September 7, 2018

Nghiemchi Van
PWC Construction Management
1751 Pinnacle Dr. 6th, Floor
McClean, VA 22102

RE: 3920 Alton Place NW
Rooftop Mechanical Equipment Review

Dear Ms. Van:

The purpose of this letter is to detail the impact of the rooftop mechanical equipment located at 3920 Alton Place in Washington, D.C, on the surrounding properties. We understand that the current building will be demolished, and in its place will be a new 4-story Sunrise Living facility and church. Additionally, we understand there are concerns that the rooftop equipment will not meet the Washington D.C. noise code.

Noise Code

We understand that the goal of this project is to meet the Washington D.C. noise code. Pursuant to the D.C. Noise Control Act and its implementing regulation in Title 20 of the D.C. Municipal Regulations, Chapter 27, we understand the General Maximum Sound Levels to be the following based on zoning:

General Maximum Sound Levels		
Zone	Daytime (7a - 9p)	Nighttime (9p - 7a)
Commercial	65 dB	60 dB
Industrial	70 dB	65 dB
Residential, Waterfront, Special Use	60 dB	55 dB
Other Zone	60 db	60 db

Additionally, we note the following about the generator in section 2704, Exemptions, of the D.C. noise control regulations:

Exemptions (§§ 2702-2704, 2800)			
Source	Maximum Level (in dB)	Times	Measurement Locations
Emergency generator equipment	No limit	Any	N/A
Emergency generator equipment testing	No limit	Weekdays, 4p to 6:30p	Property line at all other times

Sound Power Data and Site Conditions

The manufacturer's sound power data for the rooftop units was sent to us by the project team on September 4th, 2018, and are what we have used in our calculations:

Unit	Noise Level (dBA)
Generator	84 dBA @ 23'
Closed Circuit Cooler	79 dBA @ 5'
OAU 1	103 dBA
OAU 2	87 dBA
OAU 3	87 dBA

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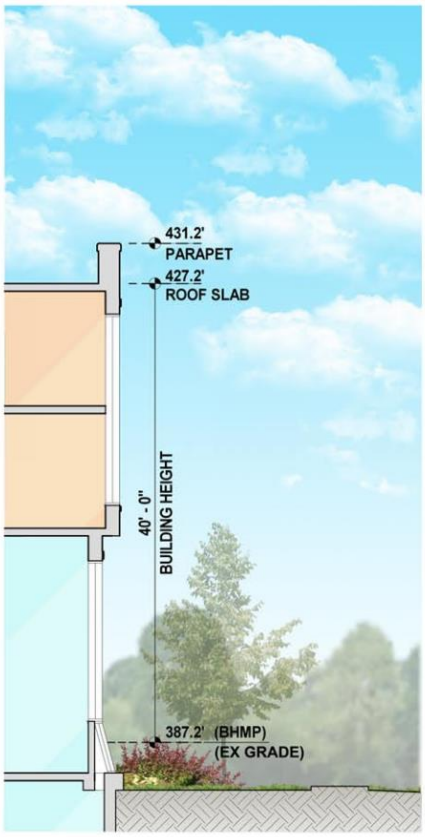
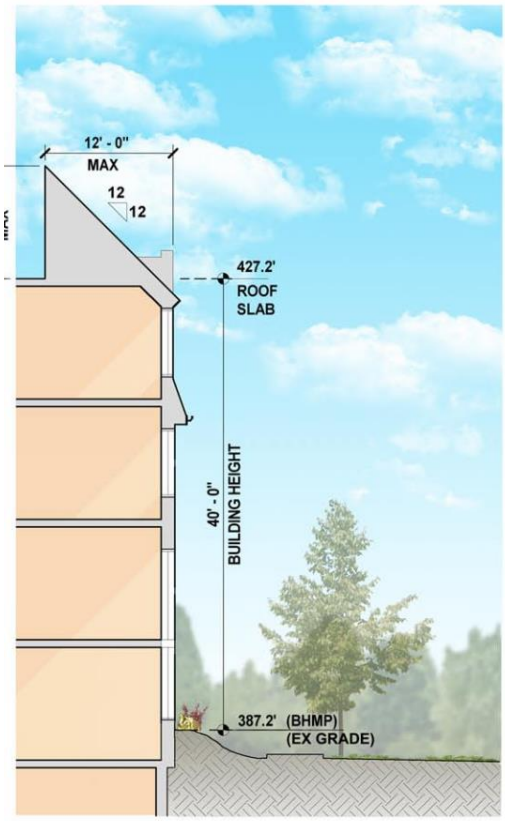
We note from the site plan that the building site is bordered by Alton Place NW to the north, 39th St. NW to east, Yuma St. NW to the south, and Tenley Circle and Nebraska Ave NW to the west. We anticipate that because the new building will house residents that it will fall into the Residential zone requirements (60 dB daytime, 55 dB nighttime) as detailed in the General Maximum Sound Levels chart above and are the criteria for our acoustical prediction analysis.

We understand that the equipment sits in the middle of a Mansard roof. The roof has a parapet that is 4' tall on the southern perimeter and a 12' tall sloped roof surrounding the remainder of the perimeter of the roof. This condition can be seen in the details below:



1 - SECTION THRU WISCONSIN AVE BAPTIST CHURCH



2 - SECTION THRU SUNRISE SENIOR LIVING

We note that OAUs 2&3 are close enough together to be considered a single source. For our calculations, we added the dBA levels together and used the result to perform a calculation over the 12' roof to the west closest to OAU 2 and an additional calculation over the 4' parapet to the west closest to OAU 3.

Anticipated Noise Levels

Based on our calculations, we anticipate the rooftop equipment to achieve the following noise levels at their respective nearest property lines:

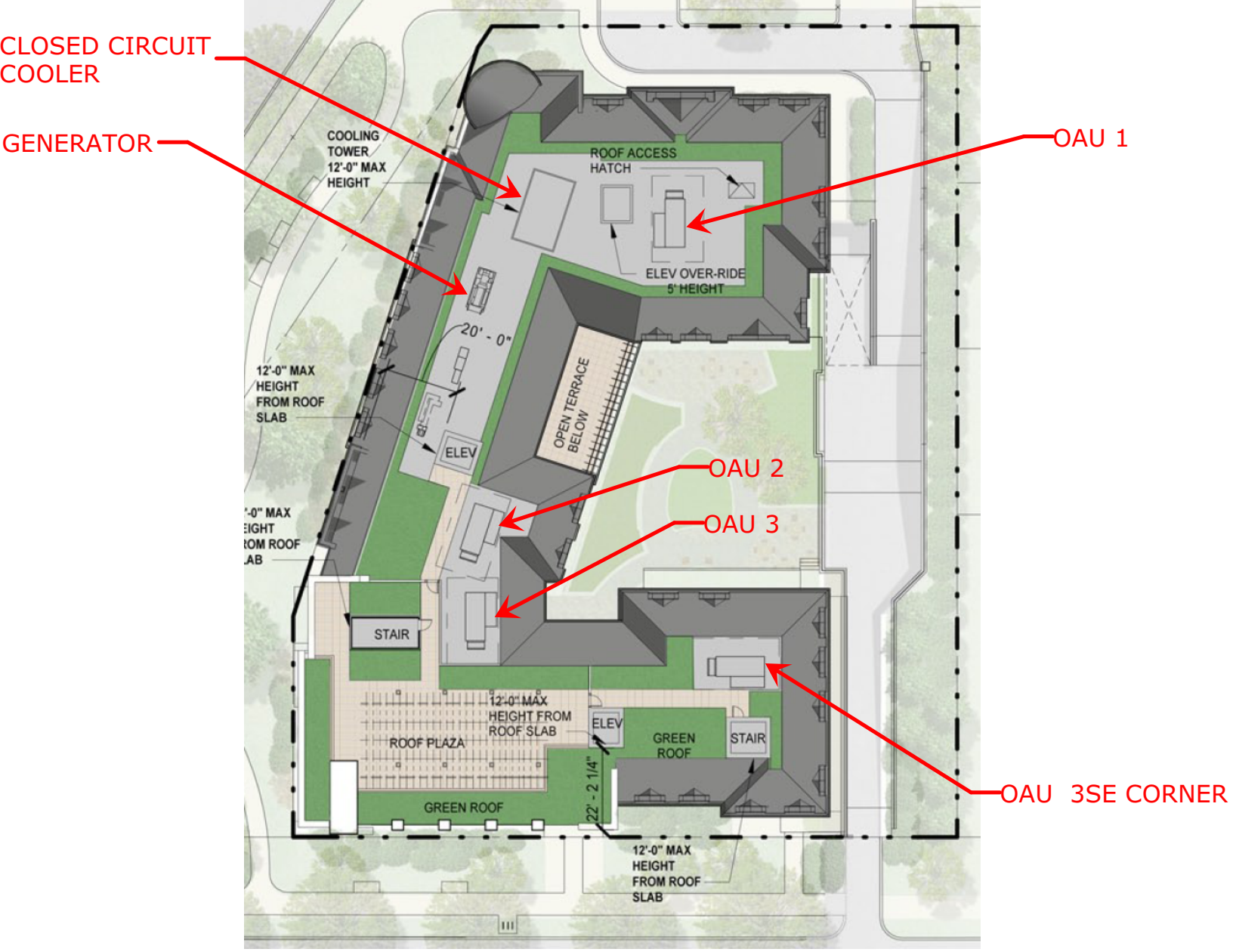
Unit	Resulting Property Line Noise Level
Generator	47 dBA
Closed Circuit Cooler	27 dBA
OAU 1	25 dBA
OAU 2	9 dBA
OAU 3	7 dBA
OAU 3 SE Corner	26 dBA

As can be seen from the table above, all equipment will meet the requirements set forth in the D.C. noise control regulations. As such, no additional mitigation is necessary.

Please do not hesitate to contact me with any questions you may have about this memorandum and its contents.

Best Regards,

Gregory Bacon EIT
Associate
Shen Milsom & Wilke LLC


CLOSED CIRCUIT COOLER
GENERATOR
OAU 1
OAU 2
OAU 3
OAU 3SE CORNER
COOLING TOWER 12'-0" MAX HEIGHT
ROOF ACCESS HATCH
ELEV OVER-RIDE 5' HEIGHT
20' - 0"
12'-0" MAX HEIGHT FROM ROOF SLAB
OPEN TERRACE BELOW
ELEV
STAIR
12'-0" MAX HEIGHT FROM ROOF SLAB
ROOF PLAZA
ELEV
GREEN ROOF
STAIR
GREEN ROOF
22' - 2 1/4"
12'-0" MAX HEIGHT FROM ROOF SLAB

SOUTH REDDING 6-LANE PROJECT

LOUDNESS COMPARISON CHART (dBA)

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
Jet Fly-over at 1000 ft	110	Rock Band
	100	
Gas Lawn Mower at 3 ft		
	90	Food Blender at 3 ft
Diesel Truck at 50 ft at 50 mph	80	Garbage Disposal at 3 ft
Noisy Urban Area, Daytime		Vacuum Cleaner at 10 ft
Gas Lawn Mower at 100 ft	70	
Commercial Area		Normal Speech at 3 ft
Heavy Traffic at 300 ft	60	
		Large Business Office
Quiet Urban, Daytime	50	Dishwasher Next Room
Quiet Urban, Nighttime		
Quiet Suburban, Nighttime	40	Theater, Large Conference Room (Background)
	30	Library
Quiet Rural, Nighttime		Bedroom at Night, Concert Hall (Background)
	20	Broadcast/Recording Studio
	10	
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

An increase of 3 dBA is barely perceptible to the human ear.

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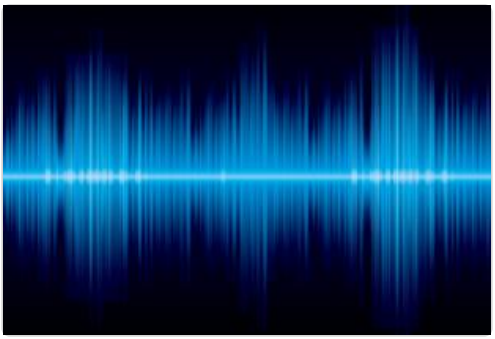
COMPARITIVE EXAMPLES OF NOISE LEVELS



Noise Source	Decibel Level	Decibel Effect
Jet take-off (at 25 meters) **Recommended product:** Outdoor Noise Barriers (http://www.industrialnoisecontrol.com/products/onb-outdoor-noise-barriers)	150	Eardrum rupture
Aircraft carrier deck	140	
Military jet aircraft take-off from aircraft carrier with afterburner at 50 ft (130 dB).	130	
Thunderclap, chain saw. Oxygen torch (121 dB).	120	Painful. 32 times as loud as 70 dB.
Steel mill, auto horn at 1 meter. Turbo-fan aircraft at takeoff power at 200 ft (118 dB). Riveting machine (110 dB); live rock music (108 - 114 dB).	110	Average human pain threshold. 16 times as loud as 70 dB.
Jet take-off (at 305 meters), use of outboard motor, power lawn mower, motorcycle, farm tractor, jackhammer, garbage truck. Boeing 707 or DC-8 aircraft at one nautical mile (6080 ft) before landing (106 dB); jet flyover at 1000 feet (103 dB); Bell J-2A helicopter at 100 ft (100 dB).	100	8 times as loud as 70 dB. Serious damage possible in 8 hr exposure.
Boeing 737 or DC-9 aircraft at one nautical mile (6080 ft) before landing (97 dB); power mower (96 dB); motorcycle at 25 ft (90 dB). Newspaper press (97 dB).	90	4 times as loud as 70 dB. Likely damage in 8 hour exposure.

Noise Source	Decibel Level	Decibel Effect
Garbage disposal, dishwasher, average factory, freight train (at 15 meters). Car wash at 20 ft (89 dB); propeller plane flyover at 1000 ft (88 dB); diesel truck 40 mph at 50 ft (84 dB); diesel train at 45 mph at 100 ft (83 dB). Food blender (88 dB); milling machine (85 dB); garbage disposal (80 dB).	80	2 times as loud as 70 dB. Possible damage in 8 hour exposure.
Passenger car at 65 mph at 25 ft (77 dB); freeway at 50 ft from pavement edge 10 a.m. (76 dB). Living room music (76 dB); radio or TV-audio, vacuum cleaner (70 dB).	70	Arbitrary base of comparison. Upper 70s are annoyingly loud to some people.
Conversation in restaurant, office, background music, Air conditioning unit at 100 feet.	60	Half as loud as 70 dB. Fairly quiet.
Quiet suburb, conversation at home. Large electrical transformers at 100 feet.	50	One-fourth as loud as 70 dB.
Library, bird calls (44 dB); lowest limit of urban ambient sound	40	One-eighth as loud as 70 dB.
Quiet rural area.	30	One-sixteenth as loud as 70 dB. Very Quiet.
Whisper, rustling leaves	20	
Breathing	10	Barely audible

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Noise Level Chart

Like 377

A noise level chart showing examples of sounds with dB levels ranging from 0 to 180 decibels.

dBA	Example	Home & Yard Appliances	Workshop & Construction
0	healthy hearing threshold		
10	a pin dropping		
20	rustling leaves		
30	whisper		
40	babbling brook	computer	
50	light traffic	refrigerator	
60	conversational speech	air conditioner	
70	shower	dishwasher	
75	toilet flushing	vacuum cleaner	
80	alarm clock	garbage disposal	
85	passing diesel truck	snow blower	
90	squeeze toy	lawn mower	arc welder
95	inside subway car	food processor	belt sander
100	motorcycle (riding)		handheld drill
105	sporting event		table saw
110	rock band		jackhammer
115	emergency vehicle siren		riveter
120	thunderclap		oxygen torch
125	balloon popping		
130	peak stadium crowd noise		
135	air raid siren		
140	jet engine at takeoff		
145	firecracker		
150	fighter jet launch		
155	cap gun		
160	shotgun		
165	.357 magnum revolver		
170	safety airbag		
175	howitzer cannon		
180	rocket launch		
...			
194	sound waves become shock waves		

Most noise levels are given in dBA, which are decibels adjusted to reflect the ear's response to different frequencies of sound. Sudden, brief impulse sounds, like many of those shown at 120 dB or greater, are often given in dB (no adjustment).

Noise Chart

Specifics about the measurement of a particular sound source can be found in the Noise Navigator® Sound Level Database, E-A-R 88-34/HP, by Elliott H Berger, Rick Neitzel, and Cynthia A Kladden, E•A•RCAL Laboratory, 3M Occupational Health & Environmental Safety Division, an extensive compilation of data on noise level measurements, including many of the values appearing on this chart.

Learn more:
What is a decibel?
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