



July 12, 2018

Christian Simionescu
The Salvation Army
2 Overlea Boulevard
Toronto, Ontario
M4H 1P4

Dear: Mr. Simionescu

Re: Aircraft Noise Monitoring Update
Salvation Army Multi-Purpose Building
GWE File No.: 15-009 – Aircraft Noise Update

1. INTRODUCTION

Gradient Wind Engineering Inc. (Gradient Wind) was initially retained by The Salvation Army to undertake a transportation noise study of a proposed multi-purpose single-storey building development at 102 Bill Leathem Drive in Ottawa, Ontario in consideration of their Official Plan Amendment, Rezoning, and Site Plan applications to the City of Ottawa. After the rezoning was approved by the City of Ottawa, an appeal was made by the Airport Authority to the Ontario Municipal Board (OMB). In preparation of the up-and-coming OMB hearing, Gradient Wind has undertaken additional sound measurements on site. This report summarizes the methodology, results and recommendations related to the supplemental noise measurements conducted between June 14 and 28, 2018.

2. TERMS OF REFERENCE

The focus of this aircraft noise monitoring update is to confirm Gradient Wind's previous noise measurements conducted in 2016. The original study was to consider possible impacts and required mitigation related to aircraft flyovers. The development is located on vacant land at the northwest corner of the Bill Leathem Drive and Leikin Drive intersection, in an established business park. The Ottawa International Airport is located approximately 4 km to the northeast. The site is surrounded on all sides with mixed-use land, specifically Light Industrial and Parks and Open Space zones. Upon completion, the

building will be approximately 10 metres (m) above local grade, respectively. No Outdoor Living Areas (OLAs) are currently located on or proposed for the site.

Under the City of Ottawa Noise Control Guidelines (ENCG) and the Ontario Ministry of Environment and Climate Change Environment Noise Guidelines (NPC-300), the proposed land uses, place of worship and community centre, are not considered noise-sensitive. The guidelines only make reference to place of worship on Tables 2.2c and 4.2b of the ENCG, and Tables C-9 and C-10 of NPC 300. In both cases, the preamble to these tables identifies the criteria for land uses not generally considered noise-sensitive; however, the criteria are provided for good practice. Despite the uses not being considered noise-sensitive, as part of good engineering practice a noise study for the development was completed, as summarized in Gradient Wind's earlier noise studies submitted to the City of Ottawa, with the latest report dated October 23, 2017.

3. BACKGROUND

Noise can be defined as any obtrusive sound. It is created at a source, transmitted through a medium, such as air, and intercepted by a receiver. Noise may be characterized in terms of the power of the source or the sound pressure at a specific distance. While the power of a source is characteristic of that particular source, the sound pressure depends on the location of the receiver and the path that the noise takes to reach the receiver. Measurement of noise is based on the decibel unit, dBA, which is a logarithmic ratio referenced to a standard noise level (2×10^{-5} Pascals). The 'A' suffix refers to a weighting scale, which better represents how the noise is perceived by the human ear. With this scale, a doubling of power results in a 3 dBA increase in measured noise levels and is just perceptible to most people. An increase of 10 dBA is often perceived to be twice as loud.

4. NOISE MONITORING

Assessment of aircraft and roadway noise, as well as other sources across the site, was performed through on-site noise monitoring over a period of two weeks in June 2018, in addition to the four-week period conducted in August 2016 as part of the original study. Noise levels were measured using a single Brüel and Kjær (B&K) noise monitoring station, model 365-C-DMO. The unit consists of an integrating sound level meter (Type 2250), a weather-proof microphone (Type 4952), a wireless modem, a power pack and batteries. The unit was powered by a solar panel and 12-volt marine battery. The monitoring station setup is illustrated in Photograph 1. The station monitored continuously 24 hours per day with data sent

wirelessly over an LTE/3G network to B&K’s cloud storage service, “Noise Sentinel on Demand”. Noise measurements were conducted from June 14 through to June 27, 2018. A two-week time frame was selected to capture a statistically relevant set of data, allowing for daily changes in airport operations and meteorological conditions. During the measurement period, airport operations would be representative of a worst case scenario, because construction on Runway 14/32 diverted all commercial traffic to taking off and landing at Runway 07-25, the flight path for which is aligned with the 102 Bill Leathem Drive site¹. The consistency within the data set proved the two-week measurement period is sufficient. The location of the noise monitoring station is identical to the original study and is shown in Photograph 1 to 3 below.



PHOTOGRAPH 1: NOISE MONITOR STATION

¹ <https://yow.ca/en/construction>



PHOTOGRAPH 2: NOISE MONITOR STATION



PHOTOGRAPH 3: NOISE MONITOR STATION

5. RESULTS

Based on the on-site monitoring, the equivalent sound pressure levels (L_{eq}) for each day are presented as 24-hour daily averages ($L_{eq(24Hr)}$), 16-hour daytime averages ($L_{eq(16 Hr)}$) and 8-hour nighttime averages ($L_{eq(8 Hr)}$). The daytime period is defined between 07:00 and 23:00 and the nighttime period from 23:00 to 07:00.

As can be seen from Table 1, the average daily $L_{eq (24 hr)}$ was found to be 56 dBA, which is below the predicted aircraft noise exposure NEF /NEP 30 contours, equivalent to 62 dBA ($L_{eq (24 hr)}$) and is similar to the result of the original report. Additionally, the standard deviation of daily $L_{eq (24 hr)}$ (energy average) is no greater than 1 dBA. There is statistical consistency day-to-day and with the original report. It can therefore be concluded that the assumptions of the theoretical analysis and original report are validated, and that the proposed wall and window assemblies will be adequate to ensure ENCG compliance for indoor sound levels and maintaining compatibility with adjacent land uses. A sample of daily 24-hour L_{eq} and hourly time history is presented in Chart 1 and 2-3, respectively. Chart 4 and 5 illustrate worst-case and typical fly-over noise levels, corresponding to a 10-second L_{eq} of 81 and 74 dBA, respectively during the flyover. The approximate NEF 30 limit is illustrated in each chart. Based on the daily number and magnitude of plane flyovers, an average flyover 10-second L_{eq} of 76 dBA can be expected. This would correspond with average indoor noise levels of approximately 45 dBA in the sanctuary and would last for only a moment. Details of outdoor-indoor noise calculations, as well as the measured aircraft flyover noise spectrum, is available in Appendix A. It should also be noted that sound pressure levels at the exterior of the building from motor vehicles, trucks and motorcycles at times can produce short-term L_{eq} similar to that of aircraft flyovers, as illustrated in Chart 6. Aircraft flyover spectrum is also illustrated in Chart 7.

TABLE 1: MEASURED EQUIVALENT SOUND PRESSURE LEVELS (dBA)

Date	L _{EQ} (24HR)	L _{EQ} (8HR)	L _{EQ} (16HR)	Wind Speed (km/h)	Temperature (°C)	Weather
14/5/18	58	52.4	59.3	14-30	13-16	Rain
15/5/18	57	50.3	58.2	5-26	9-25	Mainly Clear
16/5/18	55	49.3	55.9	4-17	10-28	Mainly Clear
17/5/18	55	50.7	55.8	2-24	14-30	Cloudy
18/5/18	56	51.8	57.7	9-42	17-29	Rain Showers
19/5/18	57	51.8	58.2	4-30	13-24	Clear
20/5/18	56	52.6	57.3	7-29	11-28	Mostly Cloudy
21/5/18	56	52.7	57.3	7-26	11-21	Clear
22/5/18	56	55.2	56.6	2-15	9-26	Mainly Clear
23/5/18	55	50.8	56.7	4-17	15-22	Rain Showers
24/5/18	57	50.2	58.2	2-26	14-24	Mostly Cloudy
25/5/18	57	52.0	57.8	2-28	11-22	Clear
26/5/18	56	52.6	57.1	1-15	7-25	Mostly Cloudy
27/5/18	56	51.1	57.6	4-16	13-23	Cloudy
Average	56	52	57			
Max	58	55	59			
Min	55	49	56			
Std Dev	1	1	1			
L10	56					
L95	36					

Note: Average is a logarithmic average of values, Std Dev = standard deviation

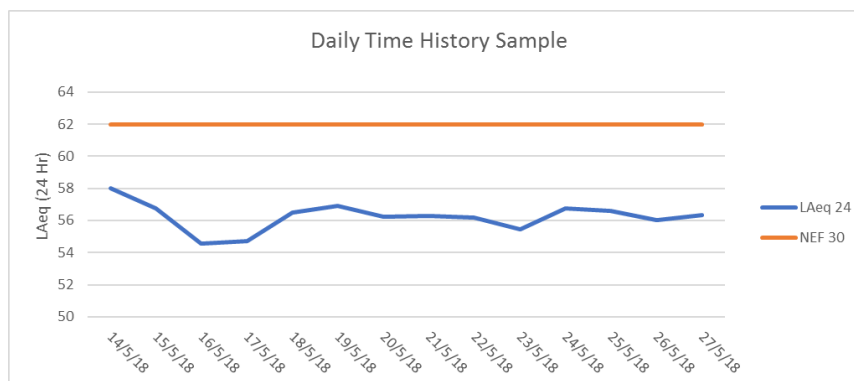


CHART 1: DAILY TIME HISTORY

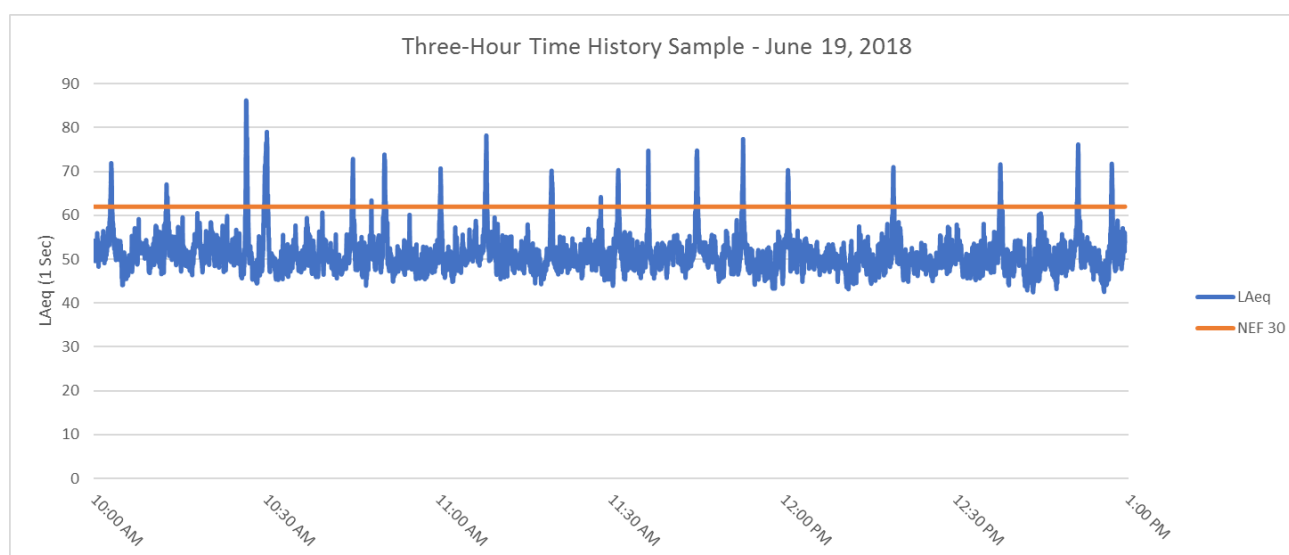


CHART 2: HOURLY TIME HISTORY (JUNE 19,2018)

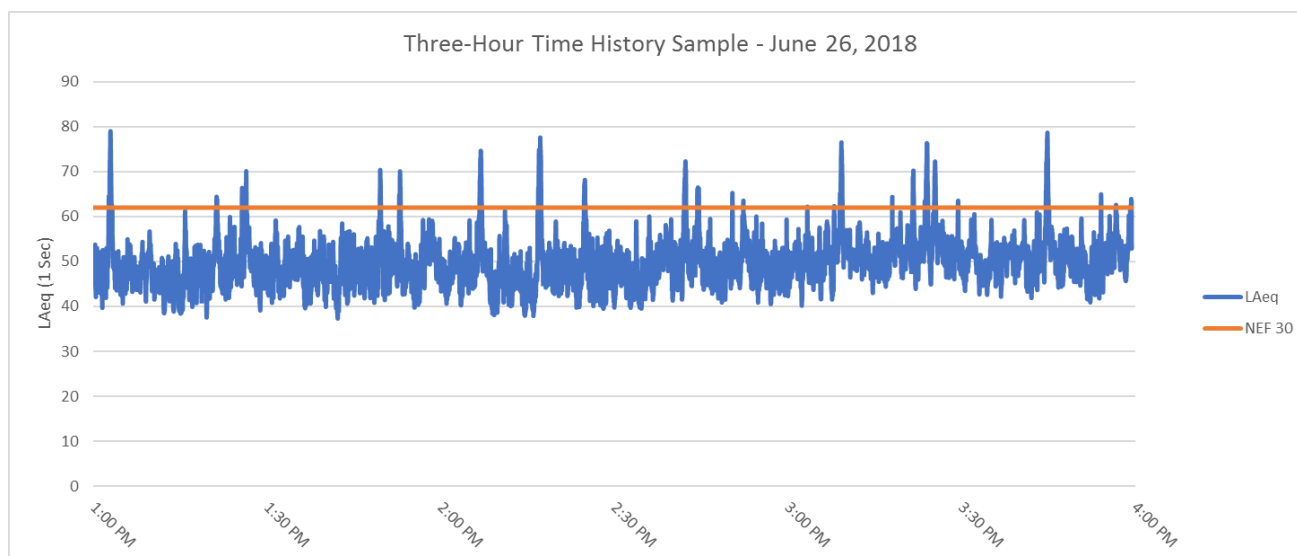


CHART 3: HOURLY TIME HISTORY (JUNE 26, 2018)

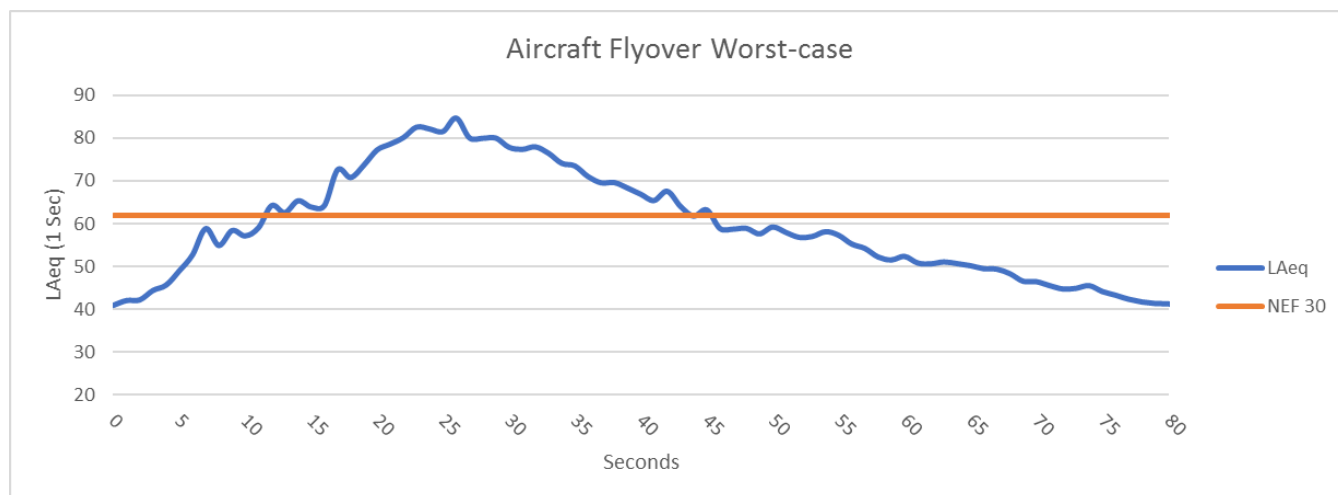


CHART 4: SINGLE PLANE FLY-OVER TYPICAL WORST-CASE

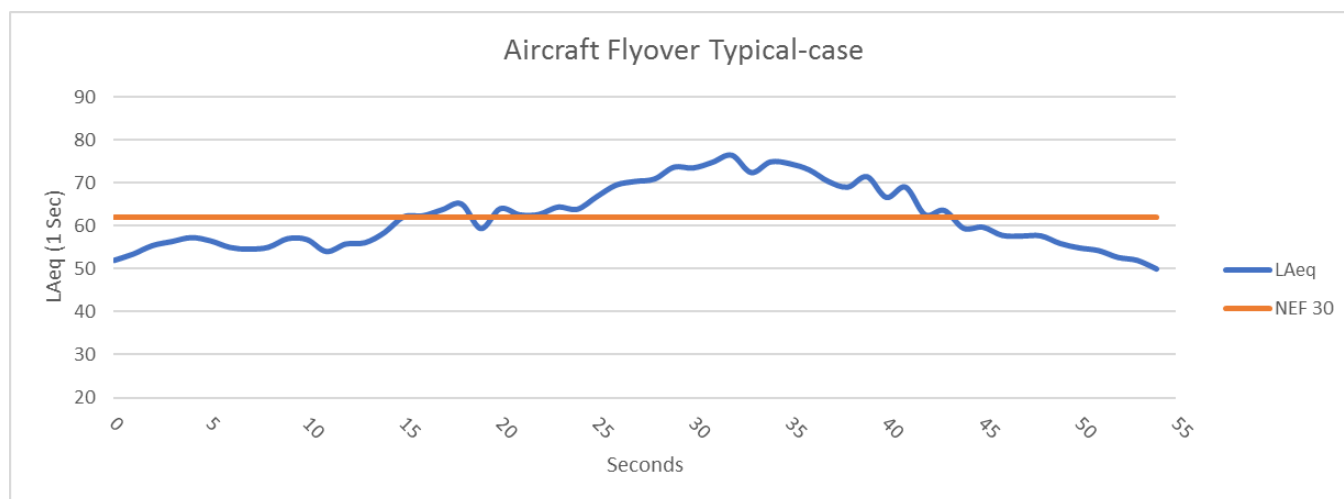


CHART 5: SINGLE PLANE FLY-OVER TYPICAL CASE

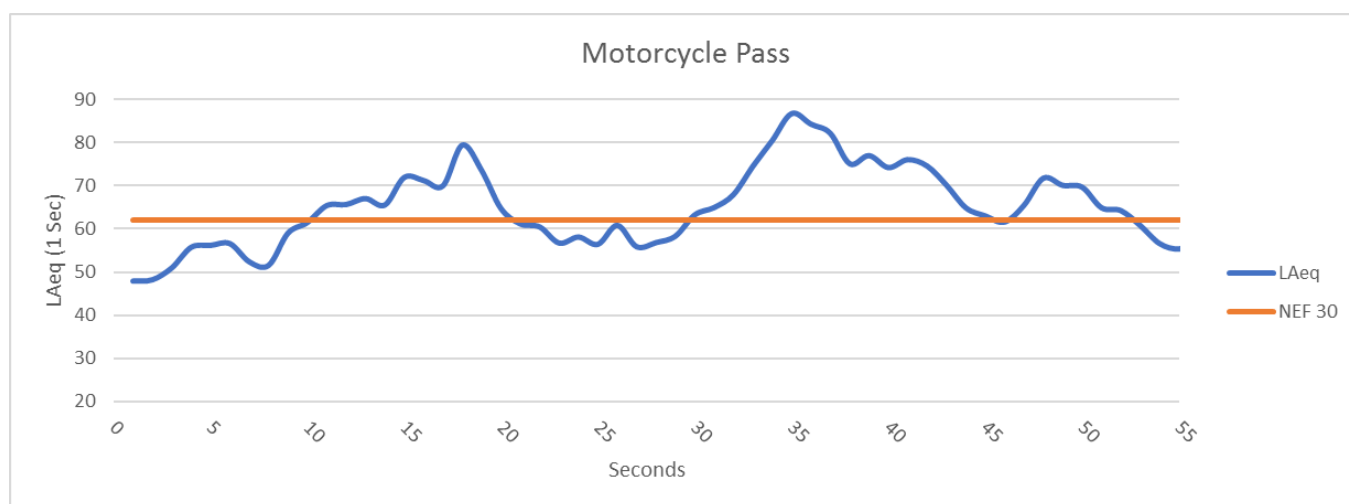


CHART 6: MOTORCYCLE PASSING THE SITE

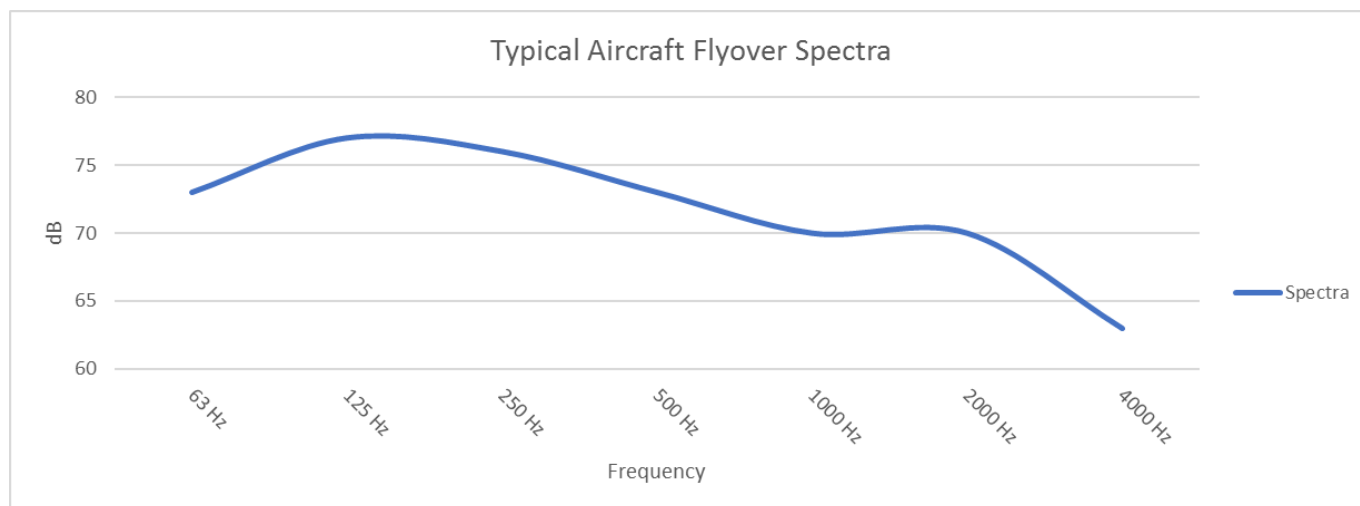


CHART 7: TYPICAL AIRCRAFT FLYOVER NOISE SPECTRUM

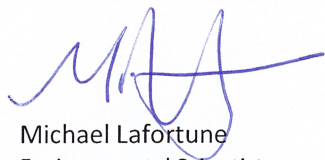
6. CONCLUSIONS AND RECCOMENDATIONS

Results of Gradient Wind’s second phase of aircraft noise monitoring reveal similar results to the original study. Under the ENCG and NPC-300 guidelines, the development is not considered noise sensitive; therefore, in keeping with Federal and Provincial policies, it is permissible between NEF 30 and 35. In addition, the Provincial Policy Statement indicates that if the development were considered noise sensitive, noise sensitive land uses may be considered above the NEF/NEP 30 for infill and redevelopment developments where it is demonstrated that there will be no negative impact on the long term function of the airport. Based on the proposed architectural drawings, building components are expected to achieve the required sound transmission ratings to control indoor noise levels to below ENCG criteria for places of worship at the proposed site. Furthermore, on-site monitoring has indicated that existing noise levels at the site are well below predicted noise exposure forecasts. In a recent update to the noise exposure forecast the NEF 30 line relative to the site has not shifted substantially and future noise levels are not expected to significantly increase. Therefore, no long-term impact on airport operations are anticipated.

This concludes our assessment and report. If you have any questions or wish to discuss our findings, please advise us. In the interim, we thank you for the opportunity to be of service.

Sincerely,

Gradient Wind Engineering Inc.

A handwritten signature in blue ink, appearing to read 'M. Lafortune'.

Michael Lafortune
Environmental Scientist
GWE15-009 – Aircraft Noise Update



Joshua Foster, P.Eng.
Principal

APPENDIX A

OUTDOOR-INDOOR NOISE LEVEL CALCULATION

Outdoor To Indoor Sound Transmission (v9.0.8)

Program copyright Marshall Day Acoustics 2017

margin of error is generally within STC +/- 3 dB

- Key No. 4807

Job Name:

Job No.:

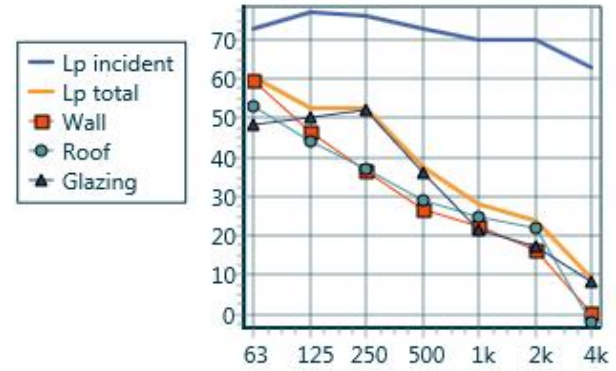
Initials:mlafortune

Date:04/07/2018

File Name:



Comment:



Octave Band Centre Frequency (Hz)								
Source	63	125	250	500	1k	2k	4k	Overall dBA
Incident sound level (freefield)	73	77	76	73	70	70	63	76
Path								
Element 1 ,Wall STL	-17	-34	-43	-50	-51	-57	-66	36
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [394 m²]	26	26	26	26	26	26	26	
Element sound level contribution	59	46	36	26	22	16	0	
Element 2 ,Roof STL	-24	-37	-43	-48	-49	-52	-69	34
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [441 m²]	26	26	26	26	26	26	26	
Element sound level contribution	53	44	37	29	25	22	-2	
Element 3 ,Glazing STL	-20	-22	-19	-32	-44	-48	-50	45
Facade Shape factor Level diff.	0	0	0	0	0	0	0	
Insertion Loss	0	0	0	0	0	0	0	
Area(+10LogA) [60 m²]	18	18	18	18	18	18	18	
Element sound level contribution	48	50	52	36	21	17	8	
Receiver								
Room volume(-10LogV) [4400 m3]	-36	-36	-36	-36	-36	-36	-36	45
Reverberation time (s)	2	2	2	2	2	2	2	
RT (+10LogT)	3	3	3	3	3	3	3	
Equation Constant	11	11	11	11	11	11	11	
Room sound level	61	52	53	37	28	24	9	