



**BRITISH COLUMBIA
INSTITUTE OF TECHNOLOGY**

Wood Waste-to-Energy Research Facility

**Determination of the existing sound levels within the BCIT Factor
Four area**

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Objective

The of the study is to evaluate of the noise impact of the planned Factor Four wood-waste-to-energy facility on the BCIT Campus. For this purpose an experiment was executed to determine the existing noise levels and compare the sound levels before and after the implementation of the biomass boiler.

Measurement Locations

The new biomass heating facility will be installed on the South-East corner of the Joinery building (NE2, near points 22, 29 and 30 on the map below). A detailed Auto-Cad map of the measurement locations and the recognized noise sources is attached.

For the measurement 42 points around the area were selected. Point 26 is within a fenced teaching space. So it was not possible to take measurements at this location.

The characteristic of the North part of the Burnaby Campus is a workspace for trades trainings. So there are several noise sources all over the area. The main ones are:

- Joinery building with dust extraction system (NE2)
- Canopy (between NE2 and NE4)
- Carpentry building (NE4), Carpentry training space (Between NW1 and NW3)
- Welding building (NE8)
- Cooling systems (NE8 and NW3)
- Traffic on the Campus (cars, motorcycles and heavy supply trucks)
- Outside roads with heavy traffic (Willingdon Avenue and Canada Way)
- Construction at the East end of English Street (On the East site of point 34 and 39. This is an additional noise source influencing the results.)



0-1: Construction at English Street



0-2: Measurement Points on the BCIT North Campus

Measurement equipment

For the sound study a sound meter from Larson Davis (Model 831) was used. The reading software was SIm Utility-G3. The sound meter was calibrated before and after each measurement set.



0-1: Larson Davis, Sound level meter, Model 831

Weather

The values for the weather conditions are taken from the site <http://www.theweathernetwork.com/weather/canada/british-columbia/burnaby> right before the start of the measurement set and are recorded in the attached Excel file "Sound Measurements".

Parameters taken:

- Temperature
- Wind speed
- Wind direction
- Humidity
- Atmospheric Pressure

Stakeholders

The biggest cause of noise for the planned wood waste-to-energy facility is the chipper. Noise levels of chippers are typically 80-90 db. BCIT management would like the noise generated to be less than 60 db to avoid disturbing classes in the adjacent Joinery workshops. So the chipper will be installed in an enclosure to reduce the noise level.

The location of the new biomass facility will be in the middle of the BCIT Campus, thus there is no influence to neighbors across the high traffic street surrounding BCIT.

The limiting factor for the noise emission are the nearby classrooms. The closest classrooms from the planned wood waste-to energy facility are located in the joinery workshop in NE21 with a distance of 5 meters to the new biomass facility. But the surrounding area is mainly used for industrial and trades trainings. So there are already several noise sources in the area.

Time and Methodology of the measurement

The measurements were taken in 11 Sets. The necessary time for one set was between 50 min and 60 min. The order of the single measurement points was picked randomly but with the focus of avoiding successive measurements on a close area. (The summary of all measurements with weather conditions, sound level, calibration history of the sound meter, measurement times and the calculation of the averages is in the attached Excel File "Sound measurements". The original measurements files are also attached.)

The sets are aligned with on characteristic operation schedules of the BCIT Burnaby Campus.

	Timeframe	Measurement sets	Amount of sets
Morning	8:30 AM -11 AM	4,7,10	3
Lunch break*	11 AM - 1:30 PM	1,5,8	3
Afternoon	15:30 PM - 8 PM	2,6,9	3
Night	8 PM-8:30 AM	3	1
Weekend	Saturday/Sunday	11	1

* There is no universal lunch break on the North Campus. The lunch break times vary between 11 am and 1:30 pm and there is always noise production in the observed area.

Following types of sound maps are prepared and attached. If there are more than one measurement set in the map the average is calculated for each measurement point.

	Measurement sets	Amount of sets
Morning	4,7,10	3
Lunch break	1,5,8	3
Afternoon	2,6,9	3
Night	3	1
Weekend	11	1
Day	1,2,4,5,6,7,8,9,10	9
Overall	1-11	11

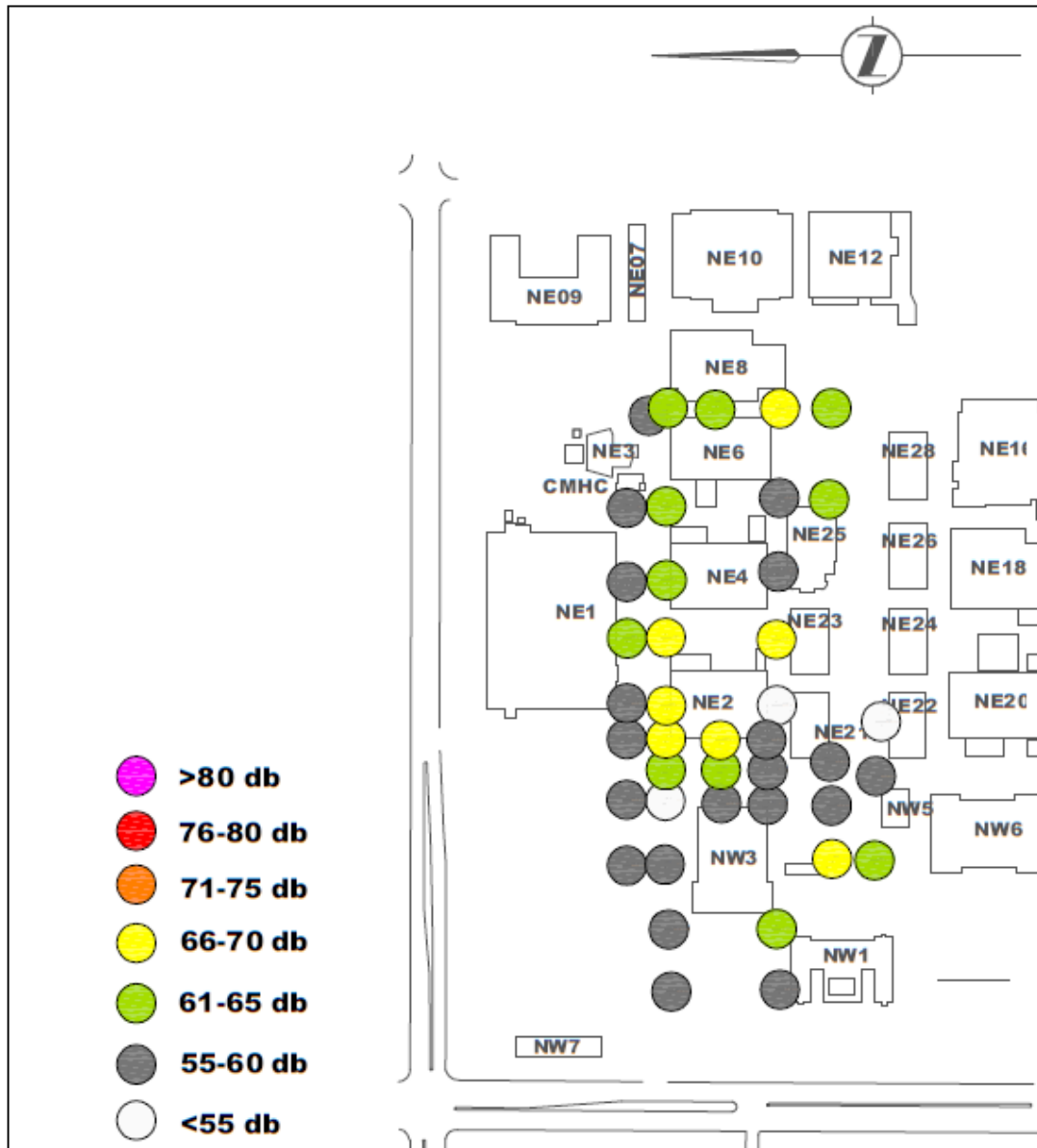
Results

For the creation of the sound maps the energy average over 30 Seconds t Equivalent Continues Level (LAeq) is used. The LAeq of each measurement is listed in the Excel-File "Sound Measurement". All other recorded values are available in the also attached single measurement files.

The table below shows the Average, the Maximum and the Minimum of the combined categories. The Single measurements is using the data before averaging the measurements to categories.

	Average [db]	Maximum [db]	Minimum [db]
Morning	62	70	54
Lunch break	63	74	52
Afternoon	58	65	50
Night	52	64	43
Weekend	53	59	45
Day	62	70	55
Overall	61	70	54
Single measurements	61	77	43

The measurement points with the loudest sound levels (65 db and higher in the overall average) are 13, 14,16, 34 and 35. The highest noise level of 77 db was measured on point 35 during a lunch break measurement.



0-1: Average Sound levels for the morning measurements

Analysis and Recommendation

The sound emission of the planned facility will be under the existing average noise level. The peak of all measurement sets in the morning and the lunch break have peaks over 70 db on a 30 second average. So it is expected that the assumed sound emissions of the new biomass facility has no influence on the sound distribution on the BCIT Burnaby Campus and the surrounding areas.

It is recommended to run the chipper (loudest component of the facility) mainly in the morning hours during the week to avoid an increase of sound emissions in the evening and on weekends. Also a similar sound analysis of single measurements for the before and after comparison after the commissioning of the new facility is recommended.

Attachments

Excel File:

- 02_Sound measurements

Auto-CAD-Drawing:

- 03_Burnabysite with Sound maps

Maps (PDF-Files):

- 01_Measurement Points
- 02_Noise Sources
- 03_Sound map morning
- 04_Sound map lunch break
- 05_Sound map afternoon
- 06_Sound map night
- 07_Sound map weekend
- 08_Sound map day
- 08_Sound map day

Measurement Files

- Measurement Files Excel
- Measurement Files SIm Utility G3- Files