				Change	-	0.4	0.1	-0.5	0.0	0.0	0.0	0.1	0.0	1.2	0.0	0.5	0.1	0.0	0.0	0.0	0.0	0.0	
Ischemic health disease	70 L _{Aeq, 16hr} (06-22 hr)	Health Council of the Netherlands. 1999. Public health impacts of large airports.	6am-10pm	Without Project	-	56.3	61.4	58.4	66.7	64.5	66.6	54.5	63.0	51.0	63.9	56.8	63.2	64.0	68.0	64.9	68.1		
				Cumulative	-	56.7	61.5	57.9	66.7	64.5	66.6	54.6	63.0	52.2	63.9	57.3	63.3	64.0	68.0	64.9	68.1		
				Change	-	0.4	0.1	-0.5	0.0	0.0	0.0	0.1	0.0	1.2	0.0	0.5	0.1	0.0	0.0	0.0	0.0	0.0	
ANNOYANCE																							
Moderate annoyance, outdoor living area	50 L _{Aeq, 16hr}	WHO. 1999b. Guidelines for Community Noise.	7am-11pm	Without Project	62.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
				Cumulative	65.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Change	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Serious annoyance, outdoor living area	55 L _{Aeq, 16hr}	WHO. 1999b. Guidelines for Community Noise.	7am-11pm	Without Project	62.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
				Cumulative	65.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Change	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Annoyance, difference between baseline and project	>6.5% difference in %HA	Health Canada. 2010. Useful Information for Environmental Assessments.	24 hrs	Without Project (L _{dn})	-	57.5	62.6	59.6	67.9	65.7	67.8	55.7	64.2	52.2	65.1	58.0	64.4	65.2	69.2	66.1	69.3		
				Cumulative (L _{dn})	-	58.2	63.2	59.3	68.0	65.7	67.8	55.9	64.2	53.9	65.2	58.7	64.5	65.2	69.2	66.1	69.3		
				Change	-	0.7	0.6	-0.2	0.1	0.0	0.1	0.2	0.0	1.7	0.1	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.0
				Without Project %HA	-	5.7	10.5	7.3	19.1	15.0	18.9	4.5	12.7	2.9	14.1	6.0	13.0	14.2	21.9	15.8	22.1		
Cumulative %HA	-	6.2	11.3	7.1	19.3	15.0	19.0	4.6	12.7	3.6	14.2	6.6	13.1	14.2	21.9	15.8	22.1						
Change in %HA	-	0.5	0.8	-0.2	0.2	0.0	0.1	0.1	0.0	0.7	0.1	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0				

... Continued

Notes:

- All values are in dBA unless otherwise noted
- Values in **Bold** exceed threshold.

Table 1 Continued: TTC McNicoll Bus Garage Noise Assessment - Comparison Versus Health Effects Thresholds

Health Effect	Threshold/ Guideline	Reference	Period	Secenario	Outdoor Living Area	Mon Sheong Long Term Care								Mon Sheong Court							
						Building Façade				Building Façade				Building Façade				Building Façade			
						N		E		S		W		N		E		S		W	
min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max						
SLEEP DISTURBANCE																					
Subjective sleep quality	40 L _{Aeq, 8hr} (23-07 hr)	Health Council of the Netherlands. 1999. Public health impacts of large airports.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Sleep disturbance, night noise guideline	40 L _{Aeq, 8hr} (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Use of sleep-aid drugs and sedatives	40 L _{Aeq, 8hr} (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Increased avg. movement during sleep	42 L _{Aeq, 8hr} (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Self-reported sleep disturbance	42 L _{Aeq, 8hr} (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Environmental insomnia	42 L _{Aeq, 8hr} (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Sleep disturbance, outside bedrooms	45 L _{Aeq, 8hr} (23-07 hr)	WHO. 1999b. Guidelines for Community Noise.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Sleep disturbance, interim target	55 L _{Aeq, 8hr} (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Sleep pattern	< 60 L _{Aeq, 8hr} (23-07 hr)	Passchier-Vermeer et al., 2000. "Noise exposure and public health". Env. Health Persp., 108(1), 123-131.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Mood next day	< 60 L _{Aeq, 8hr} (23-07 hr)	Health Council of the Netherlands. 1999. Public health impacts of large airports.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	60.6	57.5	60.7
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	60.6	57.5	60.7
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0

Notes:

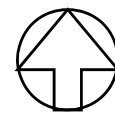
- All values are in dBA unless otherwise noted
- Values in **Bold** exceed threshold.

Figures



Figure No. 1
Modelled Façade Locations

TTC McNicoll Bus Garage
 Toronto, Ontario



True
 North

Scale: 1: 750
 Date: 14 / 01 / 27
 File No.: 13-0054
 Drawn By: KAC



Attachment 1

From: Howard Shapiro [<mailto:hshapir@toronto.ca>]

Sent: Tuesday, December 23, 2014 4:41 PM

To: Solange.Desautels@ontario.ca; Barbara Lachapelle; MacDonald, Jason; Dimovski, John

Cc: David McKeown; Jann Houston; Reg Ayre; Nagler, David; Romano, Lito; Favaro, Marcello

Subject: TPH Comment McNicoll Bus Garage EPR (Noise)

Hi John,

The following are TPH's comments with respect to the evaluation of noise from the proposed facility at McNicoll. Please contact myself or Barbara Lachapelle if you have any questions.

There is a growing body of evidence that noise at certain levels could result in health effects such as hearing impairment, sleep disturbance, cardiovascular disease, and annoyance. In the past (i.e. Billy Bishop Toronto City Airport Health Impact Assessment study) TPH used a variety of noise benchmarks representing different health endpoints to assess potential health impacts. These benchmarks have been developed by organizations such as the World Health Organization (WHO), Health Canada (HC) and the Health Council of the Netherlands. As many of these endpoint are especially relevant to sensitive receptors such as the elderly, we recommend the use of the same benchmarks for the McNicoll noise quality assessment.

Health Effect	Threshold/Guideline	Reference
Environmental insomnia	42 L _{Aeq, 8hr} (23-07 hr)	WHO, 2009
Sleep disturbance, outside bedrooms	45 L _{Aeq, 8hr} (23-07 hr)	WHO, 1999b
Sleep disturbance, night noise guideline	40 L _{Aeq, 8hr} (23-07 hr)	WHO, 2009
Sleep disturbance, interim target	55 L _{Aeq, 8hr} (23-07 hr)	WHO, 2009
Hypertension	70 L _{Aeq, 16hr} (06-22 hr)	Health Council of the Netherlands, 1999
Ischemic health disease	70 L _{Aeq, 16hr} (06-22 hr)	Health Council of the Netherlands, 1999
Sleep pattern	< 60 L _{Aeq, 8hr} (23-07 hr)	Passchier-Vermeer and Passchier, 2000
Subjective sleep quality	40 L _{Aeq, 8hr} (23-07 hr)	Health Council of the Netherlands, 1999
Mood next day	< 60 L _{Aeq, 8hr} (23-07 hr)	Health Council of the Netherlands, 1999
Increased avg. movement during sleep	42 L _{Aeq, 8hr} (23-07 hr)	WHO, 2009
Self-reported sleep disturbance	42 L _{Aeq, 8hr} (23-07 hr)	WHO, 2009
Use of sleep-aid drugs and sedatives	42 L _{Aeq, 8hr} (23-07 hr)	WHO, 2009
Moderate annoyance, outdoor living area	50 L _{Aeq, 16hr}	WHO, 1999b
Serious annoyance, outdoor living area	55 L _{Aeq, 16hr}	WHO, 1999b
Annoyance, difference between baseline and project	>6.5% difference in %HA	Health Canada, 2010

The background and the rationale for the use of the various benchmarks is outlined in the BBTCA Health Impact Assessment, here's the link:

<http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=06917b805ebe1410VgnVCM10000071d60f89RCRD>

It is listed under Golder Associates (approx. halfway down the page).

References

Health Canada. 2010. Useful Information for Environmental Assessments.
Health Council of the Netherlands. 1999. Public health impacts of large airports.
Passchier-Vermeer, W., Passchier, W.F. 2000. Noise exposure and public health. *Environmental Health Perspectives*, 108(1), 123-131.
WHO. 1999b. *Guideline for Community Noise*. Edited by B. Berglund, T. Lindvall and D.H. Schwela. Geneva.
WHO. 2009. *Night noise guidelines for Europe*

Howard Shapiro MD MSc FRCPC
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