

<u>Issue</u>	<u>CTA</u>	<u>Modeling Specialties</u>	<u>NCE</u>
<i>Compliance vs. Non-Compliance: Measured levels do not consistently reach 38 dBA</i>	Given EG's steady nature, variability in measurements comes from outside influences	The long term data record shows various times when the level at R1 has been 38 dBA or less during quiet environmental conditions. Many witnessed surveys have been conducted and found significant ambient sound. One witnessed survey reported levels as low as 36 dBA at R1 with normal plant operation.	NCE has reviewed nearly 40 days of noise monitoring data from EGS. The dates that this data includes are: three days in August, one day in September, twenty-nine days in October and 4 days in November. NCE specifically examined the noise data from R1. At no time during the night in any of the above data sets does the sound level at R1 drop to or below 38 dB(A). EGS consultants have said that this is due to sound from other sources within Devens. With the exclusion of the insect noise, NCE understands that the other Devens sources of noise are intermittent. As such, sometime during the near 40 days of monitoring the noise level at R1 should have dropped to or below 38 dB(A) when the noise generated by the other Devens noise sources stopped.
<i>Ambient Background</i>	Witnessed measurements at R1 are consistently affected by non-EGS sources.	Ambient sources noted during all witnessed measurements (even at compliant times). Site Ambient conditions better represent current R1 location but lower farmhouse ambient was used.	Most ambient sources, especially low frequency sources, are intrusive in nature and are screened by using L90. Ambient baseline R1 represents all residential properties.
	The original background of 33 dBA was a rare occurrence and requires a EGS-only sound level of 37 dBA at R1. As 33 dBA without the plant hardly ever occurred, with the plant, a sound level of 38 dBA at R1 will also hardly ever occur.	38dBA will only be achieved when 33dBA ambient conditions are present (quiet night, no wind, low train activity). The 33 dBA background is not, nor has it ever been, a frequent occurrence, based on CH2MHill study and former Devens baseline measurements.	One data set from October 17 th and 18 th , Saturday and Sunday. On this day other Devens activity around EGS was minimal which resulted in very constant sound levels at all locations. However, the amplitude at R1 remained around 40 dB(A) day and night. This is indicative of a steady-state noise source which presumably operates 24 hours per day 7 days per week. The only such source around R1 is Evergreen Solar.
	EGS sound level at R1 does not exceed 37 dBA for most days of the year, based on the few occasions where non-EGS sound did not contribute significantly to the environment.	Monitoring shows Evergreen operating at a relatively steady state. At times when overall levels drop below 38 dBA at R1, the facility is operating at the same level as other instances where sound levels are measured much higher. Compare CTA's November 9-10 data at 12:30AM. Evergreen reference monitors show the facility at virtually the same levels as they were on October 7-8 but the overall sound level never drops below 40. This demonstrates that there were variables other than EGS contributing to total sound at R1 on Oct 7-8. As I recall, crickets were an interfering factor at some of the monitoring stations to some degree at that time.	To further support of the claim, I suggest DEC examine data from October 7-8, 2009 (data from CTA is attached). Go to page 3 first. Look at the data from 12:30 to 1:00am. See how quickly the sound drops at 12:30 and then goes back up at 1am. Given locations at the tree and train, this data likely shows a work break (maybe midnight snack) at the train depot. Now go to page 2, for the exact same time. The sound levels at both Perry and Berwin drop below 37 dB(A), they even as low as 30 dB(A)! This points to the fact that this short period was very quiet with no other disturbing sounds. Now go to page 1 and the data for R5 and R7. Both EGS noise monitors stay at the same levels (CT goes up by 1 dB) during the period. Now examine the data for R1 at the same time. The same drop in sound occurs, but it hits a trough that does not drop below 40 dB(A).
<i>Application and Approach of 5dBA increase (L_{eq} vs. L₉₀)</i>	L _{eq} is too susceptible to sources other than EGS.	Background measurements are defined to be L90, so compliance measurements for a steady source should be in L90.	NCE believes that comparison of Leq data from 20 minute sampling periods is consistent with DEC regulation, 974 CMR 4.00. The DEC regulations do not specify data type for the compliance measurement. The regulation simply states "...broadband sound pressure level...". The only mention of L90 data in 974 CMR 4.00 is to define background sound (See Section 3.d.9). The Leq value is certainly not excluded from the regulation and NCE believes it is entirely reasonable for use in compliance measurement given how the regulation is written. If there is uncertainty on this matter, NCE suggests that independent peer review of this matter be performed.
	DEIR has only one L _{eq} measurement of 38 dBA before a facility was built		
	33 dBA was reached twice in the original study. At those times, the L _{eq} was 38 and 51 dBA.		

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<i>Receptor locations</i>	Original measurements were conducted at the Dunroven House and therefore compliance should be measured in the same spot.	Agree on locations and distances to original R1, current R1 and DREZ. Current R1 was selected as a compromise on ambient and location as basis for compliance plan. Should continue to use current R1 as is	Agree on locations and distances to original R1, current R1 and DREZ. Current R1 is not at DREZ property line. Should remain at R1 and be adjusted to account for displacement
	Existing R5 and R7 locations and elevations are appropriate for representing sound levels at R1.	R5 and R7 have a direct line of sight to R1 which is the closest terrestrial point outside of Devens and therefore the locations are acceptable for compliance measurements	
<i>Location of R1</i>	Compliance measurements to this point have been conducted at the edge of Dunroven Farm -- the closest accessible point to the industrial facility. This measurement location was established by the DEC.	The DEC considered landuse, ambient levels and exposure to Evergreen in establishing the compliance point at the current R1. R1 was placed at the nearest point of useable exposure to the sound field. The R1 ambient exposure is consistent with the EGS site, but the distant farmhouse ambient was used. The original graphics overlaid by the recent survey conducted by Dunroven Farms show them to be generally consistent. So none of the factors relating to landuse, property line, exposure or ambient have changed substantially.	Given that adjustments are being made to ensure conformance to the property line, NCE believes an additional adjustment would be required. Recent property surveying by Dunroven Farms produced a drawing which shows that the center of the Cooling Tower is 536 feet to the property line and 693 feet to the R1 noise monitoring position. The sound pressure level difference based on spherical spreading would be 2.2 dB. NCE recommends that the reference limits (A-weighted and low frequency) for the Cooling Tower is adjusted down by 2 dB to adjust for the difference between R1's existing location and the property line. The survey did not include distances from the VOC, but the same adjustment should be performed for that source as well.
	Current compliance requirements assume a preexisting, uniform background sound pressure level of 33 dBA at all of Dunroven Farm. The current R1 location is closer to the industrial park than original background measurements. The original tests show higher background sound pressure levels at the measurement location closer to the industrial park.		
<i>Worst Case Scenario testing</i>	Pending DEC approval of the long term monitoring protocol's proposed reference limits, EGS achieves compliance when cooling towers operate at 60% or lower. Gas unload trivial – no need to redo.	Failed at above 60% operation of cooling towers. Gas unload trivial – no need to redo. A lot of ambient intrusions. Low frequency fell off at 60%. Indeterminate effect below that.	Failed at 60%. Operation of cooling towers. Gas unload trivial - no need to redo. EGS data ramped down with lesser CT speeds. No data shows compliance without specific measurement of background sound.
<i>Duration of Compliance Measurements 5 minutes or 20 minute samples?</i>	Original measurements were based on 1-hour time samples. Five-minute sample times permits more volatility in measured sound levels, i.e. higher and lower than the corresponding 1-hour sample.	Requested 5 minute data is for review purposes only, allowing necessary resolution to identify fluctuations caused by ambient sources.	
	The discrepancy between one-hour measurements and five-minute measurements is too large. Differences between 20-minute and 1-hour measurements we believe would be acceptably small.	All compliance measurements should be made at 20 minute intervals.	The current monitoring protocol will potentially filter short duration noise given that the sampling period is 20 minutes and only the L90 noise values are being reported. NCE recommends that the protocol include capability to address shorter duration sounds (i.e. longer than impulses but shorter than 18 minutes). NCE suggests this be accomplished in one of two ways. The first approach would be to keep 20 minute sampling period, but add reporting of Leq and L10 noise data. The second approach would be to reduce sampling period to five minutes or less. From a data management standpoint, adding the Leq and L10 metrics would require less instrument memory than reducing the sampling period to five minutes.

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<p><i>Statistical analysis of data to determine reference limits?</i></p>	<p>EGS sound cannot be separated from sound produced by non-EGS sources. There are no statistical processes that can reliably separate non-EGS sound from EGS sound.</p>	<p>Data should be screened to eliminate times when ambient affected levels. So calculations need to be one at a time. Current "Delta" valid based on general trend of observed levels.</p>	<p>Appendix A should have all supporting data for when compliance was measured. "Delta" should be calculated by statistical average of lots of data points. "Delta" too high.</p>
	<p>A statistical analysis of data which has been corrupted by non-EGS sources inaccurately attributes measured sound to EGS.</p>	<p>Any statistical analysis of many points should include only points where sound is limited to only Evergreen contribution. Even during demonstrated periods of compliance, ambient sources contribute energy to the Evergreen Sound. So this approach is not workable.</p>	<p>Using the one data point, the adjustment values (or deltas) were determined to be 24 and 19 dB for the VOC and Cooling Tower, respectively. However, Table A-1 provides multiple data sets with delta values lower than above. Even the averages of the data in Tables A-1 are lower than the values used in the computation. Worst Case testing on Oct 11th, November 2nd (witnessed by NCE) among other dates (such as Oct 17th) should have produced additional data for computation of adjustment values.</p>
	<p>Even with cooling tower levels at 100%, EGS is not loud enough to be the only audible noise source at R1</p>		<p>NCE recommends that the adjustment value for A-weighted and low frequency (16 and 31.5 octave bands) sound be computed from all useful data such that a statistically valid number of samples are used. The final value should be the average of all the samples minus one standard deviation of all the samples.</p>
<p><i>Multiple Noise Source Adjustment - 3 dBA penalty for two sound meters? (37 + 37 = 40 dBA)</i></p>	<p>The two meters are not truly measuring only one source. Each source microphone is affected by sound produced by the other source.</p> <p>This is verified by data collected Nov 3 which shows that as cooling tower speeds increase, levels at BOTH R5 and R7 increase.</p> <p>The 37 dBA EGS sound level at R1 was determined by measurements at R1.</p>	<p>Witnessed measurements were made simultaneously at the three locations, so no equation adjustment is appropriate.</p>	<p>Sound from two directions. R5 and R7 are not equal so 3 dBA adjustment is needed. Adjustment is not upward, but should reduce the goal. Will give this more thought.</p>