



Received
Planning Division
03/10/2023

Memorandum

DATE: *April 18, 2022*

TO: *Julei Campos – Lynx Consulting, Inc.*

FROM: *Drew Savas, INCE*
Justin Morgan, INCE
Adam C. Jenkins, PE, INCE Bd. Cert.

RE: *Comcast Beaverton Noise Study*

INTRODUCTION

The intent of this Noise Study is to present predicted sound levels from four proposed generators at the Comcast facility (Site) located at 1750 Northwest 173rd Avenue in Beaverton, Oregon. This noise study predicts sound levels from the proposed generators at neighboring properties and summarizes the Beaverton noise code. Based on information provided to us by Lynx Consulting, we understand that the City of Beaverton considers sound emissions from these generators exempt from the noise code.

NOMENCLATURE

Decibel

The auditory response to sound is a complex process that occurs over a wide range of frequencies and intensities. Decibel levels, or “dB,” are a form of shorthand that compresses this broad range of intensities with a convenient numerical scale. The decibel scale is logarithmic. For example, using the decibel scale, a doubling or halving of energy causes the sound level to change by 3 dB; it does not double or halve the sound loudness as might be expected.

The minimum sound level variation perceptible to a human observer is generally around 3-dB. A 5-dB change is clearly perceptible, and an 8 to 10 dB change is associated with a perceived doubling or halving of loudness. The human ear has a unique response to sound pressure. It is less sensitive to those sounds falling outside the speech frequency range. Sound level meters and monitors utilize a filtering system to approximate human perception of sound. Measurements made utilizing this filtering system are referred to as “A-weighted” and are called “dBA”.

Common sound pressure levels are reported in Table 1.

Table 1 A-weighted Levels of Common Sounds

Sound	Sound Level, dBA	Approximate Relative Loudness ¹
Jet Plane at 100 feet	130	128
Rock Music with Amplifier	120	64
Thunder, Danger of Permanent Hearing Loss	110	32
Boiler Shop, Power Mower	100	16
Orchestral Crescendo at 25 feet	90	8
Busy Street	80	4
Interior of Department Store	70	2
Ordinary Conversation at three feet	60	1
Quiet Car at Low Speed	50	1/2
Average Office	40	1/4
City Residence, Interior	30	1/8
Quiet Country Residence, Interior	20	1/16
Rustle of Leaves	10	1/32
Threshold of Hearing	0	1/64

As compared to ordinary conversation at three feet.

Source: US Department of Housing and Urban Development, Aircraft Noise Impact Planning Guidelines for Local Agencies, November 1972.

Metrics

- **Equivalent Sound Level, L_{EQ}**

L_{EQ} is the A-weighted level of a constant sound having the same energy content as the actual time-varying level during a specified interval. The L_{EQ} is used to characterize complex, fluctuating sound levels with a single number. Typical intervals for L_{EQ} are hourly, daily, and annually.

- **Sound Pressure Level, SPL**

Sound pressure level correlates with what is heard by the human ear. SPL is defined as the squared ratio of the sound pressure with reference to 20 µPa. Sound pressure is affected by distance, path, barriers, directivity, etc.

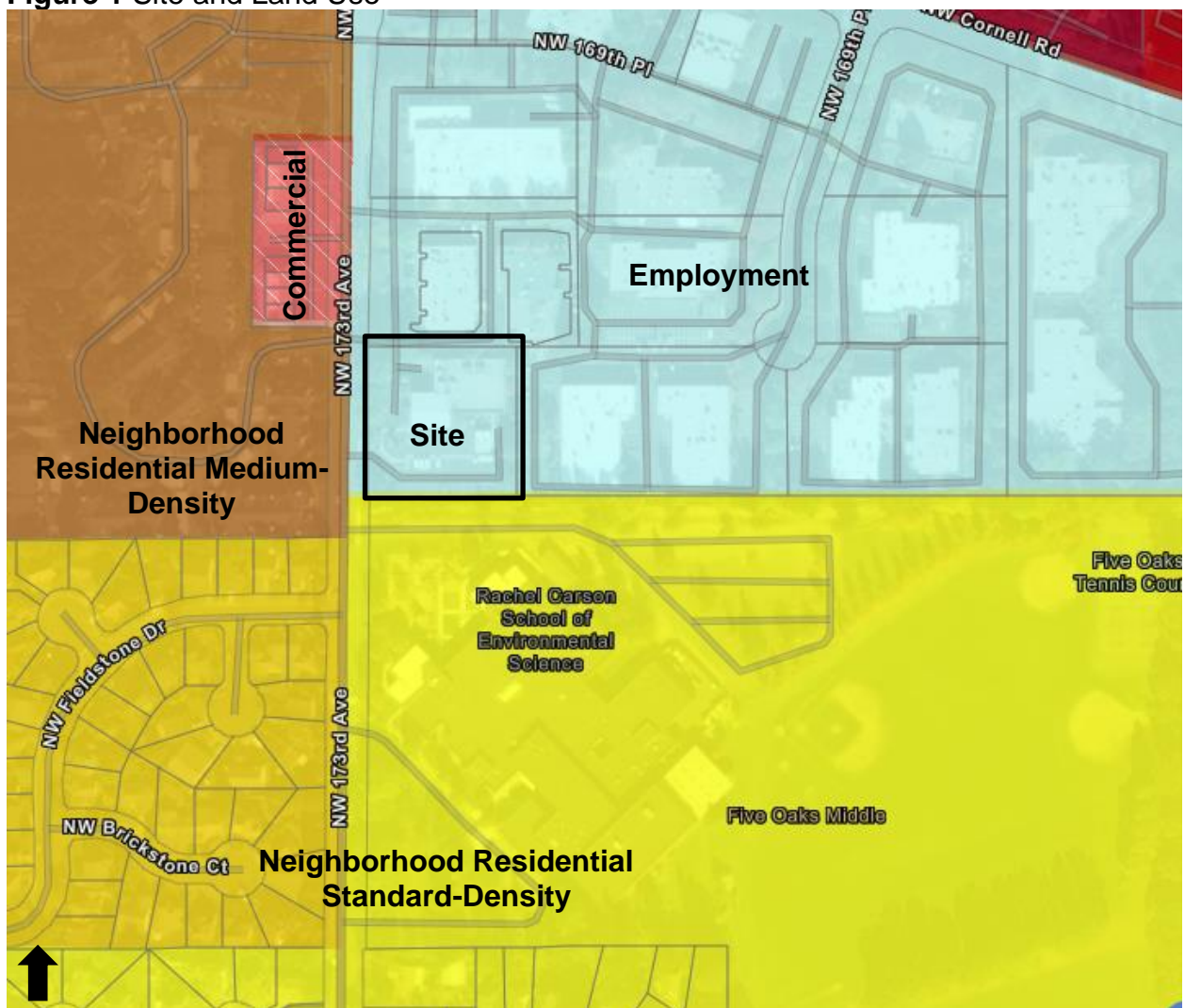
REGULATORY CRITERIA

The Site and all neighboring properties are within the City of the Beaverton. Therefore, the Beaverton City Code (BCC) Chapter 5.15 govern noise emissions from the Site. BCC Chapter 5.150.015 defines residential areas as areas that are designated as residential land use districts in the development code. BCC 5.150.015 also defines noise-sensitive areas as sleeping facilities, schools, churches, hospitals, or public libraries. BCC chapter 5.150.025-B7 provides a permissible sound level of 50 dBA when the sound occurs in a residential area and is received by a noise-sensitive area during the times of 10 PM to 7 AM. Based on information provided to us by Lynx Consulting, we understand that the City

of Beaverton considers sound emissions from these generators exempt from the noise requirements in BCC Chapter 5.15. Therefore, predicted sound levels included in this Noise Study are for informational purposes only.

Figure 1 shows the Site (black outline) and nearby land uses. The Site and properties North and East of the Site are Employment (blue) land use. Properties Northwest of the Site are Commercial (light red) land use. Properties to the South and West are Neighborhood Residential Medium-Density (brown) and Neighborhood Residential Standard-Density (yellow) land uses. Five Oaks Middle School is located on the adjacent property South of the Site and there are single-family and multi-family properties West of the Site, which are all defined as noise-sensitive areas.

Figure 1 Site and Land Use



ACOUSTICAL MODEL

The primary method used for the sound level analysis and prediction was the 3-D computer noise modeling software environment, Cadna/A. Cadna/A utilizes the CADNA (Control of Accuracy and Debugging for Numerical Applications) computation engine developed by the Pierre et Marie Curie University of Paris. The model used for this project utilized the International Organization for Standardization 9613 Part II algorithms, implemented in the Cadna/A software, which accounted for the effects of distance, topography, and surface reflections on sound levels produced by the generators. Topography, building locations, and locations of property lines were determined from City of Beaverton Map Center, Google Maps, and drawings provided by Lynx Consulting. The acoustical modeling process is typically accurate within 3 dB.

Generator Sound Levels

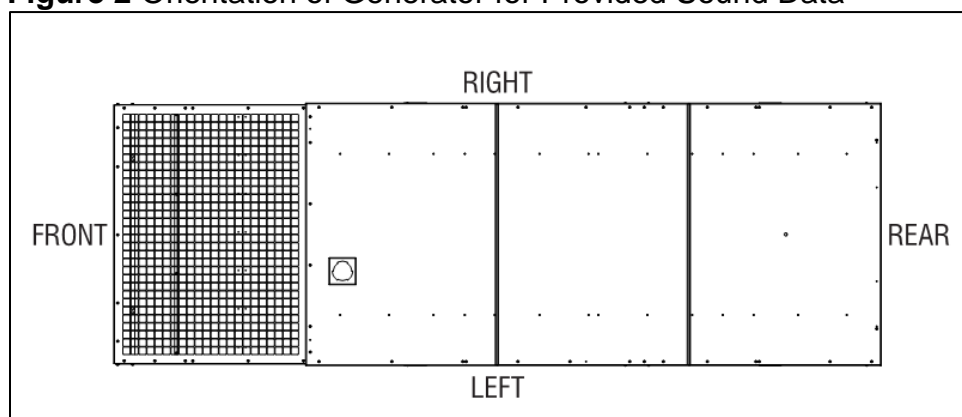
Four 600 kilowatt generators are planned to be installed at the Site. Three generators will be installed initially and a fourth will be installed at a future date. The generators will have 4-foot-tall belly mounted fuels tanks and will be within Level 2 acoustic enclosures provided by the manufacturer. Sound levels for the generators were provided by the basis of design manufacturer, Generac, and are presented in Table 2. These sound levels include an addition of 2 dB because the sound level specification sheet provided by Generac states that measured sound levels are accurate within 2 dB. Figure 2 shows the orientations of the generator for the provided sound level data.

Table 2 Generator Sound Levels – Generac SD600 with Level 2 Sound Enclosure

Measurement Location	Sound pressure level at 7 meters									Overall, dBA
	Hertz, dBA									
	31.5	63	125	250	500	1,000	2,000	4,000	8,000	
Front	53	51	68	70	73	75	73	65	55	79
Right	55	55	68	63	71	71	70	66	55	76
Rear	58	59	61	67	70	71	67	60	53	75
Left	52	58	64	68	74	71	67	58	50	77

Notes: 2 dB added to all values. Sound levels measured under full load.

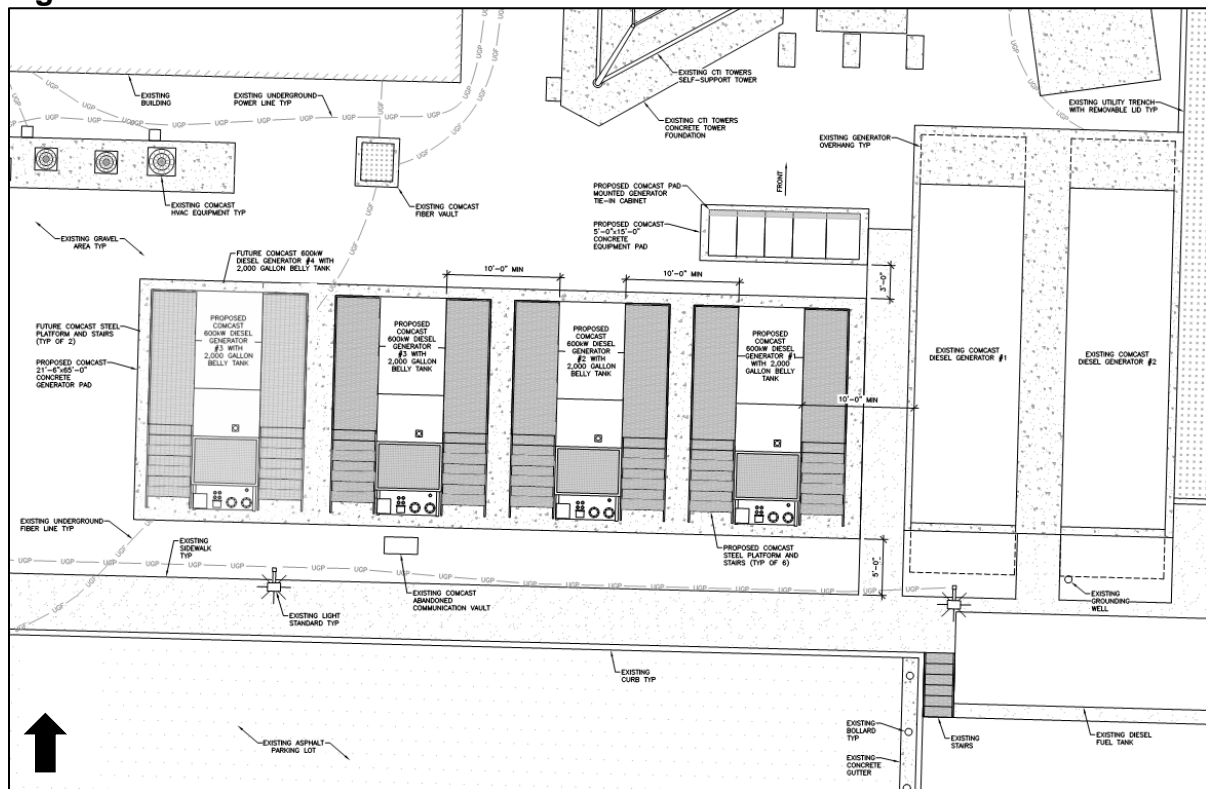
Figure 2 Orientation of Generator for Provided Sound Data



Generator Locations and Predicted Sound Levels

The proposed generators will be located near the center of the Site on a concrete pad, west of the existing generators and south of the Comcast building, as shown in Figure 3. The generator located farthest west is the proposed future generator, also included in this Noise Study.

Figure 3 Generator Locations



Sound levels originating from the four proposed generators were predicted by the acoustical model at all nearby properties. These predicted sound levels are shown in Figure 4 and the loudest predicted sound level at adjacent parcels are provided in Table 3. Predicted sound levels are at five feet above grade and only include sounds originating from the generators. Existing and future ambient sound sources are not included in these predicted sound levels.

Table 3 Predicted Sound Levels, LEQ , dBA

Receiving Property	Sound Level
North	54
South	72
East	75
West	68

Figure 4 Predicted Sound Levels Five Feet Above Grade, L_{EQ} dBA



CONCLUSION

Based on information provided to us by Lynx Consulting, we understand that the City of Beaverton considers sound emissions from these generators exempt from the noise code. Therefore, predicted sound levels are provided for informational purposes only.

To reduce sound levels received by nearby properties the following steps could be taken:

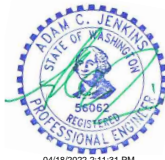
- Reduce number of generators operating at once
- Performing testing outside of school and nighttime hours.
- Limit testing to the minimum duration recommended by the manufacturer.

Respectfully submitted;

Drew Savas, INCE
Acoustician

Reviewed by;

This document has been digitally signed



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Vice President