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May 2, 2006
CPP06-102

Ms. Jeri Scott
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814-5512

Mr. Rob Sherry
Planning Director
County of Sacramento Planning Department
827 7th Street, Room 230
Sacramento, CA 95814

SUBJECT: COSUMNES POWER PLANT (01-AFC-19)
CONDITION OF CERTIFICATION NOISE-5

Dear Ms. Scott and Mr. Sherry,

The Sacramento Municipal Utility District ("District") has completed the acoustic compliance test in conformance with the requirements of Condition of Certification NOISE-5 and hereby submits the results of this test to you. The results of the compliance test show during almost all hours the Cosumnes Power Plant ("CPP") meets the noise limits set by the California Energy Commission ("Commission"). The compliance test also showed that no new pure tones were introduced by CPP at the monitoring locations. But, when specific weather conditions occur which reduce the normal atmospheric absorption of sound, noise from CPP exceeds the NOISE-5 limits for one or perhaps two hours during the late night/early morning when background noises from surrounding sources have subsided. Based upon the weather data used to analyze the air quality impacts of CPP in the licensing proceeding before the Commission, weather conditions that could increase the transmission of sound such as a temperature inversion are expected approximately 10% of the year. Nevertheless, the District will reduce the noise levels produced by CPP in an effort to encompass all weather conditions regardless of percentage or probability of occurrence.

The District takes its commitments and requirements contained in the Conditions of Certification seriously and intends to bring CPP into compliance with NOISE-5. Therefore, the District has conducted an intensive analysis of the equipment at CPP to determine the sources of noise that are traveling to the monitoring locations. Low frequency noise travels farther than high frequency noise. Since the monitoring locations are at a relatively long distance from CPP from a noise perspective, CPP must reduce low frequency noise. As you are aware, reducing low frequency noise sources is not an inexpensive proposition. Therefore, the District has analyzed the cause, weather conditions and potential solutions to be sure that the mitigation measures proposed to resolve this issue will in fact bring CPP into compliance with the requirements of NOISE-5. The District appreciates Ms. Scott's review of the following mitigation proposal and awaits her response.

The remainder of this letter summarizes the findings of the enclosed Acoustic Compliance Test Report for Cosumnes Power Plant ("Compliance Test"), the District's efforts to determine the specific pieces of equipment creating the sound levels that are traveling to the monitoring

locations, and the additional measures the District proposes to take to reduce the sound produced by CPP when weather conditions reduce sound attenuation. The discussion also evaluates the potential for any environmental impacts from those mitigation measures. Finally, the District provides a schedule for completing the installation of these mitigation measures. Consistent with the requirements of NOISE-5, the District requests approval from Ms. Scott to proceed with the mitigation measures described below.

Compliance Test

Pursuant to the requirements of NOISE-5, the District contracted with ATCO Noise Management ("ATCO") to complete the compliance test of the noise created by steady-state operation of CPP. With CPP operating at maximum output, a level greater than the 80% output required by NOISE-5, ATCO monitored noise levels from CPP for a 25-hour period on March 23 and 24, 2006. ATCO conducted a rigorous and thorough test that included the data from an on-site weather station as well as monitoring locations at the CPP boundary, at 400 feet from the noise emitting equipment, at R1, just east of the residence at 13896 Clay East Road, and at R2, 11615 Kirkwood Street. That test revealed that for an hour or perhaps two CPP does not meet the requirements of NOISE-5. During the test, CPP exceeded the limits under adverse weather conditions for the transmission of noise and when other noise-producing activities had subsided in the surrounding community. At R1 CPP did not meet the noise limits from noise levels attributable to CPP for 1 hour in a 25-hour time period. The hour where CPP caused the measured level to exceed the limit occurred from 2:00 a.m. to 3:00 a.m. To be conservative ATCO used the 2 a.m. to 3 a.m. timeframe twice in the 25-hour noise test, which included the 2 a.m. to 3 a.m. hours for both March 23 and 24. For R2, exceedances of the noise limits due to the operation of CPP occur for one or perhaps two hours during a 25-hour period. Again, ATCO used the 2 a.m. to 3 a.m. timeframe twice in the 25-hour noise test for both March 23 and 24. The maximum noise level attributable to CPP at these locations is 46.2 dBA at R1 and 45.5 dBA at R2. The NOISE-5 limits for R1 and R2 are 42 dBA and 39 dBA, respectively.

When the weather conditions are favorable for the absorption of noise, which usually occurs during the day and evening, CPP meets the noise requirements. When the weather patterns change and the conditions are favorable for the transmission of noise such as for an hour or perhaps two during temperature inversion conditions at night, noise from CPP carries farther than expected and CPP does not meet the noise limits. Therefore, the attenuation of sound normally expected over distance is reduced due to the return of sound to the ground that would otherwise dissipate in the atmosphere. Because the sound does not attenuate at the expected rate, CPP exceeds the NOISE-5 limits during these conditions.

This weather related noise result is consistent with the comments the District has received from neighbors. At times when CPP is running at full output, the neighbors have commented that they cannot hear the plant and assume CPP to be off-line. At other times under very similar operating conditions at CPP, neighbors will report that they can hear the noise from CPP. Furthermore and referring to Noise Complaint Resolution 011, the level of operation at CPP does not drive noise complaints. (Noise Complaint Resolution 011, March 27, 2006.). The District is relieved that the test was able to fully capture data during the atmospheric conditions that appear to have

generated noise complaints, so that the data could be thoroughly analyzed and the problem identified.

Identifying the Problem

Sound travels through the air at different wavelengths corresponding to the sound's frequency. As a result, higher frequency sound attenuates or declines at a faster rate than low frequency sound. Furthermore, the compliance test also demonstrated that the noise levels associated with CPP are driven by precise weather conditions. Specifically, under stable or light winds in the direction of the monitoring locations combined with a nighttime temperature inversion, CPP exceeds the NOISE-5 limits. Based upon the weather data used for the air quality modeling analysis conducted for the certification of CPP, these conditions can occur approximately 10% of the time. These conditions are referred to as stability class G. If there are light winds they are blowing to the west south-west toward the monitoring locations. Under temperature inversion conditions the sound does not dissipate in the atmosphere but instead is bent back down to the ground. When the wind blows toward the monitoring locations the sound travels farther in the direction the wind is blowing toward.

The resulting effect is that lower frequency sound from CPP is traveling farther than expected. The daytime and evening results reflect standard noise attenuation. Thus, the District must reduce the low frequency noise generated by CPP such that the NOISE-5 limits are met when weather conditions allow noise to travel farther.

The District wanted to be sure that noise mitigation measures at CPP would reduce sound levels at the monitoring locations under the weather conditions that are most conducive to the transmission of sound. Therefore, the District had sound levels of various equipment at CPP measured at numerous locations to determine where the sound problems are generated. The evaluation specifically considered the distance of the monitoring locations from CPP and the weather conditions that are most likely to transmit sound the farthest. Therefore, the analysis focused on low frequency noise sources that travel further and are less likely to be reduced or absorbed by the environment. Next, the analysis evaluated the specific pieces of equipment and determined which ones produced the highest sound power levels and therefore, the greatest influence at the monitoring locations. The noise sources within CPP that need to be addressed based upon the sound power level analyses are:

- Steam Turbine Condenser (North Side),
- Cooling Tower Water Basin,
- Steam Turbine Condenser (West Side),
- Cooling Tower Fans,
- Steam Turbine Exhaust to Condenser,
- Combustion Turbine Generator Air Intake Ducts,
- Steam Turbine Flash Tank and Piping,
- Main Transformer Fans, and
- Unit 3 Heat Recovery Steam Generator (HRSG) Inlet Duct Southern Wall.

Upon identifying the areas creating sound levels at the monitoring locations that exceed the NOISE-5 limits, the District investigated options for solutions. The solutions are expected to reduce noise levels from CPP such that in late night and early morning hours CPP will meet the limits contained in NOISE-5. Because the noise limits at R2 are the most stringent, all measures are designed to meet 39 dBA at R2 in late night/early morning hours. R2 is the controlling limit because the distance between R1 and R2 results in slightly less than a 3 dBA attenuation; however, the difference between the two limits is 3 dBA (42 dBA at R1 and 39 dBA at R2). Thus, the 39 dBA limit at R2 is the more conservative, and therefore the controlling design parameter.

Mitigation Measures

The District has identified a number of mitigation measures that it proposes to install to reduce noise levels from CPP. Due to the District's interest in implementing noise mitigation measures as quickly as possible, the District will install improvements as soon as design and materials are available instead of waiting to make all of the improvements at once. This approach allows the District to install shorter lead-time measures prior to completion of longer lead-time mitigation measures.

The mitigation measures involve the installation of noise barriers, noise absorbing equipment and replacement of specific components where attenuation is not practical. Those measures include the following:

- Noise Barriers at the North and West Sides of the Steam Turbine Condenser. To address the noise coming from the steam turbine north and west sides and the steam turbine exhaust, the District will install sound absorbing panels that will essentially close off the north and west sides of the steam turbine pedestal. These barriers will follow the profile of the condenser unit and will not extend in size beyond that structure. These barriers will dampen condenser noise.
- Cooling Tower Basin Fill. To attenuate cooling tower splash noise coming from the west side of the tower, the District will add a one foot layer of fill and associated supporting structure to the west side of the cooling tower at the basin level. The fill will be approximately one foot high and will attenuate cooling tower splash.
- Two-Speed Cooling Tower Fan Drive Motors. The District will install two-speed fan drive motors to reduce cooling tower fan noise during the late night/early morning hours when weather conditions can lead to an increase of sound levels at the monitoring locations. When heat rejection load on the cooling tower is lower the motors will operate at the lower speed, reducing noise from the cooling tower fans. This measure will reduce sound power levels under cooler ground level inversion conditions, but without impairing daytime plant heat rejection when motors can be operated at the higher speed.
- Noise Barriers Shielding the Combustion Turbine Air Intake Ducting and Bearing Housing Exhaust. These barriers will follow the dimensions of and will not exceed the combustion turbine package side elevation profile. The District anticipates that these walls shielding both combustion turbine intake structures will be approximately 33 feet wide by 33 feet high. These barriers will use sound absorbing materials and reduce sound levels from both combustion turbine intake ducts and bearing housings.

- Acoustic Insulation of the Steam Turbine Drain Tank and Piping. The acoustic insulation would consist of mass loaded vinyl acoustic insulation. This installation will wrap around the drain tank and piping and will reduce noise levels from the drain tank and piping.
- Barrier Walls and Acoustic Insulation on the Transformer Blast Walls. In order to reduce noise levels from the generator step up transformer fans, the District will install two measures. The first measure is sound absorbing insulation on all three existing main transformer blast walls. Acoustical measurements show that fan noise from all three transformers is currently reflected against the blast wall toward the monitoring locations. The acoustic insulation will absorb noise from the transformer fans. In addition, the District will install three barrier walls to the west of each of the three transformers. These barrier walls will be approximately 43 feet wide and 25 feet high, and constructed of sound absorbing materials to reduce noise reflection back into the plant.
- Barrier Wall on the South Side of Unit 3 HRSG Transition Duct. This barrier wall will shield the noise coming from the south wall of Unit 3 HRSG inlet duct. A similar wall is not needed for Unit 2 because Unit 2 is already shielded by Unit 3. This barrier will be no larger than the transition duct, a trapezoidal shape approximately 26 feet long and 65 feet high at its highest point. Preliminary calculations show this structure as a relatively small wall, significantly smaller than the transition duct. This barrier will be constructed of noise absorptive material and will be placed along side the current structure.

The District anticipates the mitigation measures listed above will reduce noise levels from all of the noise sources at CPP that caused the measured plant noise levels at R1 and R2 to exceed the limits contained in NOISE-5.

Once the District receives approval from the Commission for the mitigation measures described above, the District will initiate engineering design of these measures. Each barrier wall will need appropriate engineering from a structural and acoustic standpoint prior to installation. The District would like to proceed with detailed engineering as soon as possible so that this noise issue can be resolved as quickly as possible.

Potential Environmental Impacts from Proposed Mitigation Measures

These noise barriers and cooling tower mitigation measures will not result in any significant negative environmental impacts and will result in a substantial noise reduction at the monitoring locations. The anticipated noise reduction should meet the NOISE-5 limits when weather conditions are favorable for the transmission of sound. The District believes that these measures will reduce sound levels created by CPP at R2 by 6.5 dBA. Because other sources dominate the daytime noise environment, the noise reduction will be most notable at night and in the early morning hours.

From an air quality and public health perspective, neither the barrier walls nor the modifications to the cooling tower will impact the flow rate, temperature or constituents emitted by either HRSG stack during operation of CPP. Nor will any of the barrier walls or proposed solutions for the cooling tower increase the height of the surrounding structures such that it will impact downwash or dispersion of exhaust from the CPP stacks. The two-speed motors will reduce the

airflow rate through the cooling tower when they are operating at the lower speed. The high-speed setting will be equivalent to the current fan flow rate. The lower motor speed and resulting air flow rate will not increase the level of cooling tower drift analyzed and permitted in the Commission Decision for those times when the motors are operating on low speed. This change will also not increase annual emissions from the cooling tower. Furthermore, no additional hazardous materials will be added that could impact public health.

All of the mitigation measures will be placed within the confines of the existing CPP boundary. This area has already been extensively disturbed (and mitigated) during the recent construction of CPP. Furthermore, the District intends to use spread footings for the barrier walls to avoid any impact to existing underground equipment, or disturbance of native soil. Therefore, these improvements are not anticipated to impact biological, cultural, paleontologic, geologic or agriculture and soils resources.

Because the facility already exists and these additions do not change the land use at the site, these mitigation measures will not impact land use.

Worker health and safety will be addressed by following applicable construction and operation conditions placed upon the facility by the Commission Decision. No specific worker safety concerns are anticipated. None of these noise barriers will create a confined space and associated worker safety requirements. These barriers use standard construction materials and do not pose hazardous materials risks that are any greater than during construction of the facility. In summary, these mitigation measures do not create additional hazards to workers on site because they do not create confined spaces nor add hazardous materials to the site.

The construction and installation of the barriers and modifications to the cooling tower will require a small construction workforce of approximately 30 workers and take approximately 4 months to complete. These workforce levels are consistent with standard maintenance activities at CPP. Because these workforce levels are consistent with maintenance levels, the District does not anticipate traffic impacts. Furthermore, this short-term project to complete installation of the mitigation measures is of such short duration and requires so few workers that the District does not anticipate any workers will be moving to the area for the construction of these mitigation measures and placing additional strain on community services. Furthermore, the District has already addressed impacts to fire and sheriff services from construction and operation of CPP through the Conditions of Certification in the Commission Decision.

All of the barriers will be placed within the CPP project boundary. These structures also mirror in size the equipment they intend to shield from the monitoring locations. The barriers will be located close to the noise source providing for adequate worker access and considering worker safety and structural requirements. Thus, none of the barriers will be sitting at the edges of the CPP boundary away from the equipment they are designed to shield. Because of their relatively small size in comparison with CPP and location within the CPP project site, the District does not expect these barriers to create additional adverse visual impacts. CPP has installed the visual resources mitigation measures regarding vegetation screens. Further, the new structures will be painted or treated in Commission-approved saddle tan to be consistent with the color of the

existing structures in all instances but the acoustic insulation of the drain tank and piping that is located within and surrounded by other plant equipment.

The District does not anticipate impacts from hazardous materials because the barriers will be made of standard construction materials. These materials include standard hazardous materials such as paints, oils and solvents but do not introduce new hazardous materials or any materials in such quantities that could pose a significant onsite or offsite threat. Likewise, the construction of these barriers will not create significant amounts of construction waste that cannot be accommodated by existing waste facilities. The District will follow applicable waste and hazardous materials handling and disposal requirements in the Commission Decision. Thus, the installation of the proposed barriers and other mitigation measures will not create adverse waste or hazardous materials impacts.

The mitigation measures proposed do not increase the water used by the facility. Also since they are located within the existing CPP boundary, the mitigation measures will not disrupt surface water resources that flow around the CPP site nor will they create new sources of potential runoff that could impact flows to nearby creeks and vernal pools. The onsite storm water flow patterns and handling systems will not be changed by these mitigation measures. Therefore, the mitigation measures will not adversely impact water resources.

These mitigation measures produce positive noise impacts on the surrounding area and do not create adverse impacts. Therefore, the District has not evaluated alternatives to these proposed mitigation measures from an environmental perspective and believes that no evaluation is necessary.

These improvements will occur on the existing CPP site and will become an integral part of the facility. These mitigation measures will not expand the capacity or otherwise change the character of CPP. The construction of these barriers and other equipment will comply with building standards cited in the Commission Decision and will not cause CPP to become out of compliance with applicable laws, ordinances, regulation or standards.

Impact on the Public

For those local residents who experience weather related noise levels from CPP in the late night and early morning hours, these mitigation measures are expected to reduce CPP generated noise levels they experience *during all hours*. Although the District is designing the mitigation measures to address sound transmission during inversion conditions and when other background noises have subsided, these improvements are expected to reduce the noise level from steady-state operation of CPP during all hours and under all weather conditions. Thus, the impacts of these improvements on the public will be positive.

Schedule

Most of these improvements require engineering design, in some cases specific manufacture and in all cases installation. The District plans to install these mitigation measures as soon as possible, and as engineering and equipment procurement allow. The District will not wait for all

measures to be available for installation. All of the shorter lead-time mitigation measures will be engineered and installed first, and any long lead-time mitigation measures will follow. Should Ms. Scott approve the mitigation measures, the District will install those measures by the date shown below.

By January 31, 2007 the District will install:

- Noise Barriers at the North and West Sides of the Steam Turbine Condenser,
- Cooling Tower Basin Fill on the West Side of the Cooling Tower,
- Two-Speed Cooling Tower Fan Drive Motors,
- Noise Barriers Shielding the Combustion Turbine Air Intake Duct and Bearing Housing Exhaust,
- Acoustic Insulation of the Steam Turbine Drain Tank and Piping,
- Barrier Walls and Acoustic Insulation on the Transformer Blast Walls, and
- Barrier Wall on the South Side of Unit 3 HRSG Transition Duct.

Conclusion

These mitigation measures reflect a significant cost to the District; therefore, the District is very motivated to achieve the noise levels specified in NOISE-5 with these measures. The District would also like to resolve this issue as quickly as possible. Thus, the District has conducted an on-site evaluation of noise sources, met with vendors to evaluate and decide upon the appropriate mitigation measures, and initiated the development of detailed cost estimates for engineering and construction.

The District would appreciate a short turnaround from Ms. Scott on the above described mitigation measures. Each of these measures will need to be engineered to address the specific noise source and to meet building standards. The District would like to proceed with these improvements as soon as possible and is waiting for Ms. Scott's approval as specified in Condition of Certification NOISE-5.

Sincerely,

Kevin M. Hudson

Kevin Hudson, P.E.
Senior Project Manager, Compliance
Cosumnes Power Plant

Enclosure

cc: Bob Nelson
Corporate Files

676900

Acoustic Compliance Test Report

Cosumnes Power Plant, Herald, CA

May 1 2006

PREPARED BY:

ATCO Noise Management

EXECUTIVE SUMMARY

ATCO Noise Management (ATCO) was retained to carry out a Compliance Sound Level Survey at the new Sacramento Municipal Utility District's ("District") Cosumnes Power Plant (CPP) near Herald, California.

Based on the Condition of Certification NOISE -5 as set out by the California Energy Commission (CEC), sound emissions from CPP were to be limited as follows:

- Just east of the residence at 13896 Clay East Road identified as R1: 42 dBA
- At 11615 Kirkwood Street identified as R2: 39 dBA

Also, CPP could not introduce new pure tones or noise from a single piece of equipment that would stand out at the monitoring locations. In order to establish compliance, the Condition further required that 25-hours of continuous noise level measurements be performed at the locations identified as R1 and R2.

ATCO performed long term, continuous sound level measurements of which 25-hours covering the period from 2:00 a.m. on March 23, 2006 to 3:00 a.m. on March 24, 2006 are presented in this report. The measurements locations included:

- The two monitoring locations, R1 and R2.
- The western CPP fence line directly in line with R1 and R2 to provide data on the plant's noise signature for the purpose of distinguishing plant noise from other noise; and,
- 400 feet from the equipment footprint as suggested by CEC in NOISE-5 to provide an alternate location for extrapolation purposes.

At these locations, a continuous audio trace was recorded for use in determining the sources of intermittent noise. In addition, ATCO personnel were in the area checking the equipment for the entire 25-hours and at the monitoring locations, R1 and R2, for 19 of the 25-hours.

ATCO's weather station was placed near the sound level meter at the CPP fence line to log temperature, humidity, wind speed and wind direction over the same 25-hour period.

ATCO also performed short term measurements of 20 minutes at eight points along a circle that was approximately 400 feet from the edge of the CPP equipment footprint and in accordance with ANSI B133.8-1977, *Gas Turbine Installation Sound Emissions*. These measurements serve as backup to the continuous CPP noise level measurements.

Various noise sources were identified in the survey areas. These sources include:

1. Traffic noise from nearby roadways;
2. Rural and agricultural activities;
3. Aircraft noise;
4. Sound from natural sources in the environment; and
5. Noise from the CPP.

Overall, the acoustic environment in the vicinity of the CPP site can be characterized as rural and agricultural. Birds, insects and livestock were present at each measurement location. Noise from vehicle and aircraft traffic was prominent throughout the daytime. The noise contribution to the measured sound levels by sources other than CPP was significant although variable. Due to sources other than CPP, the L_{50} median sound level regularly exceeded the regulatory limits of 42 dBA and 39 dBA at R1 and R2 during the measurement period.

However, CPP affected the sound environment during the nighttime when noise levels were in excess of limits set by the CEC for the two monitoring locations R1 and R2. Noise contribution from CPP is best illustrated during the 2:00 a.m. – 3:00 a.m. time period on Friday March 24, 2006. During this hour, noise levels were measured as 46.2 L_{50} at R1 and 45.5 L_{50} at R2. An analysis of the one-third octave band noise levels at the receptors showed a strong correlation with the CPP noise spectrum measured at Locations 1 and 4, and during the short duration measurements.

The analysis of the spectral distribution by one-third octave bands also found that no pure tones were present. CPP meets the NOISE-5 requirement for pure tones.

During the brief period of non-compliance, weather conditions were particularly conducive to the propagation of sound. Wind direction was from the north and towards the residences; wind speed was between 1 and 5 mph; humidity was relatively high; and atmospheric conditions were stable. While the amount of noise generated by CPP was constant, the medium through which propagation occurred changed along with meteorological conditions.

These findings are consistent with reports from CPP's neighbors contained in Noise Complaint Resolution #011. Under steady state operation, CPP noise levels remain relatively constant. As background noise decreases and meteorological conditions change, noise transmission is enhanced and CPP is more audible.

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1.0 INTRODUCTION

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- Just east of the residence at 13896 Clay East Road identified as R1: 42 dBA
- At 11615 Kirkwood Street identified as R2: 39 dBA

Also, CPP could not introduce new pure tones or noise from a single piece of equipment that would stand out in the monitoring locations. In order to establish compliance, the Condition further required that 25-hours of continuous noise level measurements be performed at the locations identified as R1 and R2.

ATCO performed long term, continuous sound level measurements of which 25 hours covering the period from 2:00 a.m., March 23, 2006 to 3:00 a.m., March 24, 2006 are presented in this report. These 25 hours include the 2:00 a.m. to 3:00 a.m. hour on both March 23 and 24, which demonstrated the highest noise levels attributable to CPP at R1 and R2.

The measurements locations included:

- the two monitoring locations, R1 and R2;
- the western CPP fence line directly in line with R1 and R2 to provide data on the plant's noise signature for the purpose of distinguishing plant noise from other noise; and,
- 400 feet from the equipment footprint as suggested by CEC in NOISE-5 to provide an alternate location for extrapolation purposes.

At these locations, a continuous audio trace was recorded for use in determining the sources of intermittent noise. In addition, the monitoring locations, R1 and R2, were monitored by ATCO personnel for 19 of the 25-hours.

ATCO's weather station was placed near the sound level meter at the CPP fence line to log temperature, humidity, wind speed and wind direction over the same 25-hour period.

ATCO also performed short term measurements of 20 minutes at eight points along a circle that was approximately 400 feet from the edge of the CPP equipment footprint and in accordance with ANSI B133.8-1977, *Gas Turbine Installation Sound Emissions.*

These measurements were to serve as backup to the continuous noise level measurements.

This report provides an assessment of CPP's compliance with requirements of the Commission Decision on the Cosumnes Power Plant Project, Condition of Certification NOISE – 5 (*Docket No. 01-AFC-19, pp. 129-130*).

1.1 Noise Level Criteria

The District received a license for the construction and operation of Phase I (500 megawatts) of the combined cycle Consumnes Power Plant (CPP) from the CEC in September of 2003. That license contained requirements for noise as outlined in the following Condition of Certification NOISE – 5 ("NOISE – 5"):

> "The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that the hourly median noise level (L_{50}) produced by steady state operation of the project will not exceed the hourly median (L_{50}) noise level of the following values:
>
> - At the relocated residence identified as R1: 42dBA.
> - At the existing residence identified as R2: 39 dBA.
>
> No new pure tone components may be introduced at the nearest existing residences (relocated in the case of R1). No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints." (*Commission Decision, Docket No. 01-AFC-19, pp. 129 – 130, September 2003.)*

Further, NOISE – 5 requires noise level limits from CPP to be met at the two monitoring locations while the plant operates in steady state mode and at an output of 80% or greater.

In order to establish compliance, NOISE-5 requires that the project owner conduct a 25-hour community noise survey at the locations identified as R1 and R2. The noise surveys also have to include measurements of one-third octave band sound pressure levels at R1 and R2 to ensure that no pure-tone component has been introduced by CPP. (R1 is a caretaker's trailer located approximately 3,500 feet from CPP. R2 is a home located at the intersection of Clay East Road and Kirkwood street approximately 5,100 feet from CPP.)

The Condition also states that an alternative measurement location closer to CPP can be used, giving an example of 400 feet from the noise source. The CEC would accept noise levels that were mathematically extrapolated from the alternative location as a measure of the plant's noise contribution at the nearest residence. (*Commission Decision, Docket No. 01-AFC-19, p. 129, Sept. 2003.)*

In addition to the CEC, the Sacramento County Zoning Ordinance sets the following exterior environmental noise standards as measured at the receiving property line: 1) between 7 a.m. and 10 p.m. of 55 dBA, and 2) between 10 p.m. and 7 a.m. of 50 dBA. (*Sacramento County Municipal Code Section 6.68.070.*) The Noise Element of the Sacramento County General Plan includes noise levels of 50 dBA (L_{50}) between 7 a.m. and 10 p.m. and 45 dBA (L_{50}) between 10 p.m. and 7 a.m. for planning purposes only. The General Plan reduces the level for simple tone noises by five dB, also for planning purposes only. "These standards are for planning purposes and may vary from the standards of the County Noise Ordinance which are for enforcement purposes." (*Sacramento County General Plan, Noise Element, pp. 5-6, Dec. 15, 1993* as amended June 24, 1998).

The levels set by the County are less stringent than those set by the CEC. For the purpose of this Compliance Assessment, the stricter CEC guidelines prevail.

1.2 Site Description

CPP is close to the site of the decommissioned Rancho Seco nuclear power plant, in south Sacramento County, south of Twin Cities Road (State Route 104), about 2 miles east of Clay Station Road on Clay East Road. The plant site is at an elevation of approximately 160 feet above sea level. The terrain in the vicinity of the site gradually slopes downhill from northeast to southwest. The nearest residences are approximately one mile to the west and southwest. Figure 1 shows the CPP site and the surrounding area, including the measurement locations and their distances from the plant. The CPP site is located on a 30 acre parcel of land that is part of 2,480 acres owned by the District.

1.3 Measurement Locations

To fulfill the requirements of Condition of Certification NOISE – 5 (*Commission Decision, Docket No. 01-AFC-19, pp. 129-130, September 2003*), ATCO used four measurement locations as follows:

Location 1: Location 1 is situated at the west fence line of CPP, approximately 740 feet north of Clay East Road, and in line of sight with the two monitoring locations R1 and R2. The coordinates are N 38° 20' 17.62" W 121° 07' 34.97". The acoustic environment at this location was dominated by CPP, and vehicular traffic along Clay East and Twin Cities Roads.

Location 2, R1: The location of R1 is just east of the residence at 13896 Clay East Road in Herald, California. The sound level meter is situated in the corner of the yard, approximately 25 feet from the residence and in line of sight with CPP which is approximately 3,500 feet to the northeast. The coordinates for the monitoring location are N 38° 20'06.00" W 121° 08' 24.90". The residence is a trailer that the District relocated with the land owner's permission. This location is open, consisting of rolling grazing land then some houses situated to the south and east. Houses are also located across the

road to the west along a private road. Vehicle traffic along Clay East Road and the private road leading to homes to the west dominates during the day. During the noise test when the meteorological conditions became favorable to sound transmission, CPP was audible. This condition occurred at night.

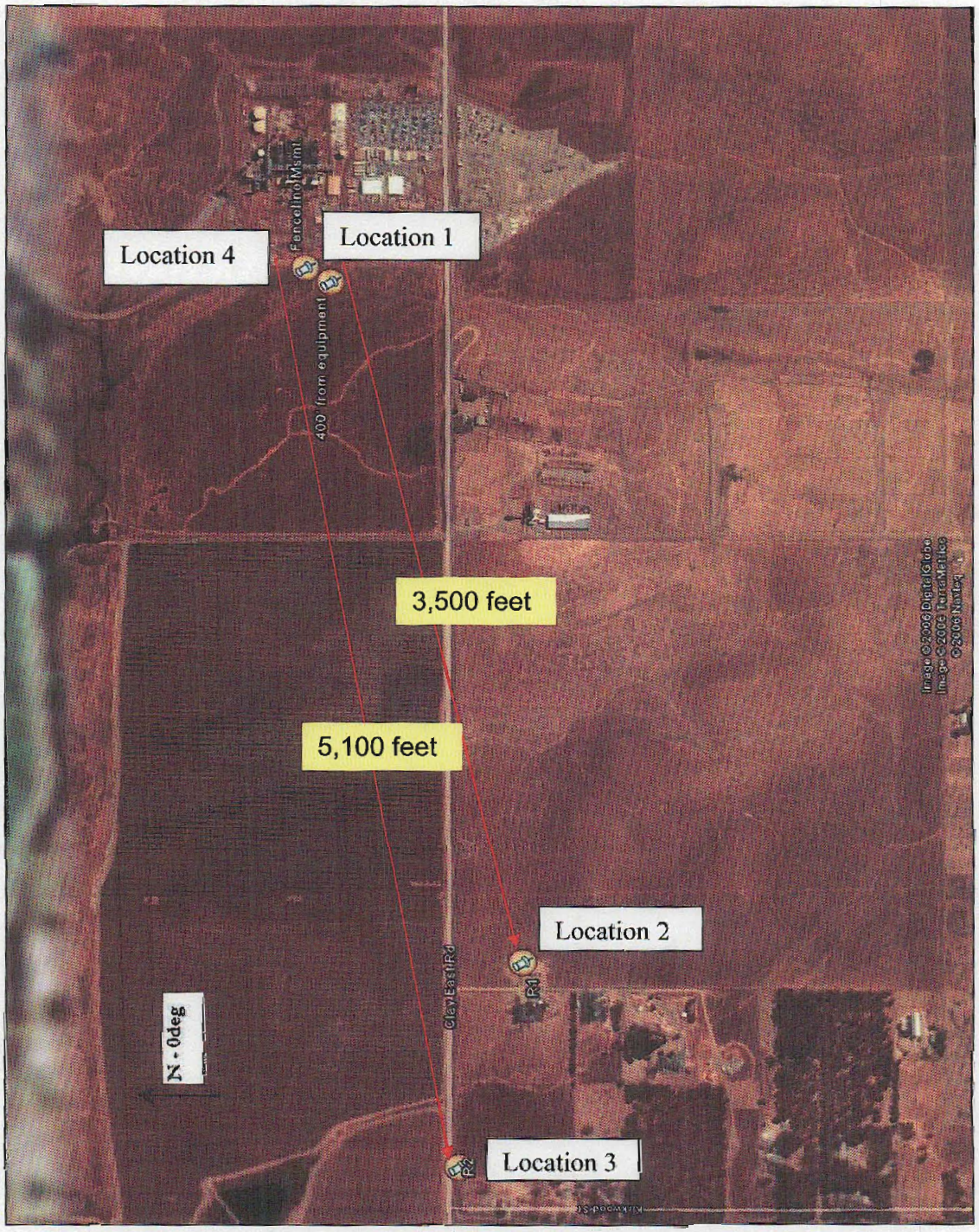
Location 3, R2: Location 3 is as near as possible to R2, which is an existing residence at 11615 Kirkwood Street. The sound level meter was situated immediately outside the northern fence line of the residential property about 10 feet south of Clay East Road and in line of sight with CPP. The monitoring location is approximately 5,100 feet from the western fence line of the plant. The coordinates are N 38° 20' 09.40" W 121° 08' 39.60". R2 is located at the corner of Kirkwood Street and Clay East Road at the start of a residential area consisting of single family dwellings on relatively large acreages. The environment can be described as a relatively quiet, rural area especially at night when insect and animal noise dominates. The nearby roads have local traffic that increases as residents drive to and from work.

Location 4, 400' from the plant equipment footprint: Location 4 is situated 400 feet from the edge of the plant equipment in the direction of R1 and R2. The coordinates are N 38° 20' 16.28" W 121° 07' 36.0". The acoustic environment at this location is dominated by CPP, with some vehicular traffic on Clay East and Twin Cities Roads.

A weather station was placed at the main CPP site, a few hundred feet west of the Plant and near Location 1.

Locations 2 and 3 were selected to test compliance of the plant at the two monitoring locations, R1 and R2. Location 1 at the plant fence line was chosen to determine noise levels at the CPP boundary and to assess characteristics of the plant noise. Location 4 was selected to serve as the alternative location suggested by the CEC for purposes of mathematically extrapolating CPP noise levels from this location to the two monitoring locations R1 and R2.

Figure 1: Measurement Locations and Distances from CPP



2.0 PROCEDURES

2.1 Methodology

The compliance sound level measurements were made with the sound level meter set on both the Linear and A-weighting scales. The A-weighting scale simulates the response of the human ear to noise and attenuates the low-frequency component of sounds in the measurement samples. The measurements at Locations 1 to 4 were set to record at 1-minute intervals in order to isolate specific noise events such as a plane or car pass-by. These measurement results were averaged to determine the hourly L_{50}.

The meters were calibrated at the beginning and end of each measurement period. A windscreen was placed on the microphone of each sound meter to reduce the effects of wind-induced noise. The microphone height was approximately 4.5 feet above ground level. Each of the measurement locations was checked by ATCO personnel periodically to verify continuous operation throughout the measurement period. The measurements were recorded and downloaded for further analysis at ATCO offices.

Long-term, continuous measurements were taken for 27-hours from 1:30 a.m. on Thursday, March 23 through to 3:30 a.m. on Friday March 24, 2006. Attended observations near or at R1 and R2 were made for a total of 19 out of the 27-hours. Observations are presented in Appendix J. Audio recordings were collected continuously at all measurement locations throughout the survey period. These recordings were used to also identify specific noise events.

Short-term sound level measurements were taken at eight (8) points along a circle and at a distance of 400 feet from the outer edge of the plant equipment. These measurements were collected during the quietest nighttime hours from 12:00 Midnight to 2:30 a.m. on Thursday, March 23, 2006 for a continuous period of 20 minutes each. These measurements were not intended to assess compliance of the plant at R1 and R2 but to gather information for additional analysis that was needed regarding the propagation of sound from the plant to the receptors of concern and for the purpose of verifying the plant's noise spectrum. The measurements were performed in accordance with ANSI B133.8 *Gas Turbine Installation Sound Emissions.*

A weather station was located near the western plant boundary to measure the temperature, wind speed, wind direction and the relative humidity over the entire measurement period. This weather data can be found in Appendix B in the form of graphs.

2.2 Instrumentation and Setup

Compliance sound level measurements were made utilizing five Brűel and Kjäer 2250 sound level meters which meet the ANSI S1.4, Type 1 Specification. The instruments were set to measure sound pressure levels on the Linear and A-weighted scales. Appendix C contains the detailed equipment setup at each measurement location.

The sound level meters were field-calibrated before and after each measurement, and have current laboratory certifications. The measurements were performed in accordance with ANSI S12.18-R 1993, *Quantities and Procedures for Description and Measurement of Environmental Sound, Part 3*, and other appropriate standards. A list of measurement standards and references are included in Appendix A.

The measurements were performed continuously at Locations 1 to 4 for a total of 27 hours, the first 25-hours of which are presented in this report. The 25-hours presented in this report contain the 2:00 a.m. to 3:00 a.m. hours for both March 23 and March 24 2006, which demonstrated the highest noise levels attributable to CPP at R1 and R2. The quantities that were logged included the equivalent sound level (L_{eq}) and all statistical exceedance levels. These measurements were converted to one-hour or 24-hour L_{eq} or L_n levels in post-processing. The sound level meter detector was set to slow response, and linear L_{eq} and L_n levels in 1/3 and 1/1 octave bands were measured and recorded.

2.3 Meteorological Conditions

Wind, temperature and relative humidity can influence the propagation and measurement of sound. A weather station was set up and used during the measurements, and its data is presented in Appendix B. During the measurement period, meteorological conditions met the requirements of ANSI 12.18 *Procedures for outdoor measurement of sound pressure level, Method #1: General method for routine measurements,* to provide an accurate measurement of sound levels from CPP.

3.0 ANALYSIS OF THE MEASUREMENT DATA

Twenty-seven hours of continuous noise measurements were collected at all four measurement locations. Data from 25 of these 27 hours at each location are presented in this section. As stated above, the 25-hours used for this analysis include the one hour from both March 23 and 24, 2006 that demonstrated the highest noise levels attributed to CPP at R1 and R2.

3.1 Long-Term Sound Level Measurements at Location 1

Location 1 is on the west property fence line of CPP. The hourly L_n sound levels measured at Location 1 are presented in Table 1 below.

Table 1: Measured Statistical Sound Pressure Levels at Location 1

Measured Sound Pressure Levels, dBA				
Time Period	L_1	L_{10}	L_{50}	L_{90}
2:00 AM - 3:00 AM	63.2	62.6	61.8	61.1
3:00 AM - 4:00 AM	64.0	63.3	62.5	61.8
4:00 AM - 5:00 AM	64.1	63.4	62.5	61.9
5:00 AM - 6:00 AM	63.9	63.1	62.2	61.5
6:00 AM - 7:00 AM	63.6	63.0	62.2	61.5
7:00 AM - 8:00 AM	62.3	61.8	61.1	60.5
8:00 AM - 9:00 AM	60.8	60.4	59.8	59.3
9:00 AM - 10:00 AM	61.8	61.1	60.2	59.4
10:00 AM - 11:00 AM	62.7	61.6	60.6	59.8
11:00 AM - 12:00 PM	62.1	61.4	60.5	59.6
12:00 PM - 1:00 PM	61.4	60.6	59.5	58.6
1:00 PM - 2:00 PM	60.6	59.9	58.9	57.8
2:00 PM - 3:00 PM	60.5	59.5	58.3	57.4
3:00 PM - 4:00 PM	59.5	59.0	58.2	57.5
4:00 PM - 5:00 PM	60.1	59.6	59.0	58.5
5:00 PM - 6:00 PM	60.7	60.2	59.6	59.2
6:00 PM - 7:00 PM	59.4	59.0	58.4	57.8
7:00 PM - 8:00 PM	60.0	59.6	59.0	58.5
8:00 PM - 9:00 PM	60.5	60.1	59.6	59.1
9:00 PM - 10:00 PM	59.8	59.4	58.9	58.3
10:00 PM - 11:00 PM	59.3	59.0	58.5	57.9
11:00 PM - 12:00 AM	61.2	60.6	59.9	59.3
12:00 AM - 1:00 AM	63.0	62.1	61.2	60.5
1:00 AM - 2:00 AM	63.5	62.6	61.6	60.8
2:00 AM - 3:00 AM	62.8	62.1	61.3	60.7

Observation and recorded audio show that the plant is the dominant noise source at this location. The statistical exceedance levels at this location are very similar during the entire measurement period. As seen in Table 1 above, the L_1 and L_{90} are usually within 2dB. This shows that the noise emissions from the plant are relatively constant throughout the measurement period.

3.2 Long-Term Sound Level Measurements at Location 2

At Location 2 which is the relocated trailer and the closest monitoring location, R1, the hourly median noise level (L_{50}) produced by the steady state operation of CPP was limited by NOISE – 5 to 42 dBA. The hourly L_n sound levels measured at location 2 are presented in Table 2 below. The bold row shows the hour where CPP caused the measured level to exceed the regulatory limit.

Table 2: Measured Statistical Sound Pressure levels at Location 2, R1

Measured Sound Pressure Levels, dBA				
Time Period	**L1**	**L10**	**L50**	**L90**
2:00 AM - 3:00 AM	47.1	45.6	44.6	43.8
3:00 AM - 4:00 AM	49.1	44.0	42.3	41.5
4:00 AM - 5:00 AM	44.2	43.3	42.4	41.7
5:00 AM - 6:00 AM	51.8	48.5	44.5	42.9
6:00 AM - 7:00 AM	55.2	52.1	46.6	44.5
7:00 AM - 8:00 AM	50.5	49.4	47.4	46.2
8:00 AM - 9:00 AM	49.0	45.8	40.2	36.6
9:00 AM - 10:00 AM	48.9	45.4	39.4	36.7
10:00 AM - 11:00 AM	50.3	45.6	40.4	36.8
11:00 AM - 12:00 PM	49.4	46.8	41.9	38.7
12:00 PM - 1:00 PM	50.3	46.0	40.9	37.8
1:00 PM - 2:00 PM	46.6	44.2	40.5	37.4
2:00 PM - 3:00 PM	49.6	46.4	41.4	38.0
3:00 PM - 4:00 PM	48.2	45.9	39.3	35.5
4:00 PM - 5:00 PM	50.2	43.9	38.2	35.7
5:00 PM - 6:00 PM	52.0	49.9	43.3	39.5
6:00 PM - 7:00 PM	51.9	48.8	41.3	38.8
7:00 PM - 8:00 PM	49.7	47.4	39.0	37.1
8:00 PM - 9:00 PM	50.2	44.2	38.7	36.8
9:00 PM - 10:00 PM	47.6 (61.4)	41.2 (61.2)	36.6 (60.9)	34.3 (60.5)
10:00 PM - 11:00 PM	41.8 (66.5)	38.5 (66.4)	35.1 (66.2)	33.2 (66.1)
11:00 PM - 12:00 AM	44.9 (63.2)	40.8 (63.0)	38.4 (62.7)	37.0 (62.6)
12:00 AM - 1:00 AM	47.2	43.1	40.5	39.3
1:00 AM - 2:00 AM	45.8	44.9	43.3	41.9
2:00 AM - 3:00 AM	**48.4**	**47.6**	**46.2**	**45.2**

Note: Sound pressure levels from 9:00 p.m. – 12:00 a.m. (midnight) show both measured and corrected levels. The reason noise levels increased during these hours was because of an alarm on the backup battery for the sound level meter. The meter continued monitoring during the alarm, so that data collection was not affected. The octave bands representing the alarm have been removed from the combined noise levels and the corrected levels which exclude the alarm sounds are also presented in Table 2. The calculation of the removal of the intrusive tones from the backup battery alarm is presented in Appendix I.

As can be seen, the hourly median noise level (L_{50}) exceeds 42 dBA for about half the time. This exceedance occurs mostly during the nighttime. However, the statistical exceedance levels at Location 2 do not remain constant. L_1 and L_{90} values are as much as 10 dB apart at times; this indicates intermittent noise sources are continually present in this environment. Cars, trucks, aircraft flyovers, and activity at the ranch location to the south are the most frequent sources of intermittent noise.

3.3 Long-Term Sound Level Measurements at Location 3

Location 3, known as monitoring location R2, must not show hourly median noise levels (L_{50}) produced by steady state operation of the plant in excess of 39 dBA. The hourly L_n sound levels measured at Location 3 are presented in Table 3 below. The bold row shows the hour where CPP caused the measured level to exceed the regulatory limit.

Table 3: Measured Statistical Sound Pressure Levels at Location 3, R2

Measured Sound Pressure Levels, dBA				
Time Period	**L1**	**L10**	**L50**	**L90**
2:00 AM - 3:00 AM	45.0	43.4	41.8	40.8
3:00 AM - 4:00 AM	56.2	48.2	41.3	38.9
4:00 AM - 5:00 AM	56.7	46.9	40.5	39.2
5:00 AM - 6:00 AM	68.2	57.7	44.5	41.9
6:00 AM - 7:00 AM	67.6	57.7	46.6	43.9
7:00 AM - 8:00 AM	66.0	55.6	47.0	45.5
8:00 AM - 9:00 AM	65.0	56.0	41.3	37.3
9:00 AM - 10:00 AM	71.1	59.8	42.8	38.2
10:00 AM - 11:00 AM	67.4	55.4	42.3	38.3
11:00 AM - 12:00 PM	65.6	53.8	42.0	38.4
12:00 PM - 1:00 PM	63.5	51.8	39.5	36.8
1:00 PM - 2:00 PM	63.8	55.2	41.4	37.0
2:00 PM - 3:00 PM	68.1	59.4	43.4	38.2
3:00 PM - 4:00 PM	68.6	54.8	41.4	36.3
4:00 PM - 5:00 PM	58.5	50.6	40.7	38.0
5:00 PM - 6:00 PM	65.3	57.0	45.6	41.8
6:00 PM - 7:00 PM	66.3	55.0	42.8	41.0
7:00 PM - 8:00 PM	62.0	52.6	40.4	38.1
8:00 PM - 9:00 PM	56.2	48.5	38.1	35.3
9:00 PM - 10:00 PM	51.7	41.7	36.3	34.2
10:00 PM - 11:00 PM	51.0 (58.1)	43.7 (57.4)	33.3 (56.9)	30.9 (56.7)
11:00 PM - 12:00 AM	50.9 (62.5)	42.9 (62.2)	36.9 (62.0)	35.8 (61.9)
12:00 AM - 1:00 AM	45.6 (54.9)	42.2 (54.6)	38.8 (62.0)	37.4 (54.2)
1:00 AM - 2:00 AM	44.6	44.0	42.6	41.3
2:00 AM - 3:00 AM	**47.5**	**46.8**	**45.5**	**44.6**

Note: Sound pressure levels from 10:00 p.m. – 1:00 a.m. show both measured and corrected levels. The reason noise levels increased during these hours was because of an alarm on the backup battery for the sound level meter. The meter continued monitoring during the alarm, so that data collection was not affected. The octave bands representing the alarm have been removed from the combined noise levels and the corrected levels which exclude the alarm sounds are also presented in Table 2. The calculation of the removal of the intrusive tones from the backup battery alarm is presented in Appendix I.

The hourly median noise level (L_{50}) exceeds 39 dBA in all but two hours during the measurement period. As at Location 2 or R1, the statistical exceedance levels at this location yield dissimilar values. L_1 and L_{90} are as much as 30 dB apart; this shows that the noise level fluctuates throughout the measurement period at this location and that intermittent noise sources are dominant. Vehicular traffic and insect and animal sounds are particularly pronounced at this location.

3.4 Long-Term Sound Level Measurements at Location 4

Location 4 is 400' from the plant equipment footprint in line of sight of R1 and R2. The hourly L_n sound levels measured at location 4 are presented in Table 4 below.

Table 4: Measured Statistical Sound Pressure Levels at Location 4

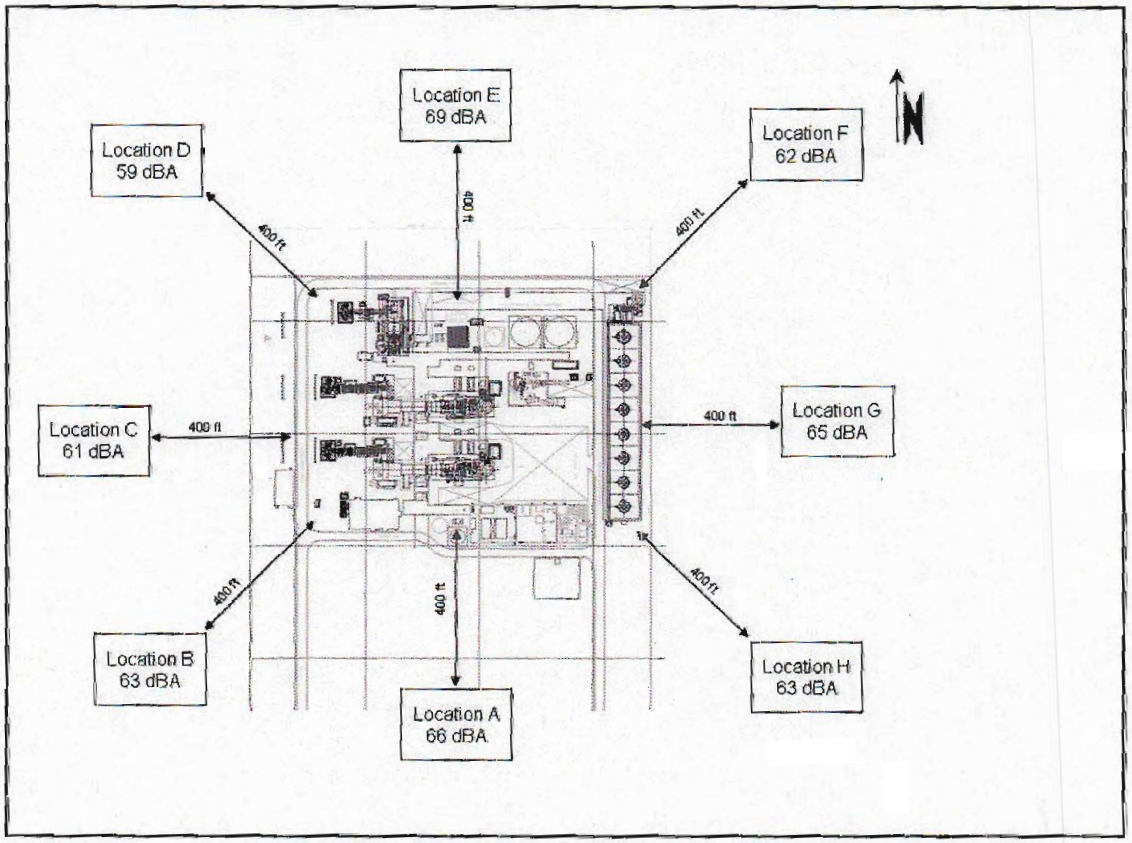
Measured Sound Pressure Levels, dBA				
Time Period	L_1	L_{10}	L_{50}	L_{90}
3:00 AM - 4:00 AM	62.4	61.8	60.9	60.2
4:00 AM - 5:00 AM	63.0	62.4	61.6	61.0
5:00 AM - 6:00 AM	63.4	62.6	61.8	61.1
6:00 AM - 7:00 AM	63.1	62.4	61.6	60.9
7:00 AM - 8:00 AM	62.7	62.1	61.3	60.6
8:00 AM - 9:00 AM	61.4	60.9	60.3	59.7
9:00 AM - 10:00 AM	59.9	59.4	58.7	58.1
10:00 AM - 11:00 AM	60.2	59.4	58.3	57.4
11:00 AM - 12:00 PM	61.1	60.1	59.0	58.0
12:00 PM - 1:00 PM	61.0	60.2	59.1	57.9
1:00 PM - 2:00 PM	59.9	59.0	57.7	56.6
2:00 PM - 3:00 PM	58.8	58.0	56.7	55.6
3:00 PM - 4:00 PM	58.6	57.5	56.1	55.1
4:00 PM - 5:00 PM	57.6	56.9	55.9	55.0
5:00 PM - 6:00 PM	58.3	57.8	57.1	56.5
6:00 PM - 7:00 PM	59.5	58.7	58.2	57.6
7:00 PM - 8:00 PM	57.9	57.3	56.7	56.1
8:00 PM - 9:00 PM	58.9	58.4	57.7	57.1
9:00 PM - 10:00 PM	59.3	58.9	58.3	57.8
10:00 PM - 11:00 PM	59.0	58.4	57.7	57.1
11:00 PM - 12:00 AM	58.1	57.8	57.2	56.7
12:00 AM - 1:00 AM	60.6	60.1	59.3	58.6
1:00 AM - 2:00 AM	62.3	61.5	60.6	59.8
2:00 AM - 3:00 AM	62.8	61.9	60.8	59.9
3:00 AM - 4:00 AM	62.2	61.5	60.7	60.0

Observation and recorded audio show that the plant is the dominant noise source at this location. As with Location 1, the statistical exceedance levels at this point are very similar during the entire measurement period, although the levels are slightly lower as this location is 78 feet further away from the plant equipment than Location 1. L_1 and L_{90} are usually within 3dB; this shows that noise emissions from the plant dominate the environment at this location, and that plant noise emissions are continuous.

3.5 Short-Term Sound Level Measurements at 400' from the Equipment Footprint

The sound levels measured at eight locations (Locations A-H) at 400 feet from the plant equipment footprint were between 61 dBA and 69 dBA. The locations of these measurements are shown in Figure 2 below, and Appendix D.

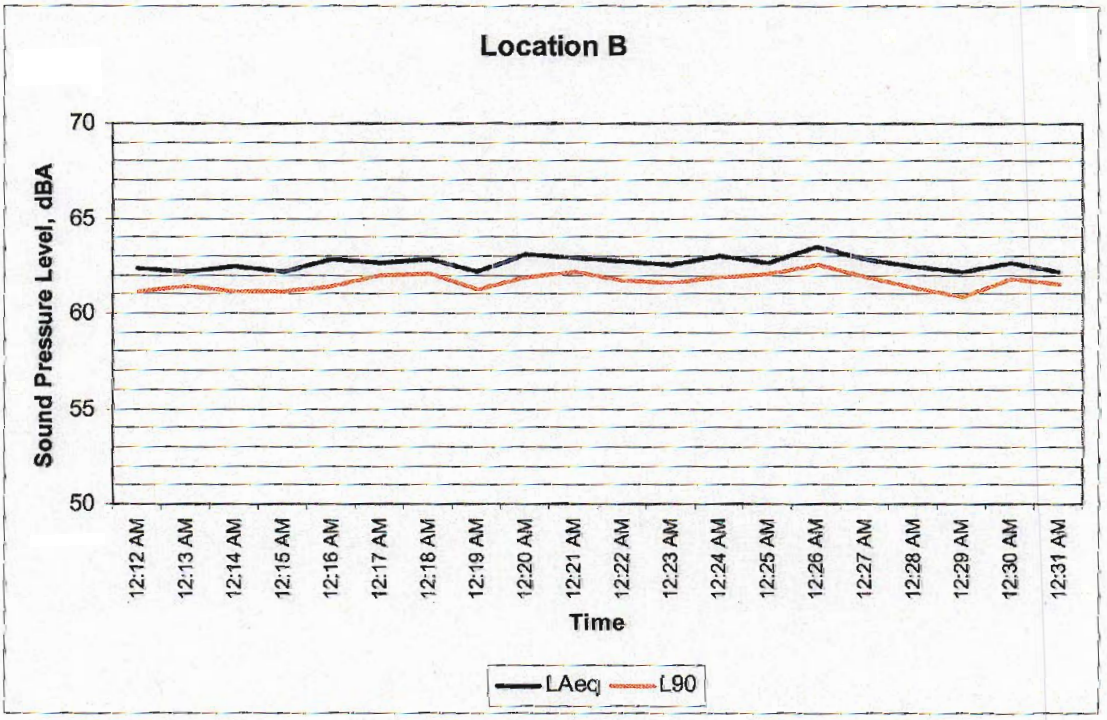
Figure 2: Short-term Measurement Locations at 400 Feet from the Equipment Footprint



The interval levels of 20-minutes and the sound levels in 1/3 octave band frequencies are shown graphically in Figure 3.

The sound levels during these measurement periods are substantively constant; this is also shown by charts in Appendix D and in Figure 3 below. Figure 3 shows the energy equivalent sound pressure level, L_{eq}, and the background sound level, L_{90}, from one of the eight short-term measurement locations. The L_{eq} is the average of the total sound energy at the measurement location. L_{90} represents the noise level that is exceeded 90% of the time. Both show very little variation in noise levels at the location near the plant footprint.

Figure 3: Sample of L_{eq} and L_{90} at Short-term Measurement Location B



Note: Short-term measurement Location B is the location of the 20-minute measurement taken 400 feet from CPP's southwest fence line as shown in Appendix D.

4.0 Compliance Assessment

As shown in Tables 2 and 3 in Section 4.3, the hourly L_{50} noise levels exceed the compliance criteria at both R1 and R2. During many of the time periods, sources of sound other than CPP are present in the environment. Therefore, it is necessary to conduct further analysis to determine the cause of the measured sound levels that exceed the compliance criteria.

4.1 Methodology

The following elements were used to investigate noise levels and to determine compliance at R1 and R2.

1. Statistical Exceedance Levels (Percentile Sound Levels)

L_{50} is known as the median sound level. This level is exceeded 50% of the time and provides a measure of the average noise conditions at each measurement location. The L_{50} sound level is influenced by constant sources like CPP, but it is also influenced by intermittent sources that are continually present in the environment. This means that traffic, aircraft activity, and repetitive natural sounds such as insect and animal noise can contribute to the L_{50} sound level. By comparison, the L_{90} sound level is the sound level exceeded 90% of the time. L_{90} is influenced by sources that are steady state in nature and excludes a large portion of intermittent sources. Plant noise is relatively constant; this is shown by the measurements made near the plant at Locations 1 and 4 and as discussed in Section 4. In measurements close to the plant statistical exceedance levels are very close in value, indicating that few intermittent sources are present. By this reasoning, comparing the L_{50} sound level and L_{90} sound level at the residence is a good indicator of whether or not the plant is responsible for an exceedance of the hourly L_{50} sound criteria. That is, if the L_{90} sound level is below the criteria, intermittent sources have a greater influence on the L_{50} noise level than the steady-state noise sources.

2. Frequency Spectrum

The characteristic one-third octave band sound levels of the CPP noise emissions, shown in Figures 2 and 3, remain relatively constant over the measurement period. Comparison of 1/3 octave band sound levels at R1 and R2 during exceedance periods distinguish between plant noise emissions and sound from other sources. Analysis of 1/3 octave band frequencies for measurement periods 1-minute in duration is also performed to test for the presence of tones. These are given in Appendices F and H for Locations 2, R1, and 3, R3, respectively. For this analysis the definition of a pure tone is defined as follows: *if the 1/3 Octave Band sound pressure level in the band with the tone exceeds the arithmetic average of the two contiguous bands by 5 decibels (dB) for center frequencies of 500 Hz and above, or 8 dB for center frequencies between 160 Hz and 400 Hz, or by 15 dB for center frequencies less than or equal to 125 Hz.* The monitoring did not find any pure tones.

3. Observations & Recorded Audio

Observations of the acoustic environment and recorded audio are used to verify the acoustic environment during the measurement period. On this basis, when sources of sound other than the plant dominate the acoustic environment, exceedance periods cannot be attributable to noise emissions from CPP.

4.2 Assessment at Location 2, R1

At Location 2, R1, the noise level criteria is 42 dBA L_{50}. The hourly L_{50} exceeds 42 dBA for 10 of the 25 hourly periods. One and perhaps two of these hours is due to CPP. These periods are shown below in Table 5 with a summary of the noise event observations made during these times. The hour where CPP caused the measured levels to exceed the regulatory limit is shown in bold.

Table 5: Assessment of R1 Exceedance Periods

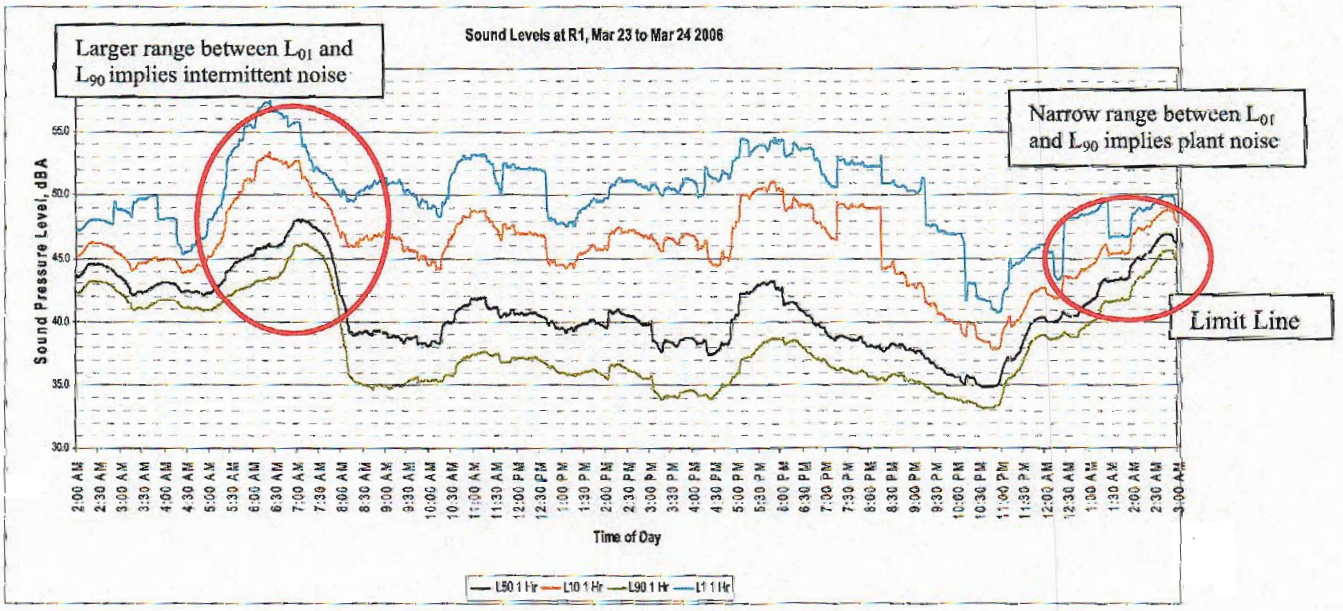
Measured Sound Pressure Levels, dBA			Notes
Time Period	L50	L90	
2:00 AM - 3:00 AM	44.6	43.8	Plant audible, 1/3 Octave Band Levels are similar to plant noise emission characteristics, birds crickets & dogs intermittently, 1 car passby
5:00 AM - 6:00 AM	44.5	42.9	1/3 Octave Band Levels are somewhat similar to plant noise emission characteristics, rooster, birds, and dogs intermittently, traffic is present for 1/3 of period
6:00 AM - 7:00 AM	46.6	44.5	1/3 Octave Band Levels have some plant noise emission characteristics but are influenced by other sources, birds and traffic are present continually
7:00 AM - 8:00 AM	47.4	46.2	1/3 Octave Band Levels are influenced by many sources, birds and traffic are present continually, some residential activity is present
5:00 PM - 6:00 PM	43.3	39.5	L_{90} below 42 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, traffic is present, birds are continually present
9:00 PM - 10:00 PM	36.6	34.3	Continuous tone causing exceedence, this is not attributed to plant noise emission.
10:00 PM - 11:00 PM	35.1	33.2	Continuous tone causing exceedence, this is not attributed to plant noise emission.
11:00 PM - 12:00 AM	38.4	37.0	Continuous tone causing exceedence, this is not attributed to plant noise emission.
1:00 AM - 2:00 AM	43.3	41.9	L90 below 42 dBA, 1/3 Octave Band Levels are characteristic of plant noise emission, plant audible, some insect sounds present, occasional traffic 7 aircraft flyover
2:00 AM - 3:00 AM	**46.2**	**45.2**	**1/3 Octave Band Levels are characteristic of plant noise emission, plant audible, some insect sounds present, occasional traffic & aircraft flyover**

Note: Sound pressure levels from 9:00 p.m. – 12:00 a.m. (midnight) are corrected levels as described in notes to Table 2, Section 3.2 and Table 3, Sections 3.3.

As indicated in the accompanying notes in Table 5, noise from CPP is sometimes, but not always responsible, for exceedance of noise criteria. Noise from CPP is most evident during the nighttime hours when intrusive noise is lower, and meteorological conditions are conducive to noise propagation. During the times when noise levels at R1 exceed the noise criteria, wind direction is from the north blowing between 1 and 5 mph toward the residence or, in the worst case when CPP noise is most audible, wind speed is 2 mph or below: humidity is 80% or over; and atmospheric conditions are stable (shown in Appendix B).

Figure 4 shows the hourly L_n exceedance sound levels at R1; this figure also illustrates the effect of intermittent sounds on the L_{50} median sound level as compared to the L_{90} level. The L_{90} levels also show that the noise levels at R1 exceed the limits during the nighttime. Further, from about 1:00 a.m. to 3:00 a.m. the range above the noise limit and between the different exceedance sound levels is narrow (less than 5 dB) which implies plant noise is responsible. By contrast, the exceedances evident from between 5:00 a.m. to 7:00 a.m. show a wider range, which suggests intermittent noise sources (cars coming and going during morning work commutes).

Figure 4: Trend of Hourly L_n Sound Levels at R1 Over 25 hours



*Hours 9:00PM, 10:00 PM, and 11:00 PM are adjusted using methodology in Appendix I.

Charts of 1/3 octave band sound levels which identify the presence of noise that is characteristic of the CPP noise emissions during the exceedance periods are shown below in Figures 5 - 7 and in Appendix E. In Figure 5, the sound spectrum at Location 1 (CPP fence line) during a one-hour period (2:00 a.m. – 3:00 a.m. on Friday, March 24, 2006) is shown. A similar noise spectrum was measured at Location 4 (400 feet from the plant footprint) during this same hour. This "typical" plant noise spectrum was repeated at Location 2 (R1), demonstrating that CPP noise is responsible for exceedance of the criteria from 2:00 a.m. – 3:00 a.m. on Friday, March 24, 2006.

Figure 5: Sound Level Spectrum at Location 1 by 1/3 Octave Band Frequency from 2:00 a.m. – 3:00 a.m. on Friday, March 24, 2006

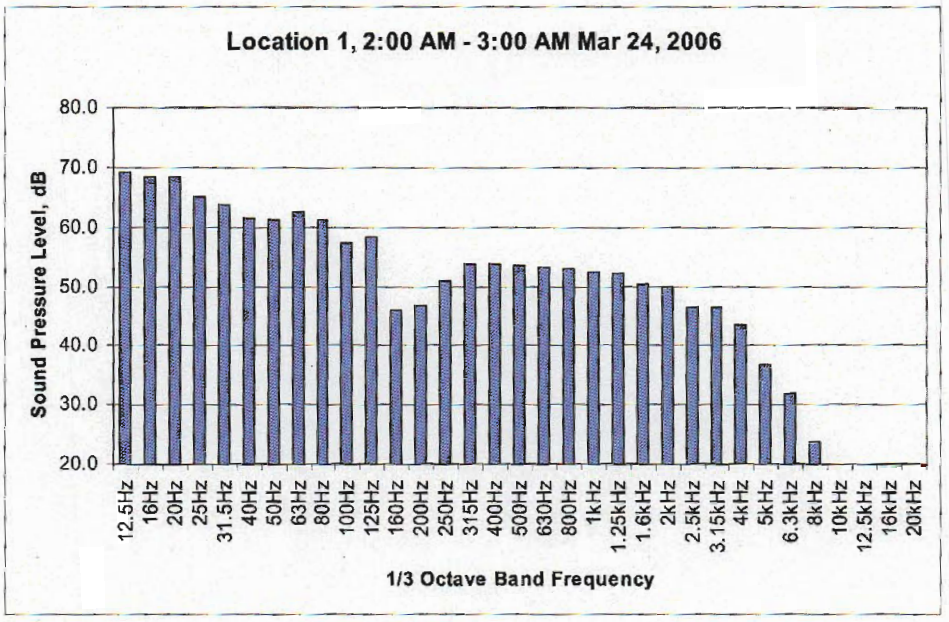


Figure 6: Typical Sound Levels at Location 4 by 1/3 Octave Band Frequency from 2:00 a.m. – 3:00 a.m. on Friday, March 24, 2006

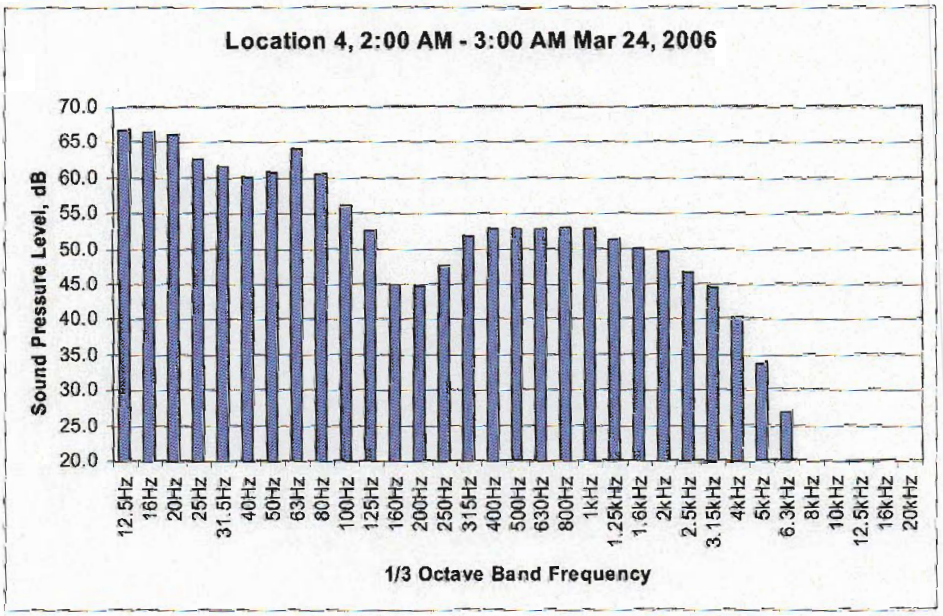
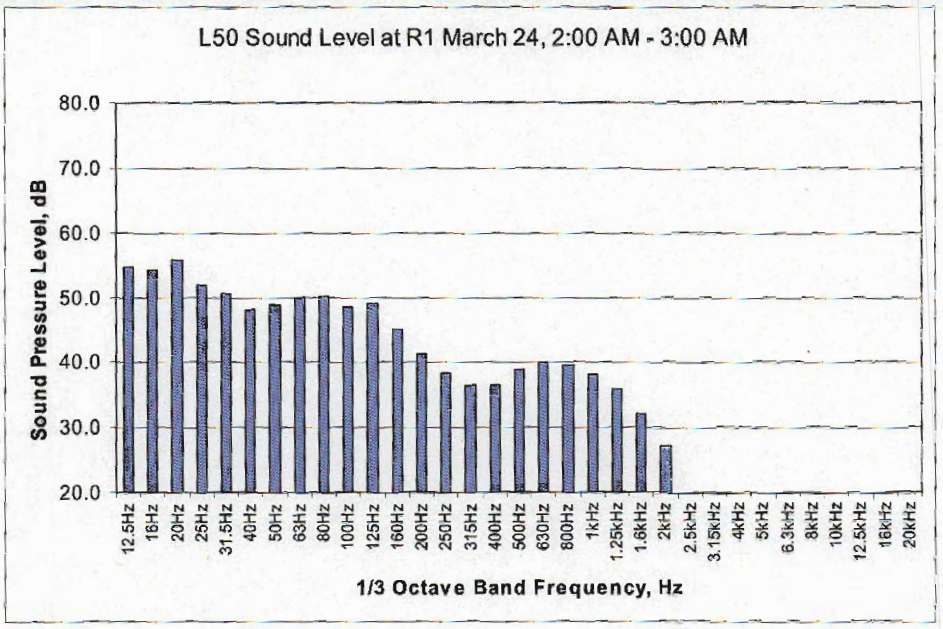


Figure 7: Sound Level Spectrum at Location 2 by 1/3 Octave Band Frequency from 2:00 a.m. – 3:00 a.m. on Friday, March 24, 2006


L50 Sound Level at R1 March 24, 2:00 AM - 3:00 AM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

For a tonal analysis at R1, the entire measurement period was assessed and three representative samples were chosen when plant noise was deemed audible and intrusive sounds from other sources were minimal. The spectral distributions corresponding to these samples are shown in Appendix F. No tonal components were identified. The one-third octave band sound levels share the same characteristics as CPP noise as shown in Figures 3 and 4, indicating that the acoustic environment during this period is dominated by plant noise; however, pure tones as defined are not present.

4.2 Assessment at Location 3, R2

This location has established noise level criteria of 39 dBA L_{50}. The hourly L_{50} exceeds 39 dBA for 23 of the 25-hourly periods. At least one of those hours is CPP induced exceedances. These periods are listed below in Table 6 with a summary of observations made at these times. Table 6 shows the hour where CPP causes the measured level to exceed the regulatory limit. Charts of 1/3 octave band sound levels during these exceedance periods are provided in Appendix G.

Table 6: Assessment of R2 Exceedance Periods

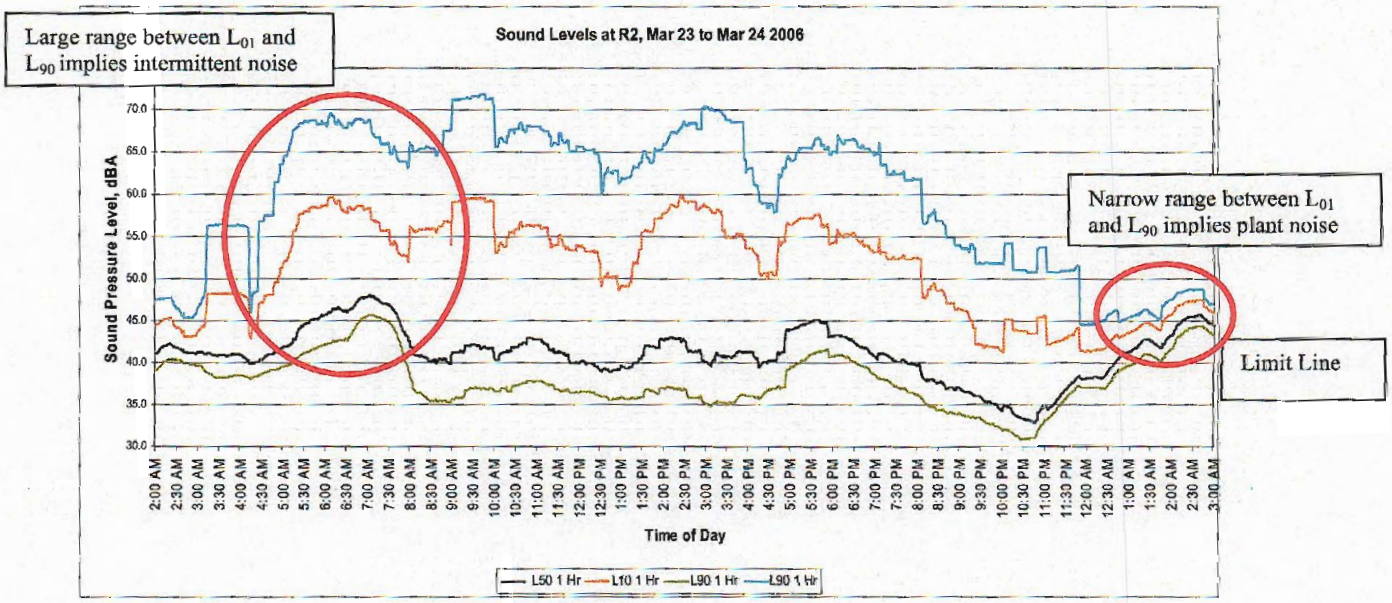
Measured Sound Pressure Levels, dBA			Notes
Time Period	L50	L90	
2:00 AM - 3:00 AM	41.8	40.8	Plant audible, 1/3 Octave Band Levels are similar to plant noise emission characteristics, birds crickets & dogs intermittently, 1 car passby
3:00 AM - 4:00 AM	41.3	38.9	L90 below 39 dBA, plant audible, 1/3 Octave Band Levels are similar to plant noise emission characteristics, birds crickets & dogs intermittently
4:00 AM - 5:00 AM	40.5	39.2	L90 is 42 dBA, plant audible, 1/3 Octave Band Levels are similar to plant noise emission characteristics, birds crickets & dogs intermittently
5:00 AM - 6:00 AM	44.5	41.9	1/3 Octave Band Levels are somewhat similar to plant noise emission characteristics, rooster, birds, and dogs intermittently, traffic is present for 1/3 of period
6:00 AM - 7:00 AM	46.6	43.9	1/3 Octave Band Levels have some plant noise emission characteristics but are influenced by other sources, birds and traffic are present continually
7:00 AM - 8:00 AM	47	45.5	1/3 Octave Band Levels are influenced by many sources, birds and traffic are present continually, some residential activity is present
8:00 AM - 9:00 AM	41.3	37.3	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds and traffic are present continually
9:00 AM - 10:00 AM	42.8	38.2	emissions, birds and traffic are present continually
10:00 AM - 11:00 AM	42.3	38.3	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds and traffic are present continually
11:00 AM - 12:00 PM	42	38.4	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds and traffic are present continually
12:00 PM - 1:00 PM	39.5	36.8	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds and traffic are present continually
1:00 PM - 2:00 PM	41.4	37	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds and traffic are present continually
2:00 PM - 3:00 PM	43.4	38.2	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds and traffic are present continually
3:00 PM - 4:00 PM	41.4	36.3	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds and traffic are present continually
4:00 PM - 5:00 PM	40.7	38	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds, traffic and insects are present continually
5:00 PM - 6:00 PM	45.6	41.8	1/3 Octave Band Levels are not characteristic of plant noise emissions, birds, traffic and insects are present continually
6:00 PM - 7:00 PM	42.8	41	1/3 Octave Band Levels are not characteristic of plant noise emissions, birds, traffic and insects are present continually
7:00 PM - 8:00 PM	40.4	38.1	L90 below 39 dBA, 1/3 Octave Band Levels are not characteristic of plant noise emissions, birds, traffic and insects are present continually
10:00 PM - 11:00 PM	33.3	30.9	Continuous tone casuing exceedence; this is not attributed to plant noise emission.
11:00 PM - 12:00 AM	36.9	35.8	Continuous tone casuing exceedence; this is not attributed to plant noise emission.
12:00 AM - 1:00 AM	38.8	37.4	Continuous tone casuing exceedence; this is not attributed to plant noise emission.
1:00 AM - 2:00 AM	42.6	41.3	1/3 Octave Band Levels are characteristic of plant noise emission, plant audible, some insect sounds present, occasional traffic 7 aircraft flyover
2:00 AM - 3:00 AM	**45.5**	**44.6**	**1/3 Octave Band Levels are characteristic of plant noise emission, plant audible, some insect sounds present, occasional traffic & aircraft flyover**

Note: Sound pressure levels from 10:00 p.m. – 1:00 a.m. are corrected levels as described in notes to Table 2, Section 3.2 and Table 3, Sections 3.3.

As shown in Table 6 above, noise from CPP is sometimes responsible for exceedance of the noise criteria. These occasions correspond to the nighttime periods when plant noise is audible and other noise sources are limited. Wind from the north (at 1 – 5 mph) increases the plant's noise impact at the residence.

Figure 8 shows the trend of hourly L_n sound levels at R2, which illustrate the effect of intermittent sounds on the L_{50} median sound level as compared to the L_{90} statistic. While the L_{90} statistic is less affected by intrusive sounds of short duration, it still clearly shows that the noise levels at R2 are in excess of the criteria for certain hours at night. Further, during the daytime hours the acoustic environment is dominated by intermittent sources as seen by the wide range between L_{01} and L_{90} . Exceedances from about 1:00 a.m. – 3:00 a.m. are due to CPP. Exceedances from about 5:00 a.m. – 7:00 a.m. are due to intermittent sources.

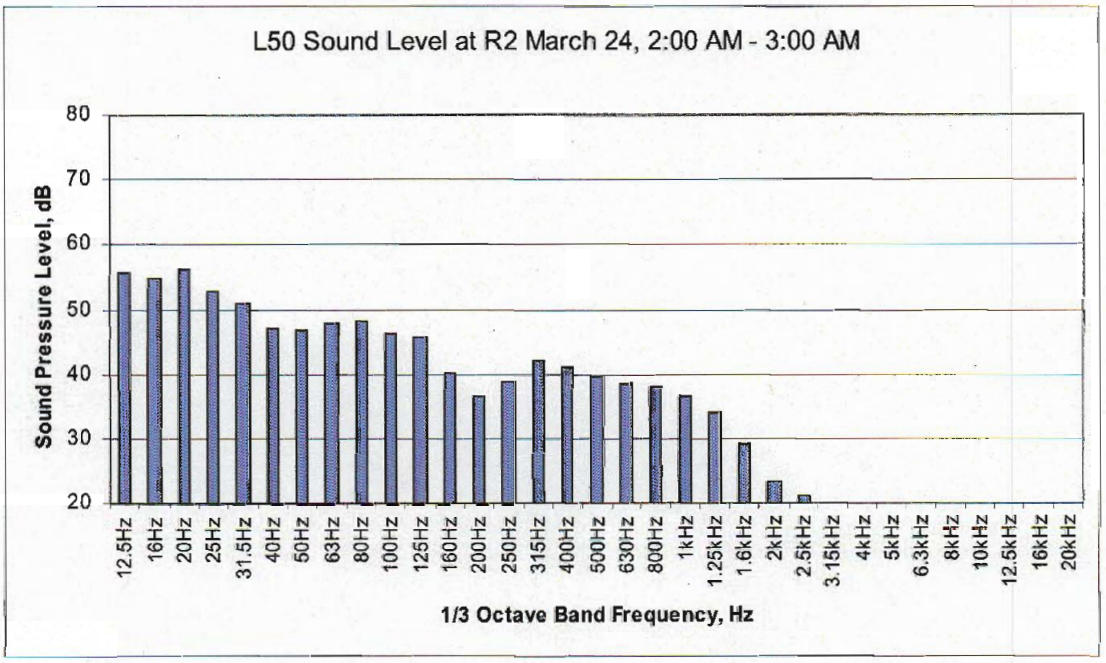
Figure 8: Trend of Hourly L_n Sound Levels at R2 Over 25 hours



*Hours 10:00PM, 11:00PM, and 12:00AM are adjusted using methodology in Appendix I.

A chart of 1/3 octave band sound levels is shown in Figure 9, below. The noise spectrum is similar to the spectra measured at Locations 1 and 4 (shown in Section 4.2) which are at CPP fence line and 400 feet away. As this "typical" plant noise spectrum was repeated at Location 3 (R2) from 2:00 a.m. – 3:00 a.m. on Friday, March 24, CPP noise during this one hour is responsible for exceedance of the criteria.

Figure 9: Sound Level Spectrum at Location 3 by 1/3 Octave Band Frequency from 2:00 a.m. – 3:00 a.m. on Friday, March 24, 2006



For a tonal analysis at R2, the entire measurement period was assessed and three representative samples were chosen when plant noise was deemed audible and intrusive sounds from other sources were minimal. The spectral distributions corresponding to these samples are shown in Appendix H. No tonal components are identified. The one-third octave band sound levels share the same characteristics as CPP noise as shown in Figures 3 and 4 indicating that the acoustic environment during this period is dominated by plant noise; however, pure tones as previously defined are not present.

4.3 Influence of Meteorological Conditions

From 2:00 a.m. to 3:00 a.m. on March 24th the 1/3 octave band noise levels at R1 and R2 show a strong correlation with CPP noise emissions at Locations 1 and 4 as well as with the short duration measurements taken in the direction of R1 and R2 on Thursday, March 24. (See Figures 5-7 & 9 and corresponding charts in Appendices E and G).

Weather conditions during this timeframe are known to be conducive to the propagation of sound. Wind direction is towards the residences; wind speeds are moderate, and humidity is relatively high. While the amount of noise generated by CPP is constant, the medium through which propagation occurs changes due to meteorological conditions, resulting in changes of sound levels at the receptors.

For a more detailed assessment of the meteorological impact during the 2:00 a.m. to 3:00 a.m. period see Appendix K.

5.0 CONCLUSION

Overall, the acoustic environment in the vicinity of the CPP site can be characterized as rural and agricultural. Wildlife like birds and insects, and livestock were present at each of the measurement locations. Noise from vehicle and aircraft traffic was prominent throughout the day. As a result, the noise contribution to the measured sound levels by sources other than CPP was significant and varied throughout the day. However, CPP affected the sound environment particularly during the nighttime when noise levels were in excess of noise limits set by the CEC for the two monitoring locations of R1 and R2.

At R1 and R2, the L_{50} median sound level regularly exceeded the criteria of 42 dBA and 39 dBA respectively. Some of this excess was attributable to continual intrusive sounds (insects, frogs, vehicles); however, during the early morning hours when intrusive sounds were less frequent and meteorological conditions favored noise propagation towards the residences, the exceedance was attributable to the CPP.

Noise contribution from CPP was best illustrated during the 2:00 a.m. – 3:00 a.m. time period on Thursday. During this time period, the plant was non-compliant with criteria established in NOISE – 5, when levels were found to be 46.2 L_{50} at R1 and 45.5 L_{50} at R2. CPP had a characteristic distribution of noise emissions in 1/3 octave band sound levels. This characteristic "noise signature" was found in sound levels measured at R1 and R2 during this measurement period. During this period of non-compliance, wind speed was between 1 and 5 mph and the wind direction was from the plant toward the residences.

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Reviewed by:

Paul Wierzba, Ph. D., MBA
Acoustical Engineer

REFERENCES

ANSI SI.1-1960 (RI976), Acoustical Terminology;

ANSI SI.11-1986 (Rl993), Specification for Octave-Band and Fractional-Octave-Band-Analog and Digital Filters;

ANSI SI.26-1978, Method for the Calculation of the Absorption of Sound by the Atmosphere;

ANSI B133.8-1977, Gas Turbine Installation Sound Emissions;

CONCAWE, May 1981, The propagation of noise from petroleum and petrochemical complexes to neighbouring communities;

ISO Standard 9613, Attenuation of sound during propagation outdoors – Part 1: Calculation of the Absorption of Sound by the Atmosphere, Part 2: General method of calculation;

EPA Report No.55019-74-004, 1974, Information on Levels of Environment Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety, U.S. Environmental Protection Agency, Washington, D.C., pg D-17;

The American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE) Room Criterion, 1999.

NASA Guideline TM-83288 The National Aeronautical Space Association criterion for Perceptibility of Vibration in housing Structural Elements and Hearing Threshold.

FIGURES

Figure 1: CPP plant, receptors and surrounding area

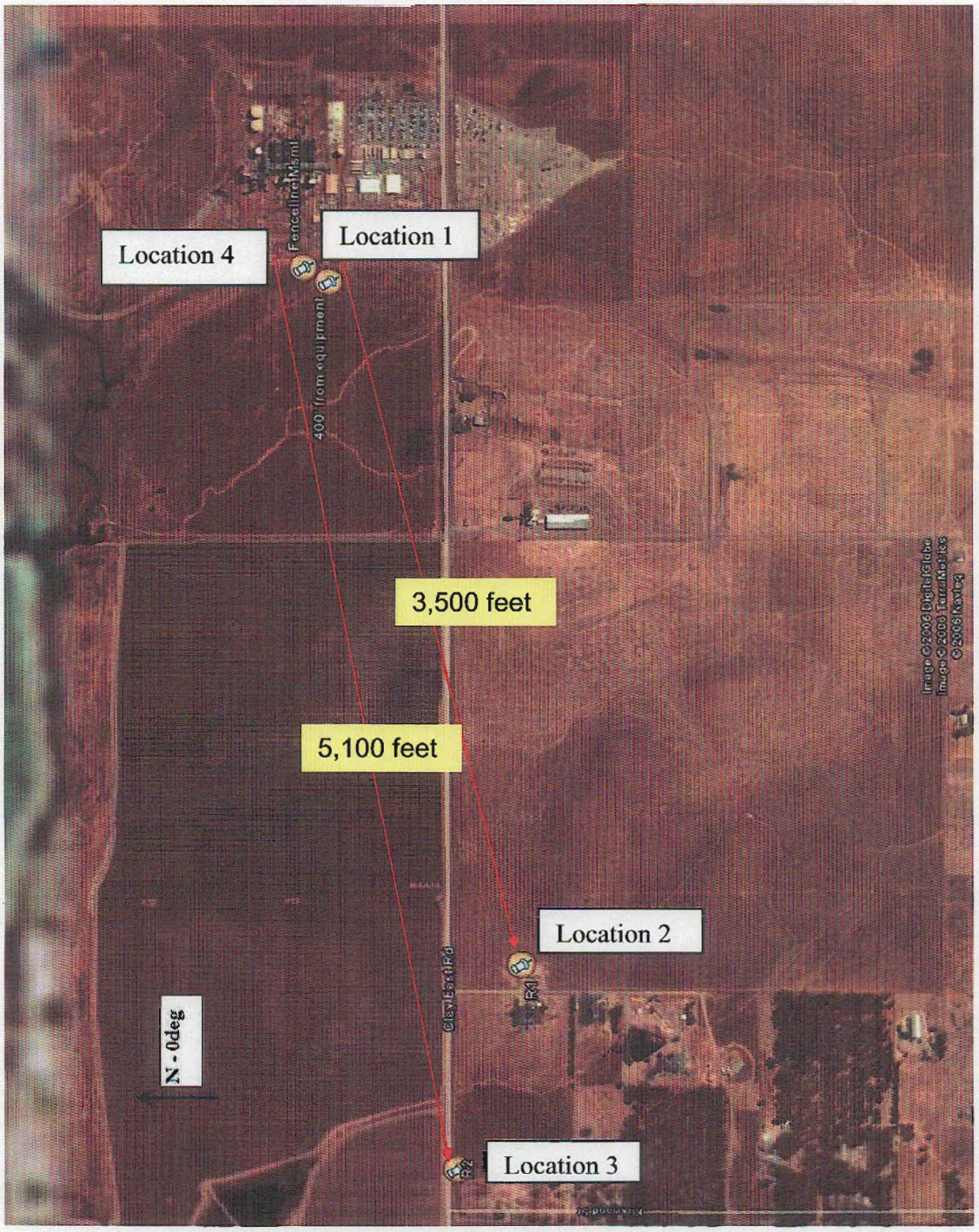


Figure 2: Sound Levels at Location 1 by 1/3 Octave Band Frequency

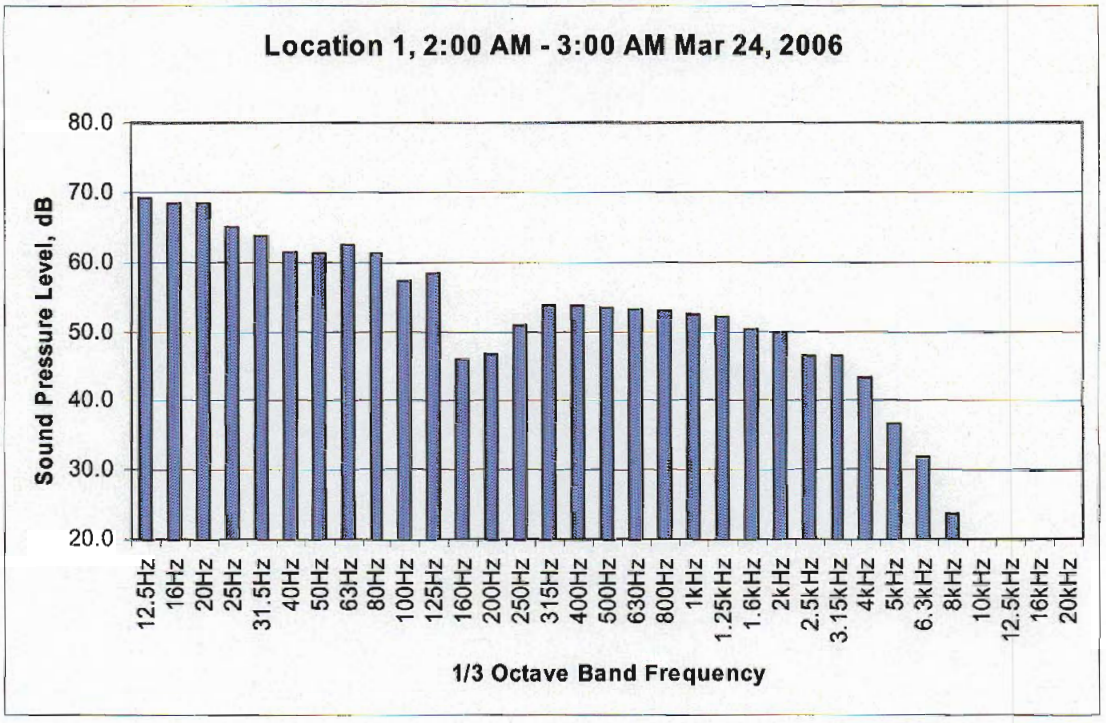


Figure 3: Sound Levels at Location 4 by 1/3 Octave Band Frequency

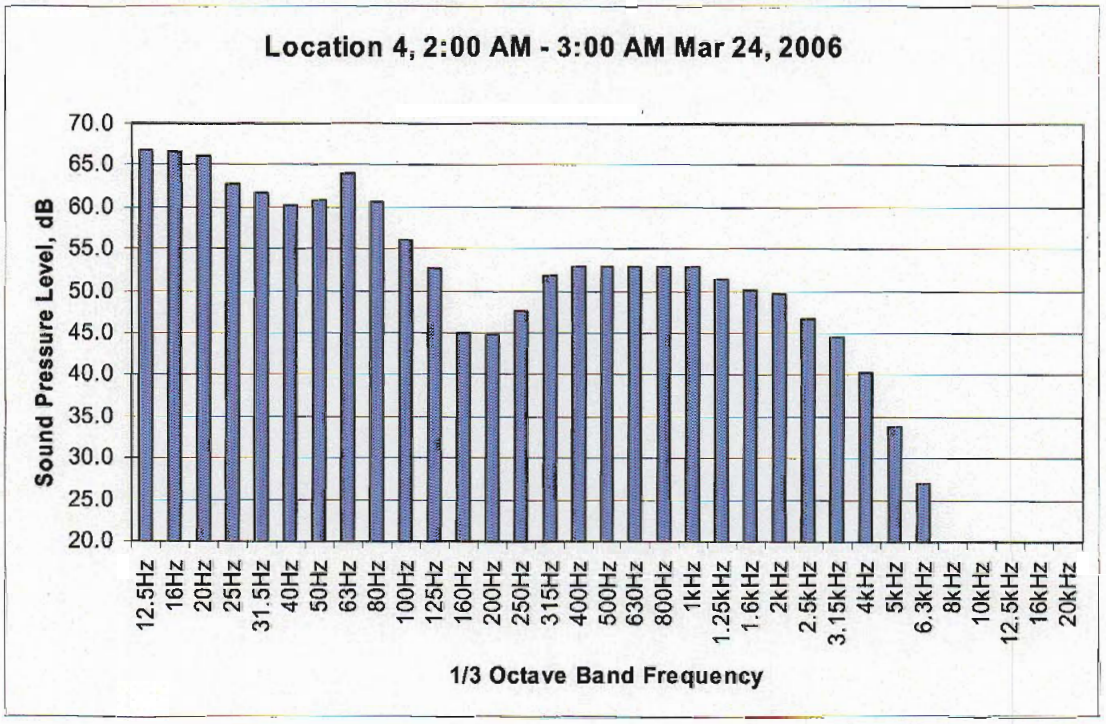


Figure 4: Sample of Noise Level Continuity at CPP

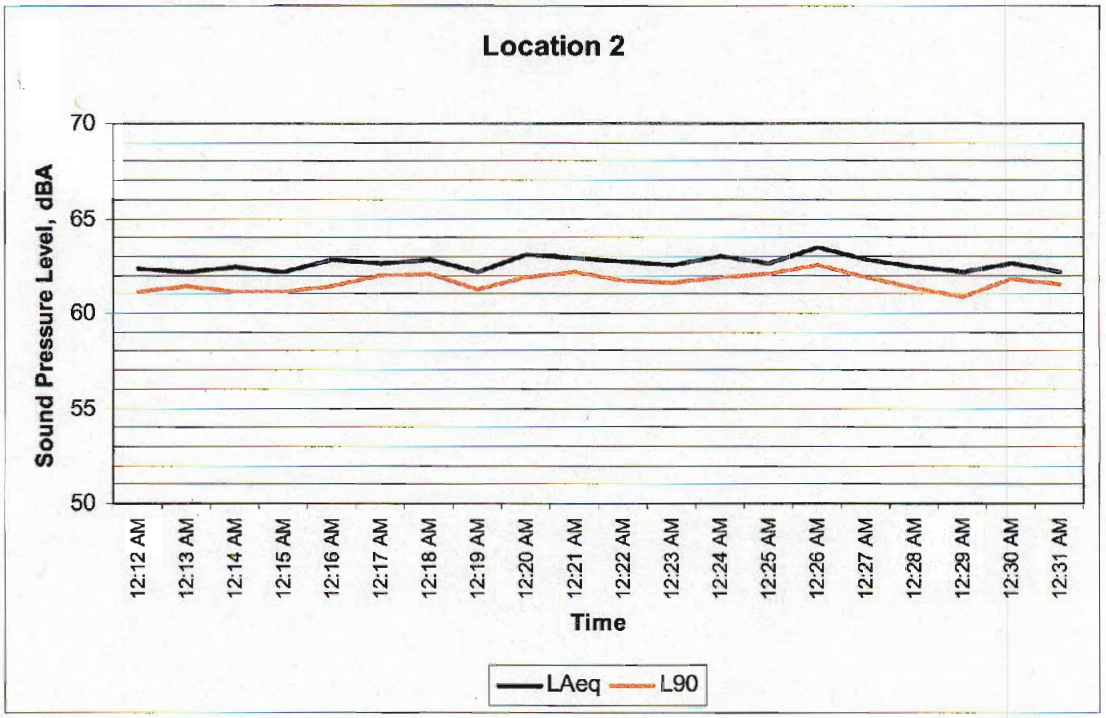


Figure 5: Trend of hourly L_n sound levels at R1 over 25 hours

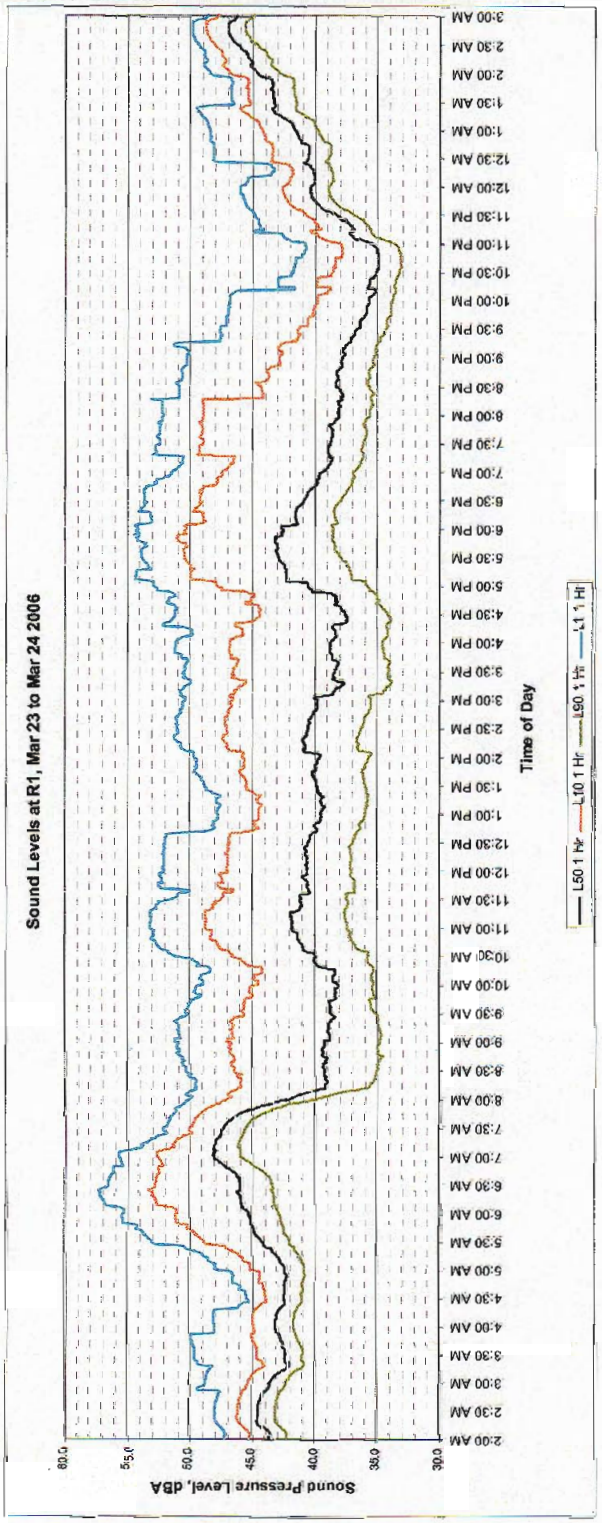
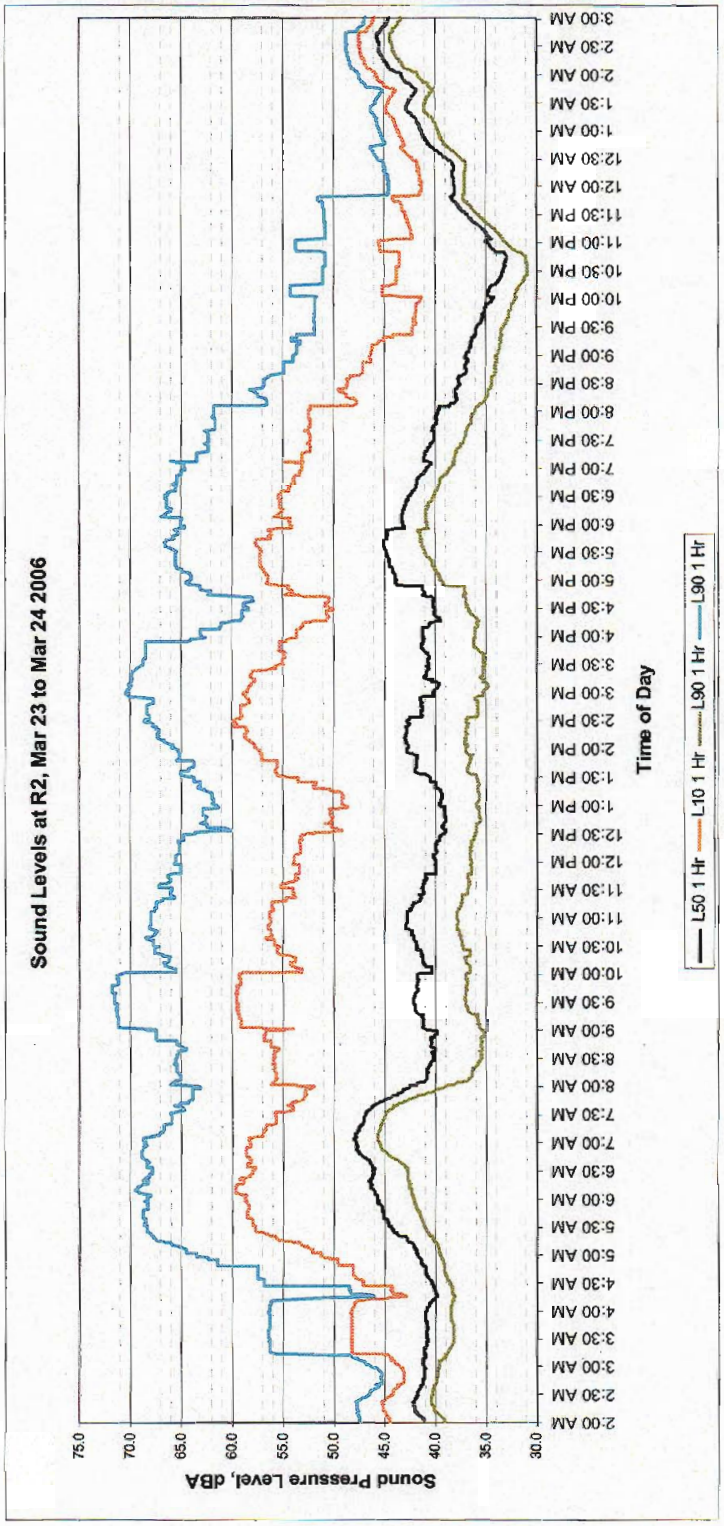


Figure 6: Trend of hourly L_n sound levels at R2 over 25 hours



APPENDIX A

Guide and Abbreviations

APPENDIX A: SOUND LEVEL TERMINOLOGY

Frequency - the number of cycles per unit interval of time. *Units Hz (Hertz).*

Bel (B) - a unit of measure for LEVEL or LEVEL DIFFERENCE (A.G. Bell *1847-1922*). If a quantity is increased by a factor 10^n, its level goes up by *n* bels.

Decibel (dB) - the standard unit of measure, in acoustics, for level or level difference. The decibel scale is based on the ratio $10^{1/10}$; multiplying a power-like quantity (such as sound power or mean square) by this factor increases its level by 1 decibel. If a power-like quantity is increased by a factor $10^{n/10}$, its level goes up by *n* decibels. *Unit symbol for dB.*

Sound Pressure (Pa) - the difference between the instantaneous pressure at a fixed point in a sound field, and the pressure at the same point with the sound absent. *Units Pa (Pascal).*

Sound Pressure Level (SPL, L_p) - or sound pressure-squared level, at a given point the quantity L_p defined by $L_p = 10\ \mathrm{Log}_{10}(P_{rms}/P_{ref})^2 = 20\ \mathrm{Log}_{10}(P_{rms}/P_{ref})$. Here P_{rms} is the ROOT MEAN SQUARE sound pressure, and P_{ref} is the reference rms sound pressure. *Units dB re* $(20\mu Pa)^2$.

A-weighted Sound Pressure Level (SPL, L_{pA}, L_A) - the LEVEL of sound pressure signal to which A-WEIGHTING has been applied. *Units dB re* $(20\mu Pa)^2$.

Sound Power – the rate of acoustic energy flow across a specified surface, or emitted by a specified sound source. *Units W (Watt).*

Sound Power Level (PWL, L_w) - the level of SOUND POWER expressed in decibels relative to a stated reference value. The quantity L_w is defined by $L_w = 10\ \mathrm{Log}_{10}(W/W_{ref})$. Here W_{ref} is the reference sound power. *Units dB re* 1_pW.

A-weighted Sound Power Level (PWL, L_{wA}) - the level of sound power to which A-WEIGHTING has been applied. *Units dB re* $(20\mu Pa)^2$.

A-weighting - a frequency-weighting procedure, in which the power or energy spectrum of a signal is progressively attenuated towards the high and low ends of the human

audible range. Frequency components around 1 kHz - 5 kHz are hardly affected, but the attenuation is large at low frequencies (i.e., 70 dB at 10 Hz).

Percentile Sound Levels, L_N - since the noise levels in a community vary with time in a more or less random manner, the descriptors of these time varying noise levels may be defined in statistical terms. The statistical descriptors are referred to as the percentile sound levels, L_N; with L_N defined as the level exceeded N% of the time. The descriptors often used are:

L_0, Highest Level - this is the highest noise level, also known as L_{max}.

L_1, Level of Highly Intrusive Sounds – the level exceeded 1% of the time, is a measure of the highly intrusive sounds.

L_{10}, Level of Intrusive Sounds - The level exceeded 10% of the time, and is used to indicate the average level of the intrusive sounds.

L_{50}, Median Level - The level exceeded 50% of the time or the median level. A useful measure of the average noise conditions on a site.

L_{90}, Background Level – The level exceeded 90% of the time. It provides a good indication of the steady background noise level on a site.

L_{eq}, Equivalent Sound Level - the prime descriptor used in assessing most types of sounds heard in a community. The L_{eq} is an average of sounds measured over time. It is strongly influenced by occasional loud, intrusive noises. Because it is able to account for such noises, for example, the L_{eq} is the best descriptor for the intermittent sound levels from construction activities.

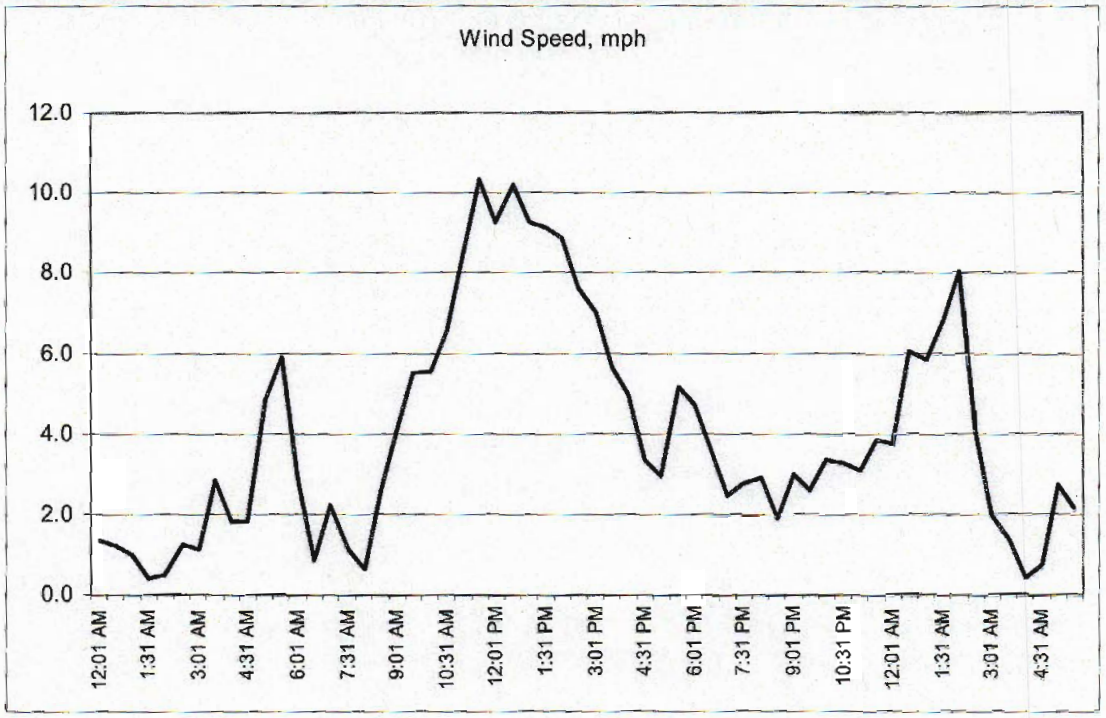
L_{DN}, The Day-Night Sound Level, derived by applying a 10 dB "penalty" to noise levels that occur at night, between 10 p.m. and 7 a.m., thus accounting for increased sensitivity to noise during nighttime hours.

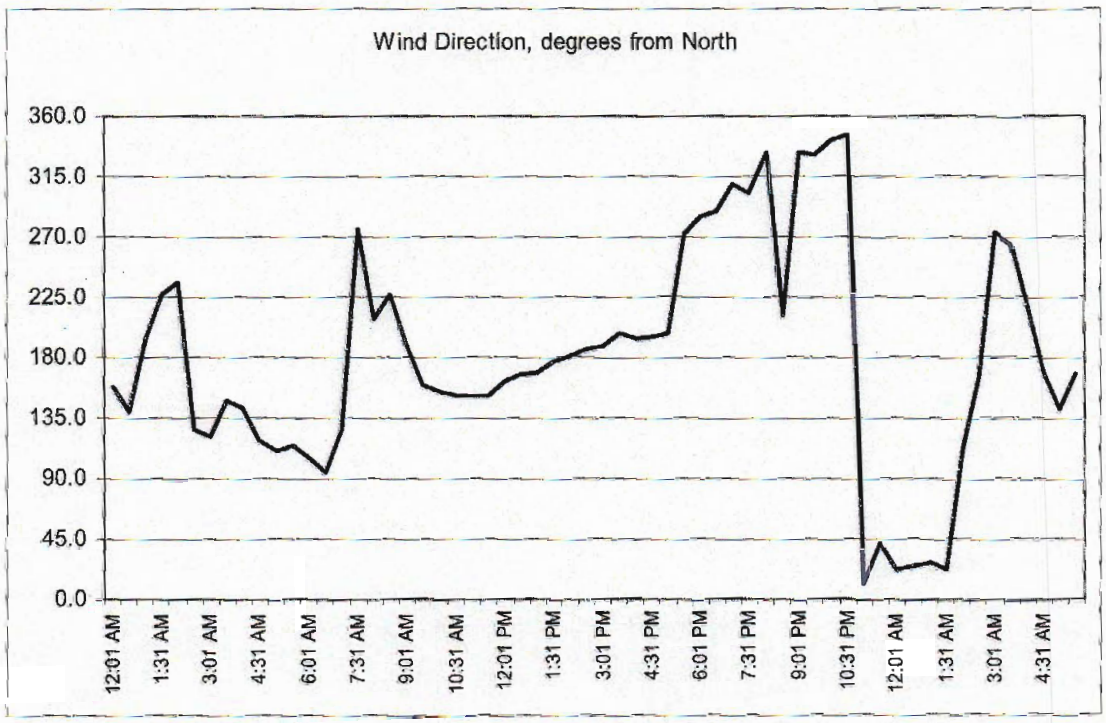
Ambient sound level - means background sound level. It is the sound level that is present in the acoustic environment of a defined area. Aircraft flyover and rail noise may be excluded in some jurisdictions.

Reference: Dictionary of Acoustics, Christopher L Morfey, Institute of Sound and Vibration Research, University of Southampton, Southampton, UK –Academic Press, 2001.

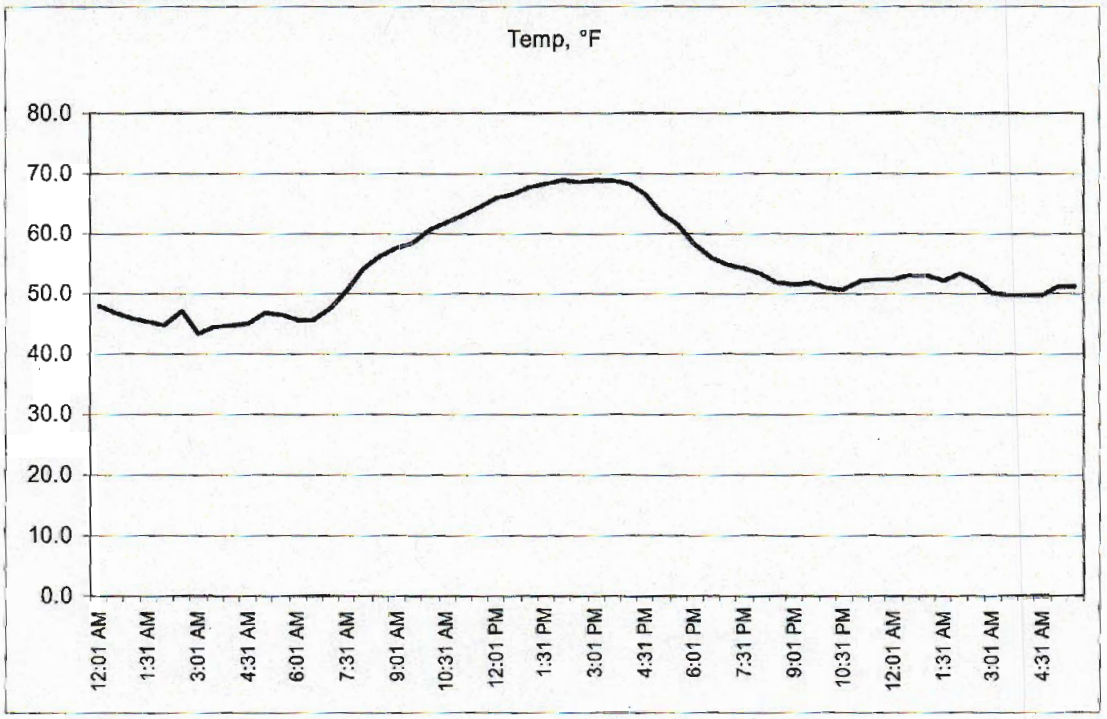
APPENDIX B

Meteorological Conditions





*North is in the 0°/360° direction, R1 and R2 are approximately in the 250° - 260° direction


Temp, °F
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
12:01 AM
1:31 AM
3:01 AM
4:31 AM
6:01 AM
7:31 AM
9:01 AM
10:31 AM
12:01 PM
1:31 PM
3:01 PM
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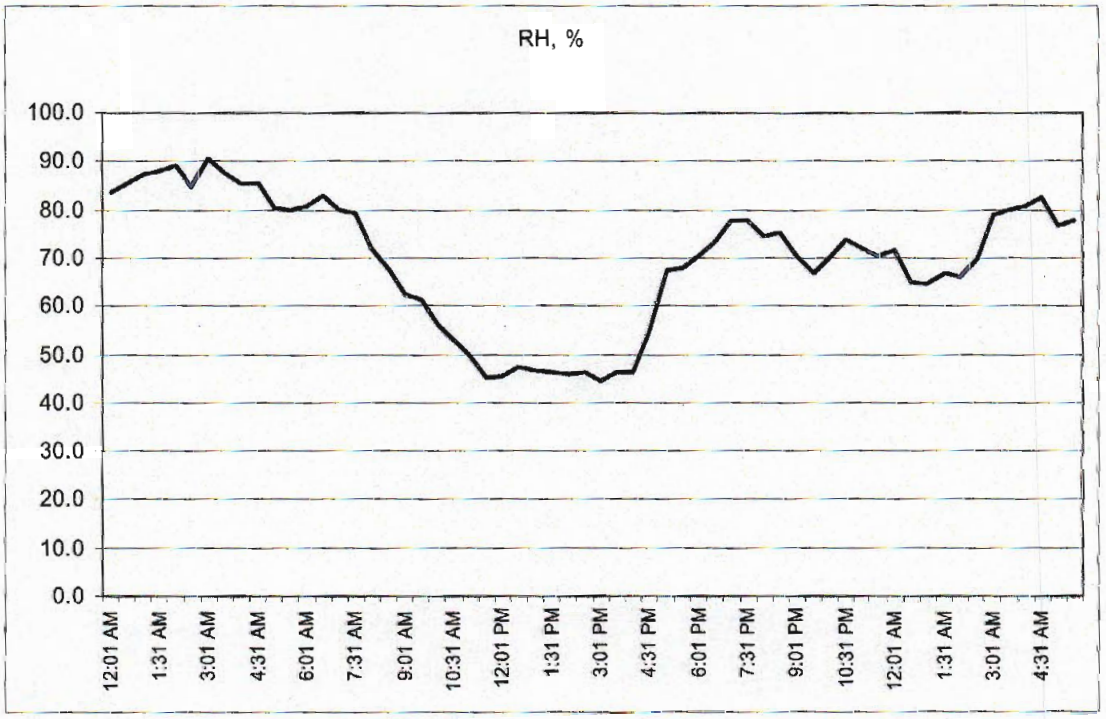
10:31 PM
12:01 AM
1:31 AM
3:01 AM
4:31 AM


RH, %
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
12:01 AM
1:31 AM
3:01 AM
4:31 AM
6:01 AM
7:31 AM
9:01 AM
10:31 AM
12:01 PM
1:31 PM
3:01 PM
4:31 PM
6:01 PM
7:31 PM
9:01 PM
10:31 PM
12:01 AM
1:31 AM
3:01 AM
4:31 AM

APPENDIX C

Sound Level Meter Setup

R2		
Instrument:		2250
Application:		BZ7224 Version 1.3
Start Time:		03/23/2006 00:56:41
End Time:		03/24/2006 03:56:41
Elapsed Time:		1.03:00:00
Bandwidth:		Broadband
Max Input Level:		140.40
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z
Instrument Serial Number:		2505916
Microphone Serial Number:		2503182
Input:		Top Socket
Windscreen Correction:		UA 1650
Sound Field Correction:		Free-field
Calibration Time:		03/22/2006 18:05:36
Calibration Type:		External reference
Sensitivity:		53.12 mV/Pa

R1		
Instrument:		2250
Application:		BZ7224 Version 1.3
Start Time:		03/23/2006 01:03:06
End Time:		03/24/2006 04:03:06
Elapsed Time:		1.03:00:00
Bandwidth:		Broadband
Max Input Level:		140.84
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z
Instrument Serial Number:		2506115
Microphone Serial Number:		2509068
Input:		Top Socket
Windscreen Correction:		UA 1650
Sound Field Correction:		Free-field
Calibration Time:		03/22/2006 19:29:20
Calibration Type:		External reference
Sensitivity:		50.59 mV/Pa

400' From Equipment

Instrument:		2250
Application:		BZ7224 Version 1.3
Start Time:		03/23/2006 02:34:25
End Time:		03/24/2006 05:34:25
Elapsed Time:		1.03:00:00
Bandwidth:		Broadband
Max Input Level:		141.30
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		C
Spectrum:	FS	Z
Instrument Serial Number:		2463136
Microphone Serial Number:		2453503
Input:		Top Socket
Windscreen Correction:		UA 1404
Sound Field Correction:		Free-field
Calibration Time:		03/22/2006 20:53:22
Calibration Type:		External reference
Sensitivity:		47.99 mV/Pa

At Property Fence

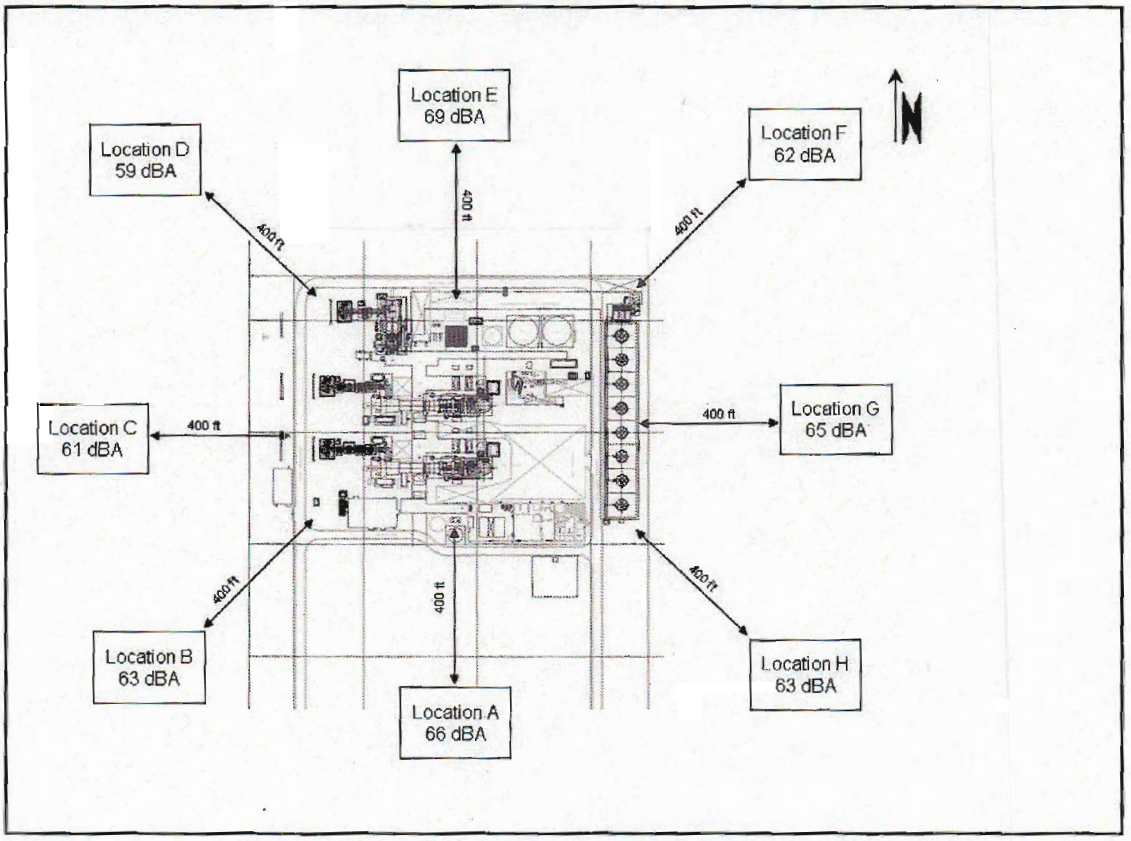
Instrument:		2250
Application:		BZ7224 Version 1.3
Start Time:		03/23/2006 01:43:57
End Time:		03/24/2006 04:43:57
Elapsed Time:		1.03:00:00
Bandwidth:		Broadband
Max Input Level:		141.52
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		Z
Spectrum:	FS	Z
Instrument Serial Number:		2506114
Microphone Serial Number:		2471122
Input:		Top Socket
Windscreen Correction:		UA 1650
Sound Field Correction:		Free-field
Calibration Time:		03/22/2006 20:15:49
Calibration Type:		External reference
Sensitivity:		46.94 mV/Pa

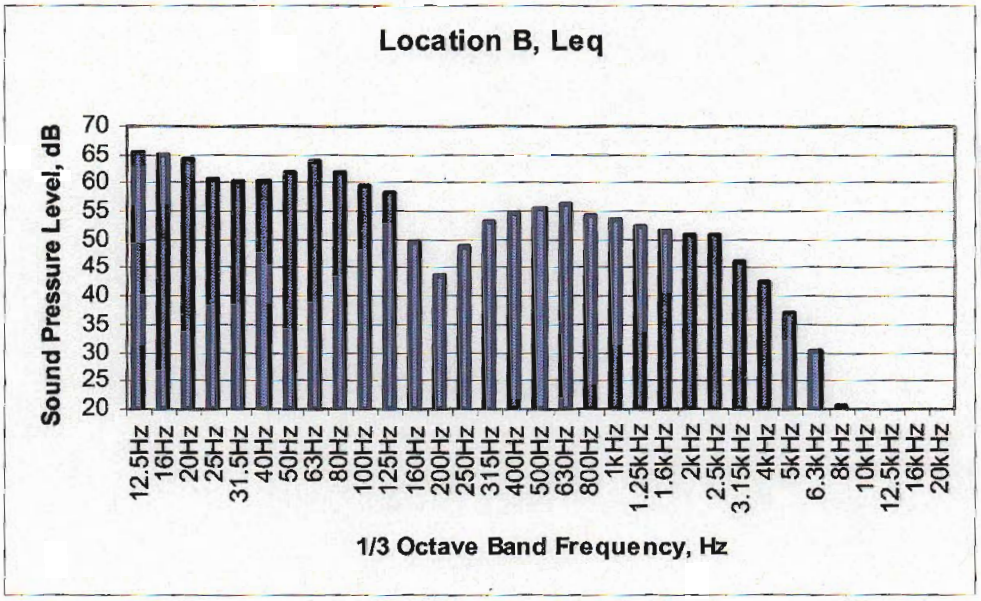
Short Term Msmts.

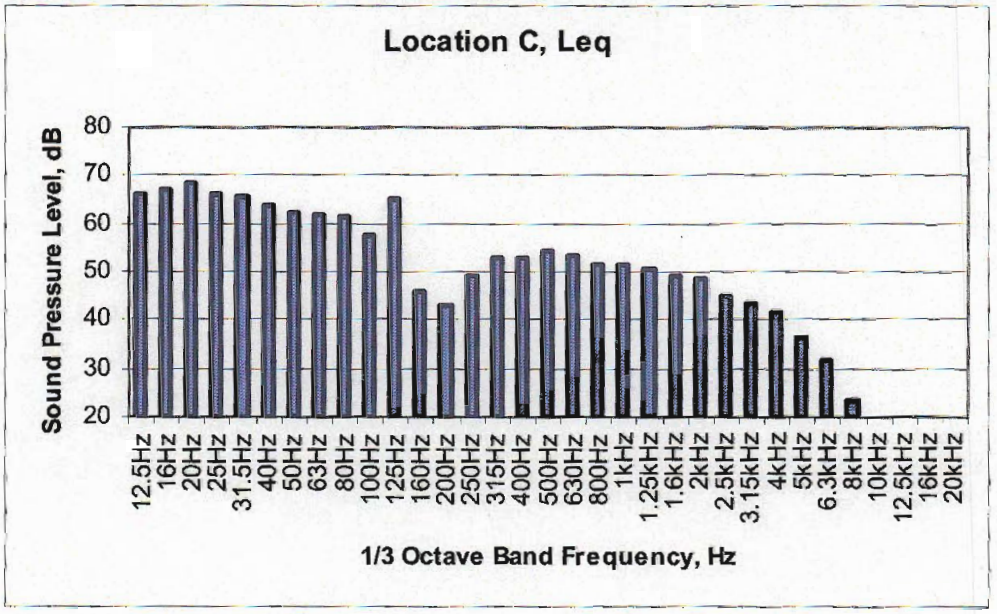
Instrument:		2250
Application:		BZ7224 Version 1.3
Start Time:		03/24/2006 00:12:26
End Time:		03/24/2006 00:32:26
Elapsed Time:		00:20:00
Bandwidth:		Broadband
Max Input Level:		140.56
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:		Z
Spectrum:	FS	Z
Instrument Serial Number:		2505915
Microphone Serial Number:		2509067
Input:		Top Socket
Windscreen Correction:		UA 1650
Sound Field Correction:		Free-field
Calibration Time:		03/22/2006 21:43:55
Calibration Type:		External reference
Sensitivity:		52.32 mV/Pa

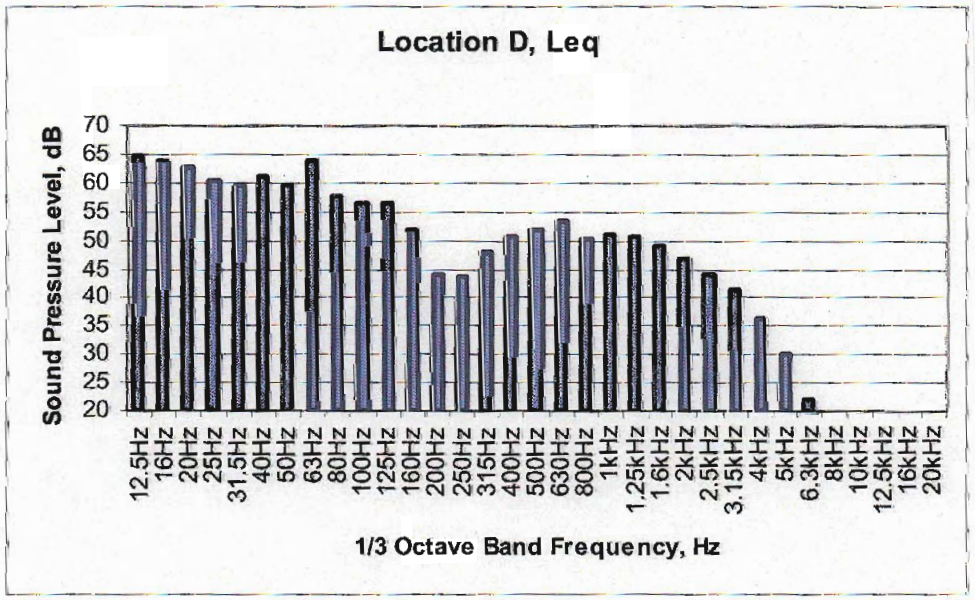
APPENDIX D

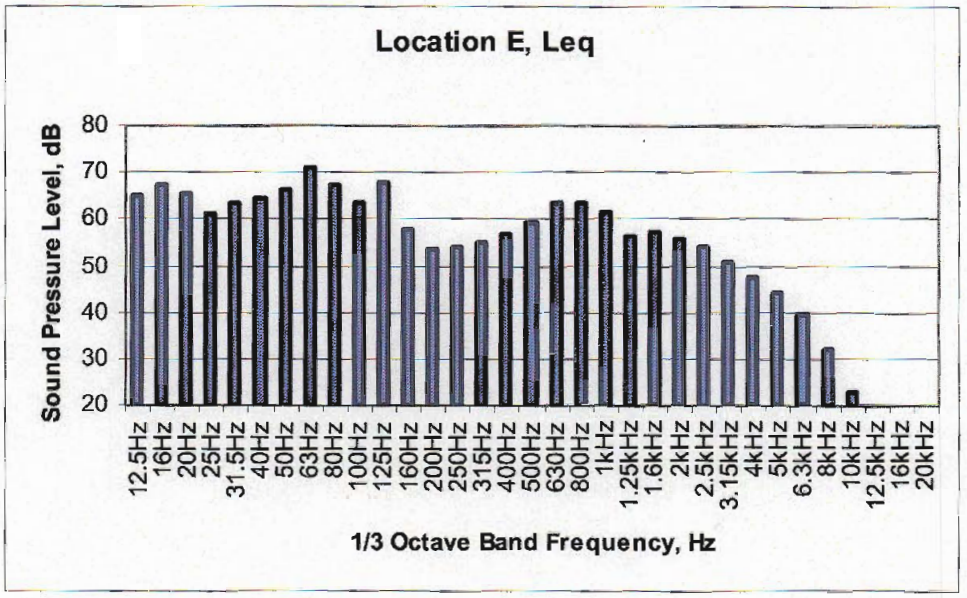
Short Term Measurement Results

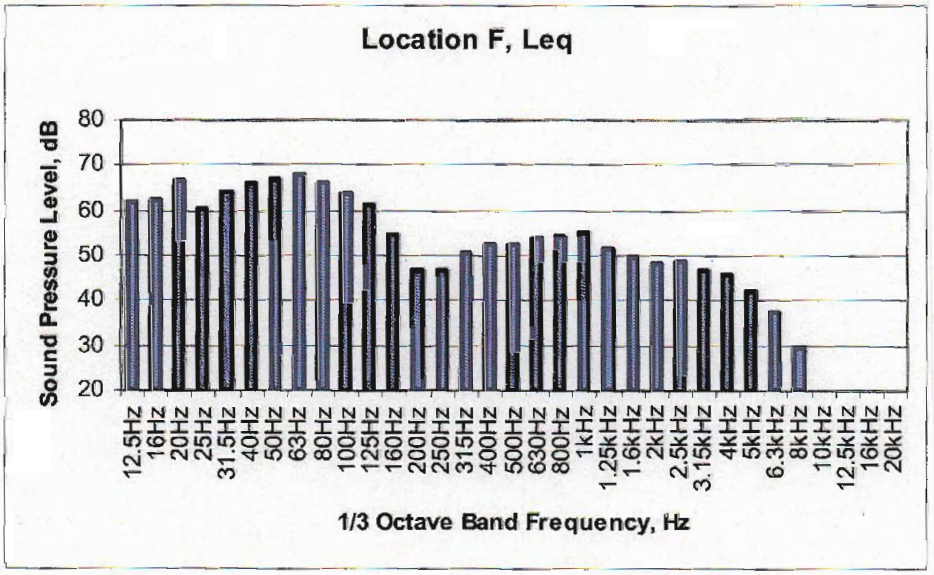

Location E
69 dBA
Location D
59 dBA
Location F
62 dBA
N
400 ft
400 ft
400 ft
Location C
61 dBA
400 ft
400 ft
Location G
65 dBA
400 ft
400 ft
Location B
63 dBA
Location H
63 dBA
Location A
66 dBA

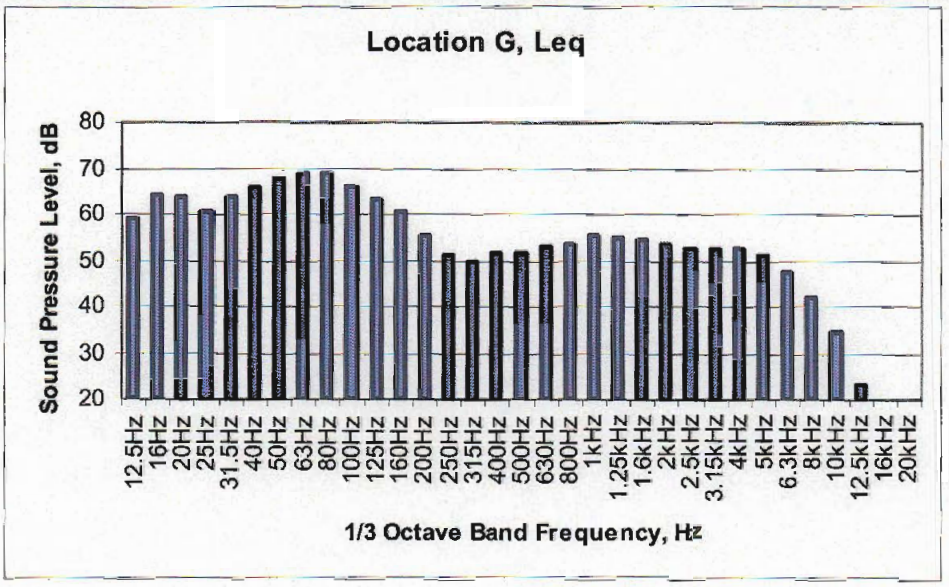

Location B, Leq
Sound Pressure Level, dB
70
65
60
55
50
45
40
35
30
25
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

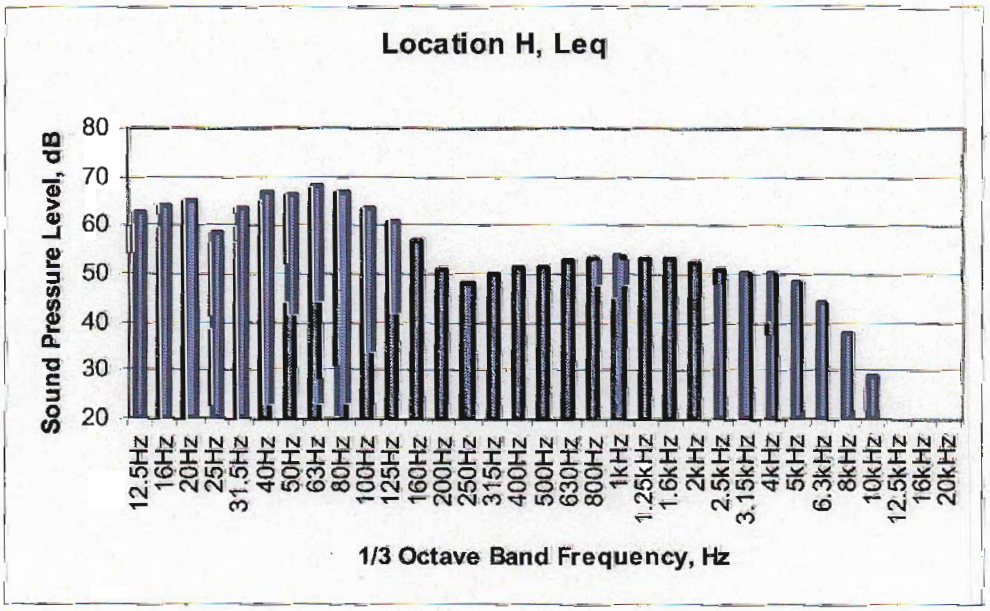

Location C, Leq
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

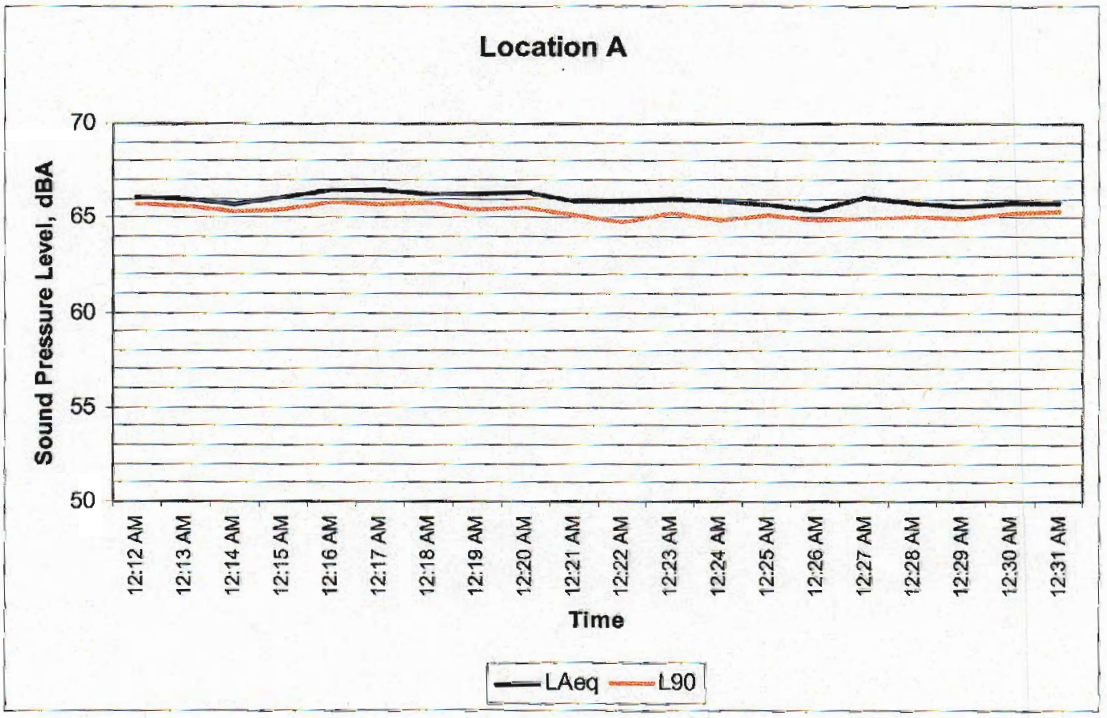

Location D, Leq
Sound Pressure Level, dB
70
65
60
55
50
45
40
35
30
25
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

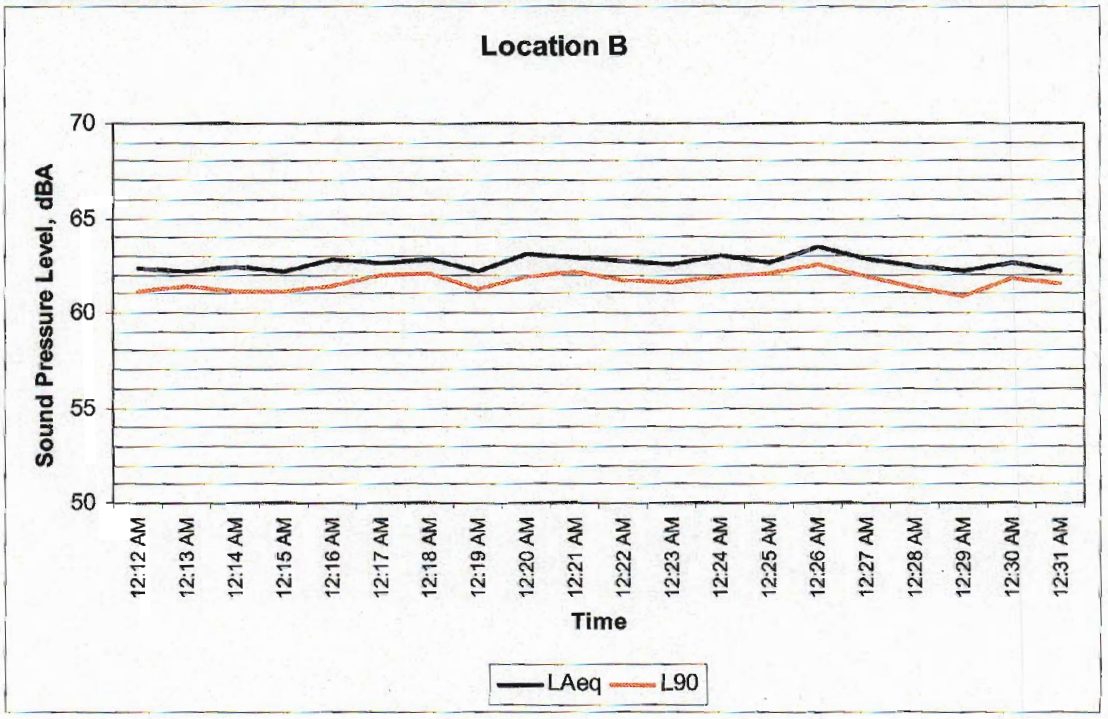

Location E, Leq
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

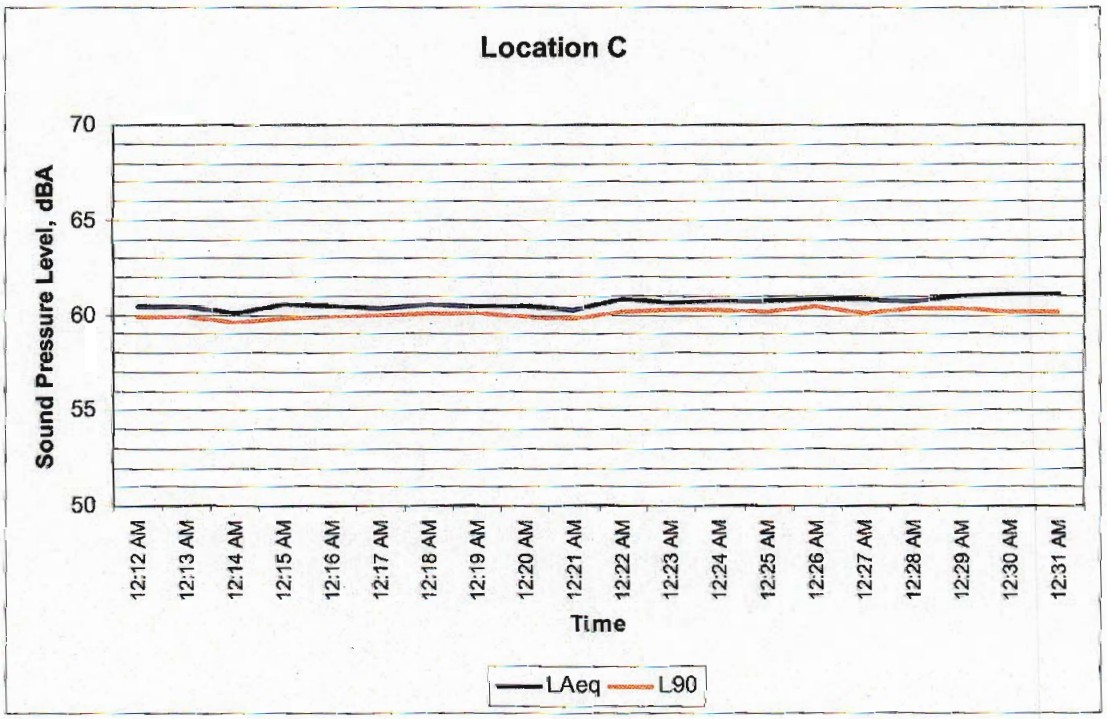

Location F, Leq
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

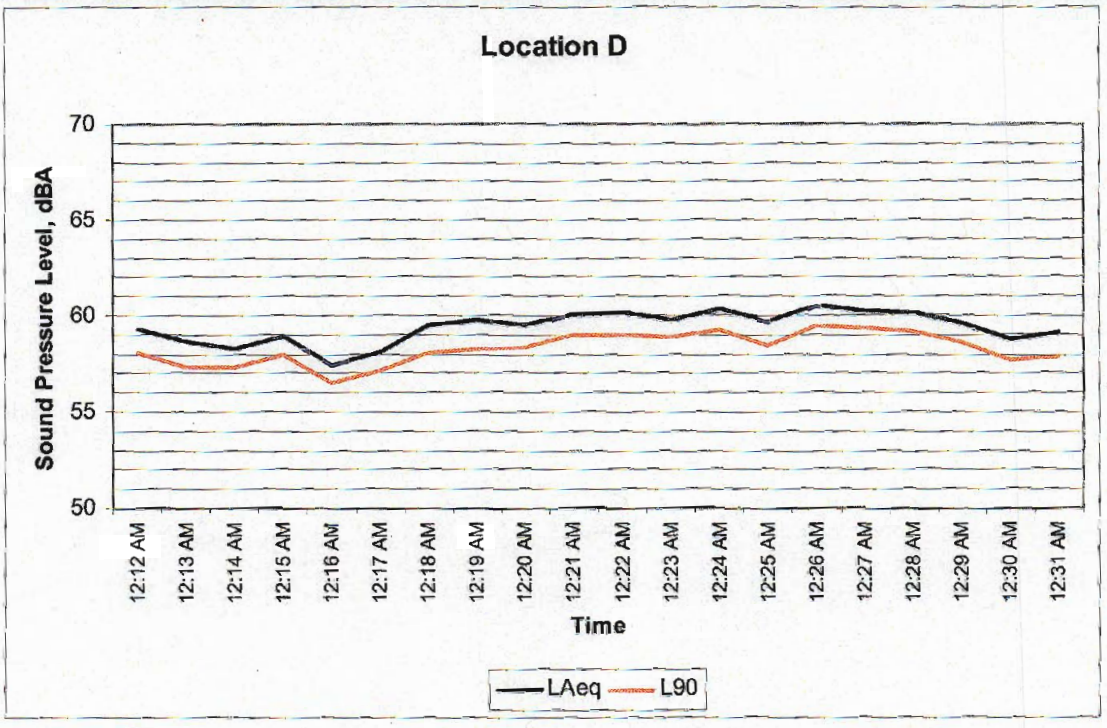

Location G, Leq
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

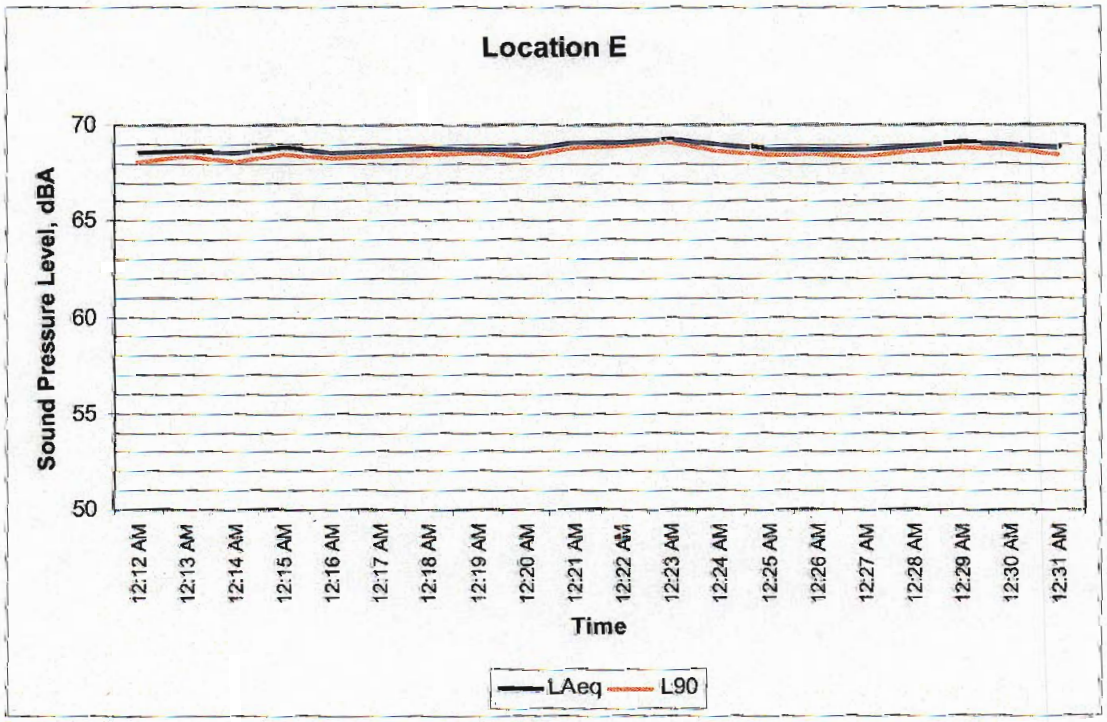

Location H, Leq
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

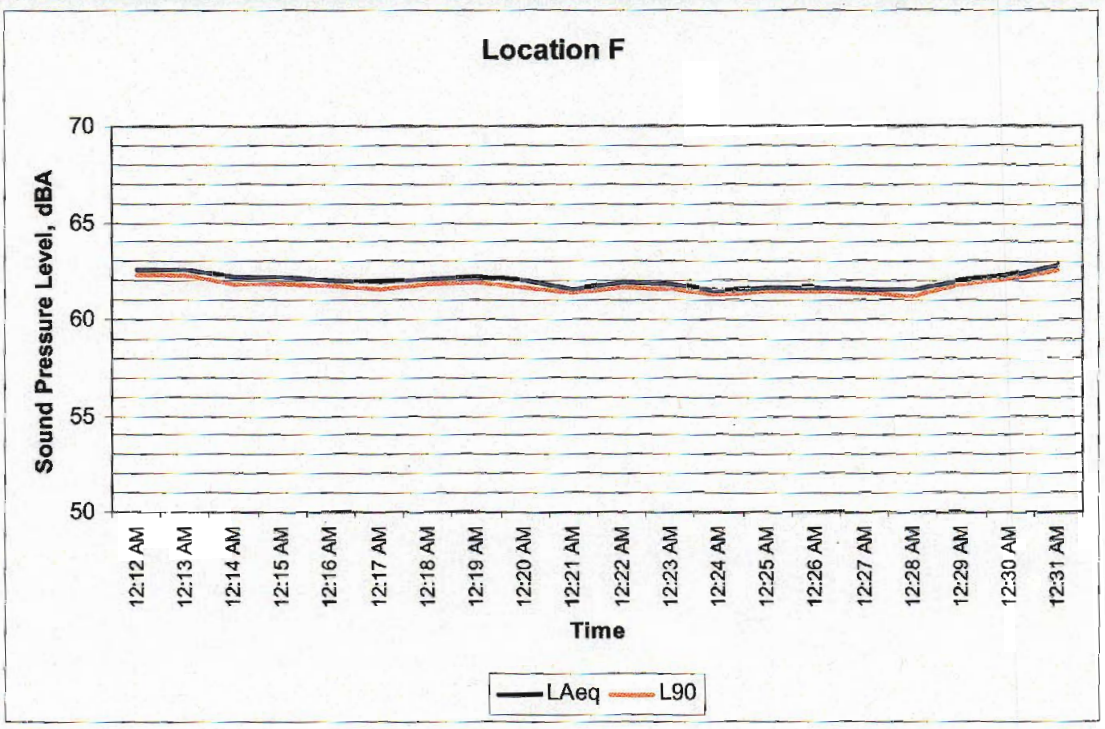

Location A
Sound Pressure Level, dBA
70
65
60
55
50
12:12 AM
12:13 AM
12:14 AM
12:15 AM
12:16 AM
12:17 AM
12:18 AM
12:19 AM
12:20 AM
12:21 AM
12:22 AM
12:23 AM
12:24 AM
12:25 AM
12:26 AM
12:27 AM
12:28 AM
12:29 AM
12:30 AM
12:31 AM
Time
LAeq
L90

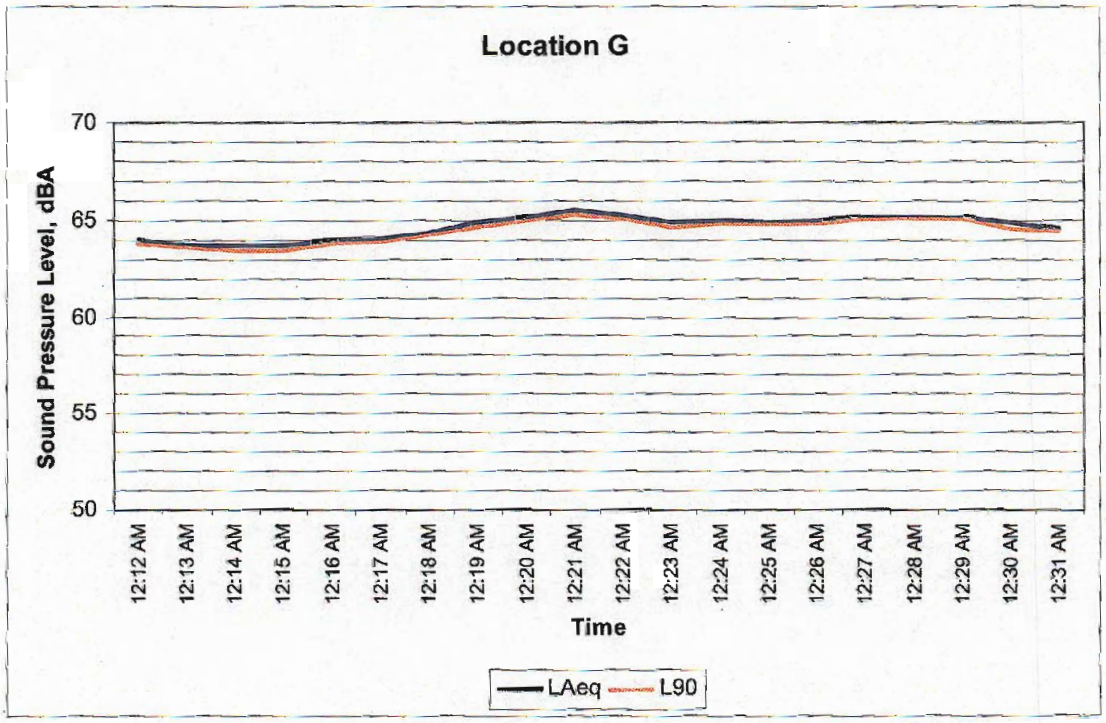

Location B
Sound Pressure Level, dBA
70
65
60
55
50
12:12 AM
12:13 AM
12:14 AM
12:15 AM
12:16 AM
12:17 AM
12:18 AM
12:19 AM
12:20 AM
12:21 AM
12:22 AM
12:23 AM
12:24 AM
12:25 AM
12:26 AM
12:27 AM
12:28 AM
12:29 AM
12:30 AM
12:31 AM
Time
LAeq
L90

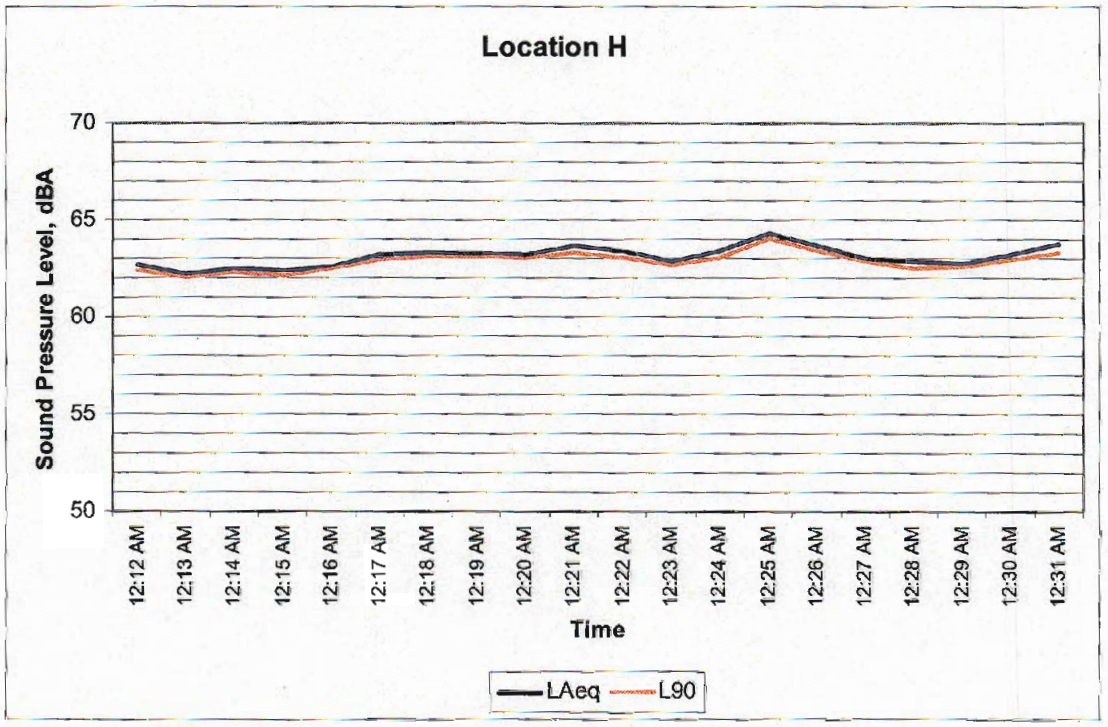

Location C
Sound Pressure Level, dBA
70
65
60
55
50
12:12 AM
12:13 AM
12:14 AM
12:15 AM
12:16 AM
12:17 AM
12:18 AM
12:19 AM
12:20 AM
12:21 AM
12:22 AM
12:23 AM
12:24 AM
12:25 AM
12:26 AM
12:27 AM
12:28 AM
12:29 AM
12:30 AM
12:31 AM
Time
LAeq
L90


Location D
Sound Pressure Level, dBA
70
65
60
55
50
12:12 AM
12:13 AM
12:14 AM
12:15 AM
12:16 AM
12:17 AM
12:18 AM
12:19 AM
12:20 AM
12:21 AM
12:22 AM
12:23 AM
12:24 AM
12:25 AM
12:26 AM
12:27 AM
12:28 AM
12:29 AM
12:30 AM
12:31 AM
Time
LAeq
L90


Location E
Sound Pressure Level, dBA
70
65
60
55
50
12:12 AM
12:13 AM
12:14 AM
12:15 AM
12:16 AM
12:17 AM
12:18 AM
12:19 AM
12:20 AM
12:21 AM
12:22 AM
12:23 AM
12:24 AM
12:25 AM
12:26 AM
12:27 AM
12:28 AM
12:29 AM
12:30 AM
12:31 AM
Time
LAeq
L90

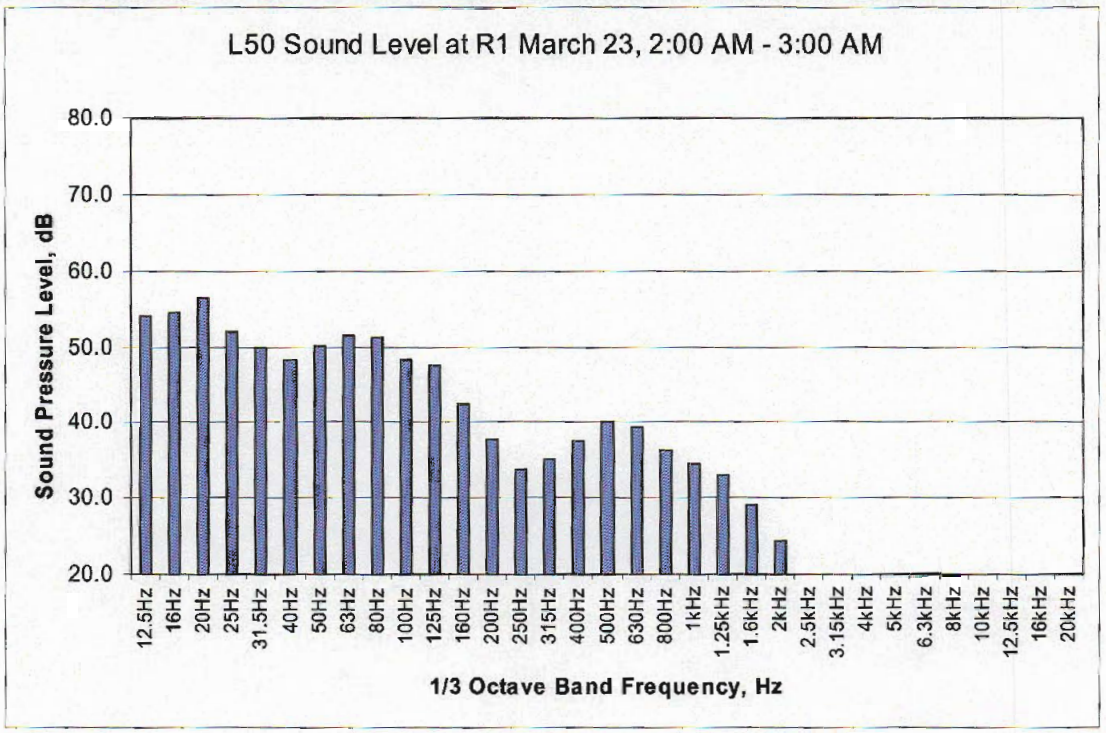

Location F
Sound Pressure Level, dBA
70
65
60
55
50
12:12 AM
12:13 AM
12:14 AM
12:15 AM
12:16 AM
12:17 AM
12:18 AM
12:19 AM
12:20 AM
12:21 AM
12:22 AM
12:23 AM
12:24 AM
12:25 AM
12:26 AM
12:27 AM
12:28 AM
12:29 AM
12:30 AM
12:31 AM
Time
LAeq
L90

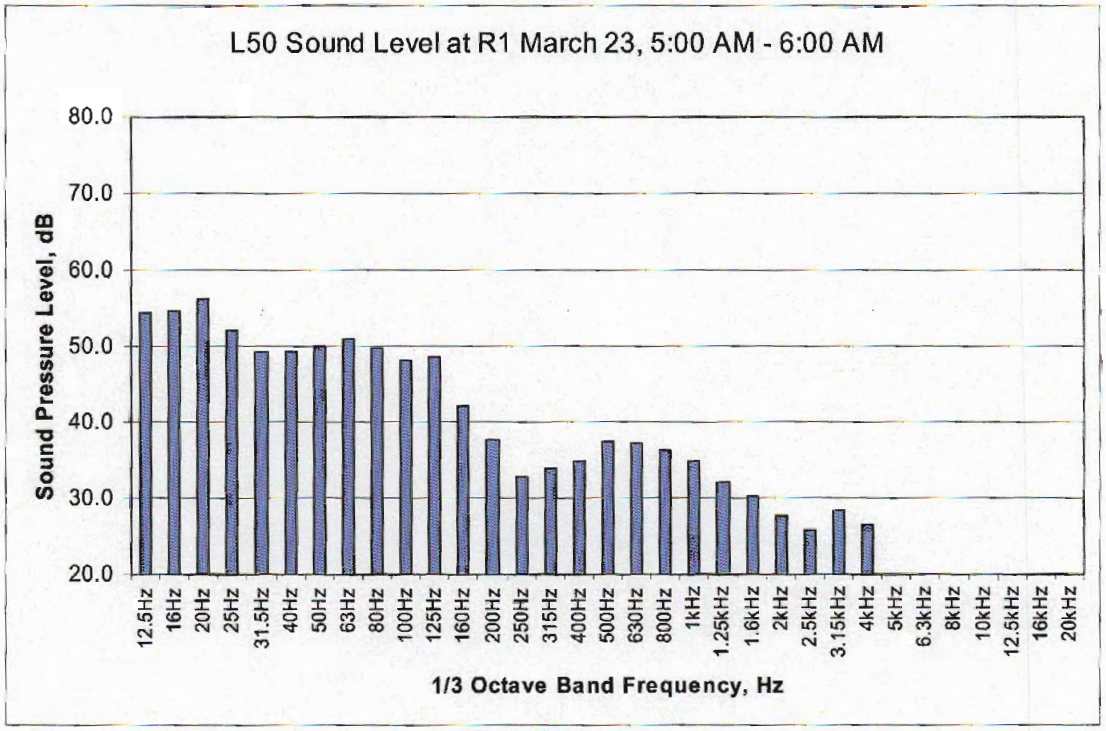

Location G
Sound Pressure Level, dBA
70
65
60
55
50
12:12 AM
12:13 AM
12:14 AM
12:15 AM
12:16 AM
12:17 AM
12:18 AM
12:19 AM
12:20 AM
12:21 AM
12:22 AM
12:23 AM
12:24 AM
12:25 AM
12:26 AM
12:27 AM
12:28 AM
12:29 AM
12:30 AM
12:31 AM
Time
LAeq
L90

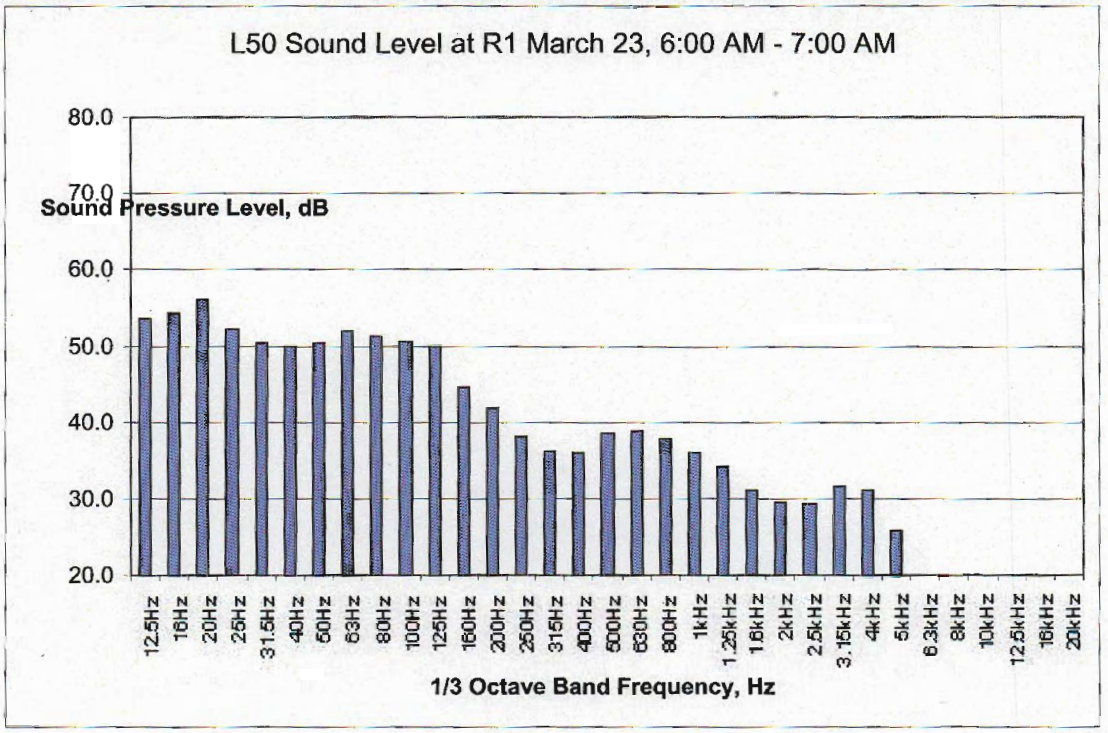

Location H
Sound Pressure Level, dBA
70
65
60
55
50
12:12 AM
12:13 AM
12:14 AM
12:15 AM
12:16 AM
12:17 AM
12:18 AM
12:19 AM
12:20 AM
12:21 AM
12:22 AM
12:23 AM
12:24 AM
12:25 AM
12:26 AM
12:27 AM
12:28 AM
12:29 AM
12:30 AM
12:31 AM
Time
LAeq
L90

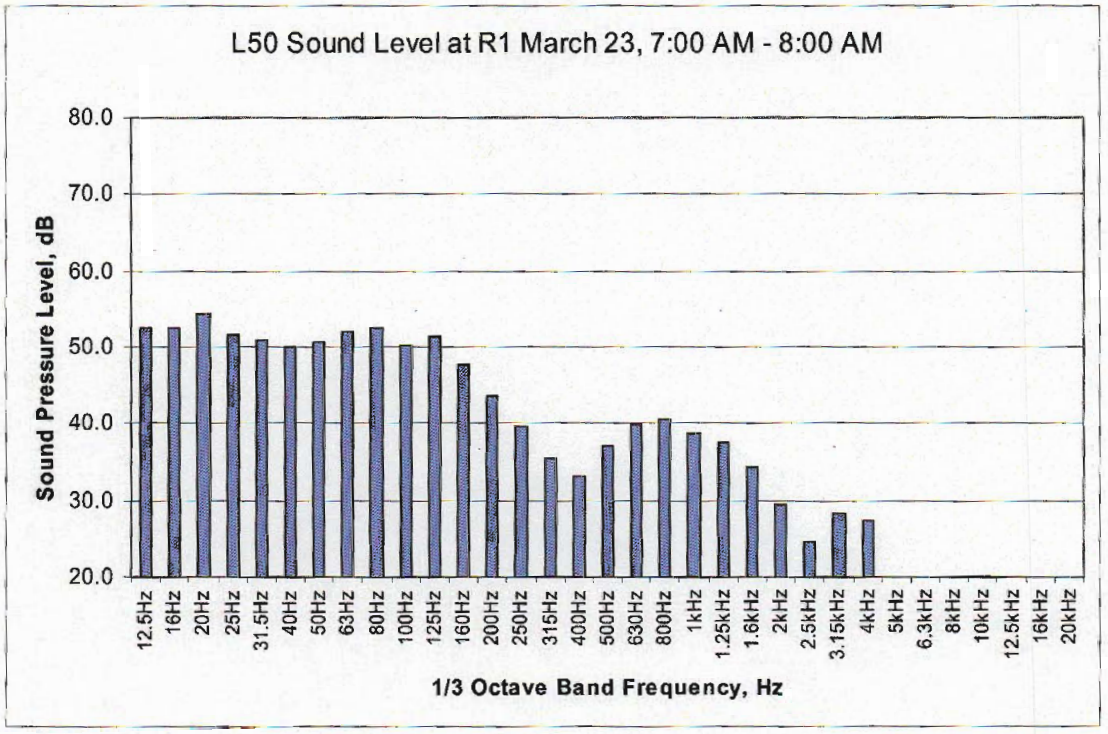
APPENDIX E

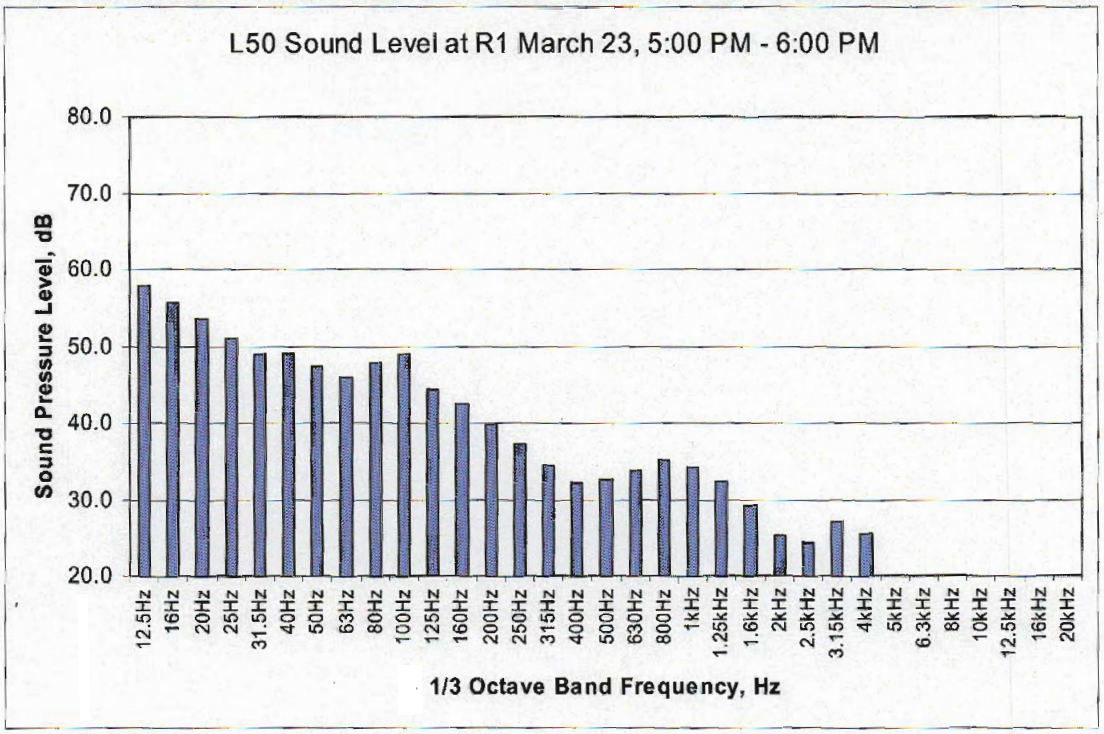
1/3 Octave Band Sound Levels at R1 during Exceedance Periods

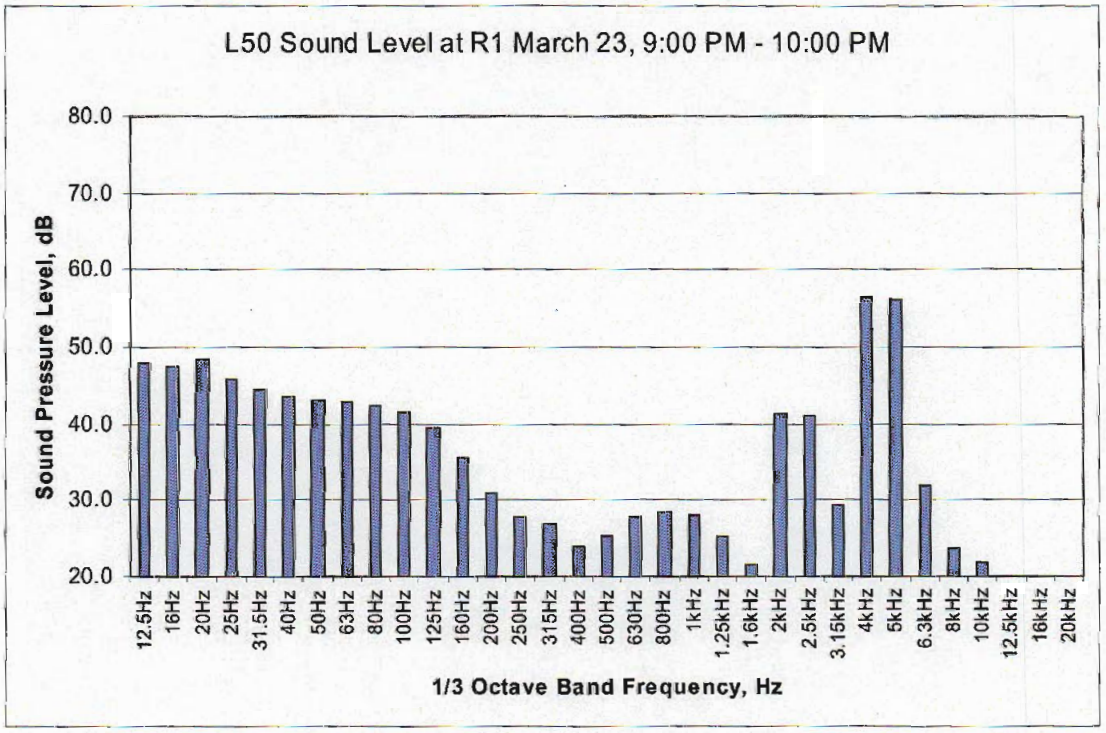

L50 Sound Level at R1 March 23, 2:00 AM - 3:00 AM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz 16Hz 20Hz 25Hz 31.5Hz 40Hz 50Hz 63Hz 80Hz 100Hz 125Hz 160Hz 200Hz 250Hz 315Hz 400Hz 500Hz 630Hz 800Hz 1kHz 1.25kHz 1.6kHz 2kHz 2.5kHz 3.15kHz 4kHz 5kHz 6.3kHz 8kHz 10kHz 12.5kHz 16kHz 20kHz
1/3 Octave Band Frequency, Hz

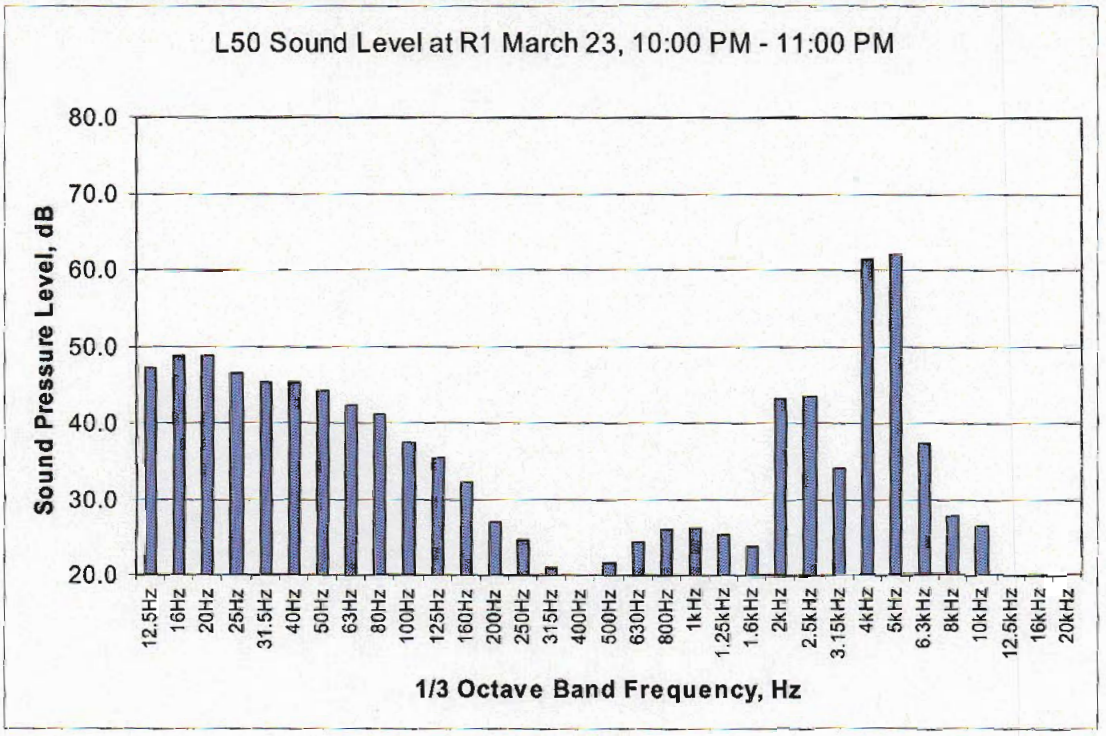

L50 Sound Level at R1 March 23, 5:00 AM - 6:00 AM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz 16Hz 20Hz 25Hz 31.5Hz 40Hz 50Hz 63Hz 80Hz 100Hz 125Hz 160Hz 200Hz 250Hz 315Hz 400Hz 500Hz 630Hz 800Hz 1kHz 1.25kHz 1.6kHz 2kHz 2.5kHz 3.15kHz 4kHz 5kHz 6.3kHz 8kHz 10kHz 12.5kHz 16kHz 20kHz
1/3 Octave Band Frequency, Hz

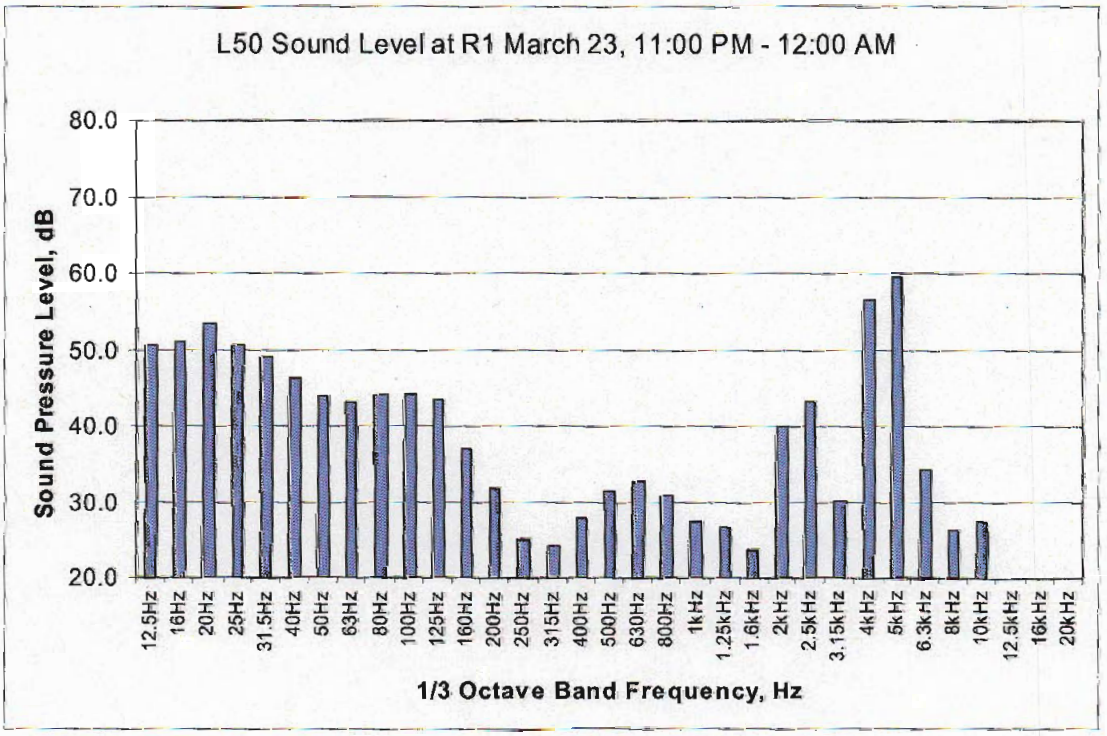

L50 Sound Level at R1 March 23, 6:00 AM - 7:00 AM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz 16Hz 20Hz 25Hz 31.5Hz 40Hz 50Hz 63Hz 80Hz 100Hz 125Hz 160Hz 200Hz 250Hz 315Hz 400Hz 500Hz 630Hz 800Hz 1kHz 1.25kHz 1.6kHz 2kHz 2.5kHz 3.15kHz 4kHz 5kHz 6.3kHz 8kHz 10kHz 12.5kHz 16kHz 20kHz
1/3 Octave Band Frequency, Hz

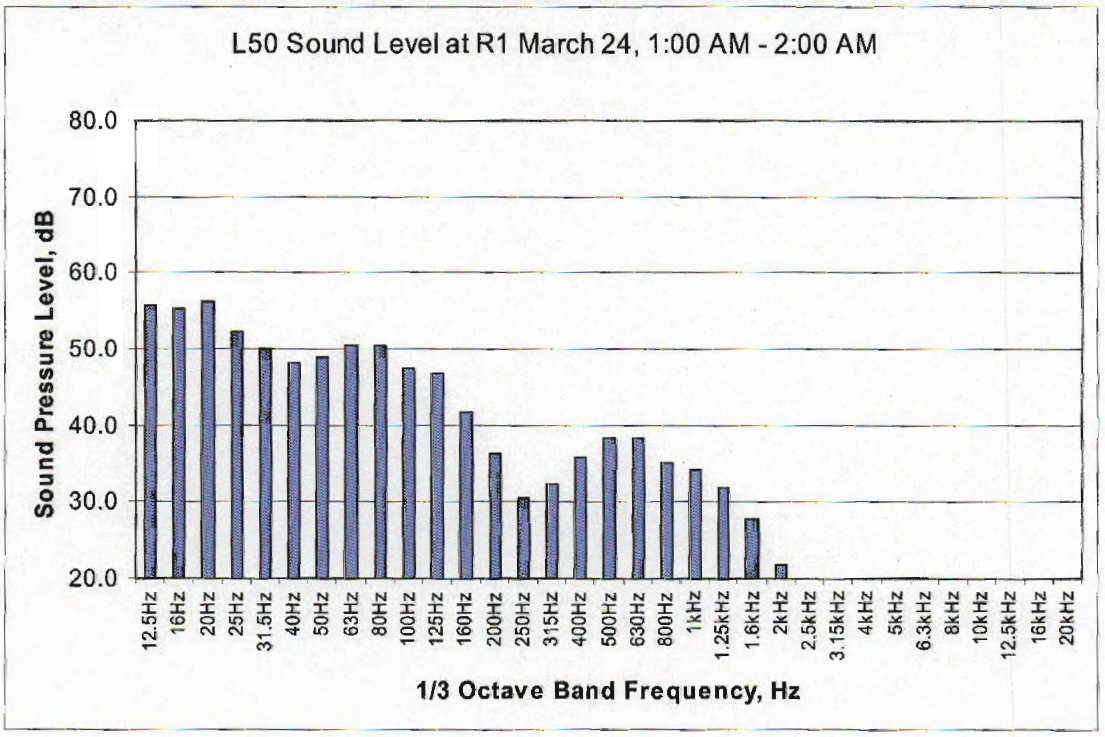

L50 Sound Level at R1 March 23, 7:00 AM - 8:00 AM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz 16Hz 20Hz 25Hz 31.5Hz 40Hz 50Hz 63Hz 80Hz 100Hz 125Hz 160Hz 200Hz 250Hz 315Hz 400Hz 500Hz 630Hz 800Hz 1kHz 1.25kHz 1.6kHz 2kHz 2.5kHz 3.15kHz 4kHz 5kHz 6.3kHz 8kHz 10kHz 12.5kHz 16kHz 20kHz
1/3 Octave Band Frequency, Hz

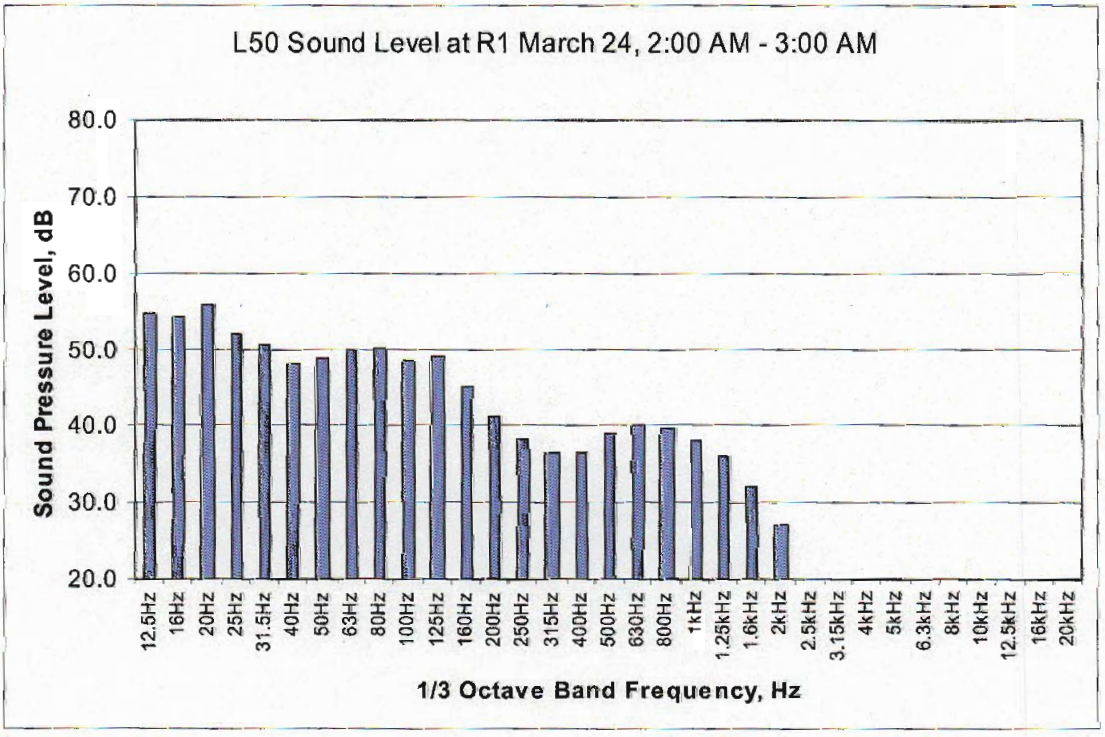

L50 Sound Level at R1 March 23, 5:00 PM - 6:00 PM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R1 March 23, 9:00 PM - 10:00 PM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R1 March 23, 10:00 PM - 11:00 PM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R1 March 23, 11:00 PM - 12:00 AM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R1 March 24, 1:00 AM - 2:00 AM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz 16Hz 20Hz 25Hz 31.5Hz 40Hz 50Hz 63Hz 80Hz 100Hz 125Hz 160Hz 200Hz 250Hz 315Hz 400Hz 500Hz 630Hz 800Hz 1kHz 1.25kHz 1.6kHz 2kHz 2.5kHz 3.15kHz 4kHz 5kHz 6.3kHz 8kHz 10kHz 12.5kHz 16kHz 20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R1 March 24, 2:00 AM - 3:00 AM
Sound Pressure Level, dB
80.0
70.0
60.0
50.0
40.0
30.0
20.0
12.5Hz 16Hz 20Hz 25Hz 31.5Hz 40Hz 50Hz 63Hz 80Hz 100Hz 125Hz 160Hz 200Hz 250Hz 315Hz 400Hz 500Hz 630Hz 800Hz 1kHz 1.25kHz 1.6kHz 2kHz 2.5kHz 3.15kHz 4kHz 5kHz 6.3kHz 8kHz 10kHz 12.5kHz 16kHz 20kHz
1/3 Octave Band Frequency, Hz

APPENDIX F

1/3 Octave Band Sound Levels at R1 for Tonal Analysis

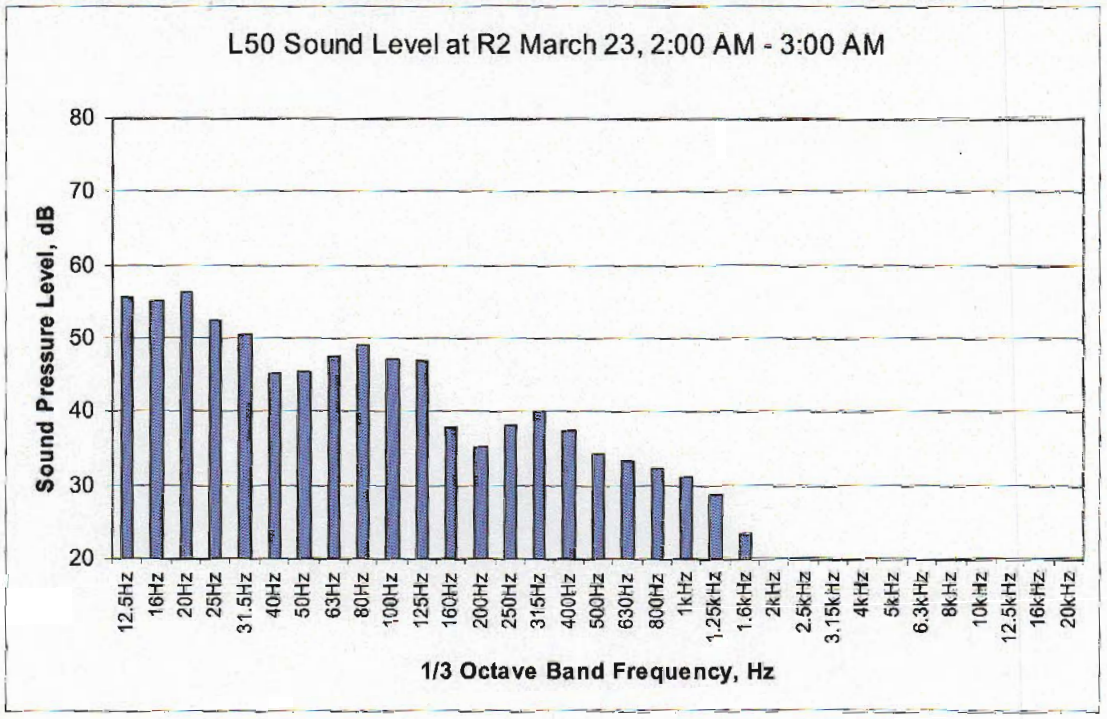
Spectrum Time Slot:	2006-03-23 02:31:00 AM - 02:32:00 AM			
Frequency [Hz]	LZeq [dB]	LZS50 [dB]	LZS90 [dB]	LZS1 [dB]
12.50	54.27	54.1	52.1	57.0
16	54.31	54.2	52.4	56.8
20	56.14	56.0	54.1	58.9
25	51.57	51.5	49.5	54.1
31.50	49.72	49.5	48.0	52.7
40	48.32	48.2	46.7	50.8
50	50.46	50.2	48.8	53.5
63	52.43	52.4	50.8	54.6
80	51.26	51.2	50.0	53.5
100	48.9	48.9	47.8	50.8
125	47.46	47.4	46.3	49.7
160	42.06	41.9	41.1	44.0
200	36.13	36.1	35.1	37.9
250	32.53	32.5	31.5	34.0
315	34.44	34.4	33.3	36.0
400	37.5	37.4	36.4	39.0
500	40.44	40.4	39.4	41.9
630	39.31	39.2	38.2	41.0
800	36.82	36.4	35.3	39.8
1000	34.07	34.0	33.2	35.8
1250	32.37	32.4	31.5	33.9
1600	28.48	28.3	27.3	30.9
2000	25.51	25.4	24.1	27.9
2500	19.28	18.9	18.2	21.4
3150	11.25	11.1	10.0	13.9
4000	6.25	6.5	6.1	7.0
5000	6.74	6.5	6.1	7.0
6300	7.22	7.5	7.1	8.0
8000	7.39	7.5	7.1	8.0
10000	7.39	7.5	7.1	8.0
12500	7.3	7.5	7.1	8.0
16000	7.39	7.5	7.1	8.0
20000	7.71	7.5	7.1	8.0
A	44.47	44.4	43.8	45.5
C	59.19	---	---	---

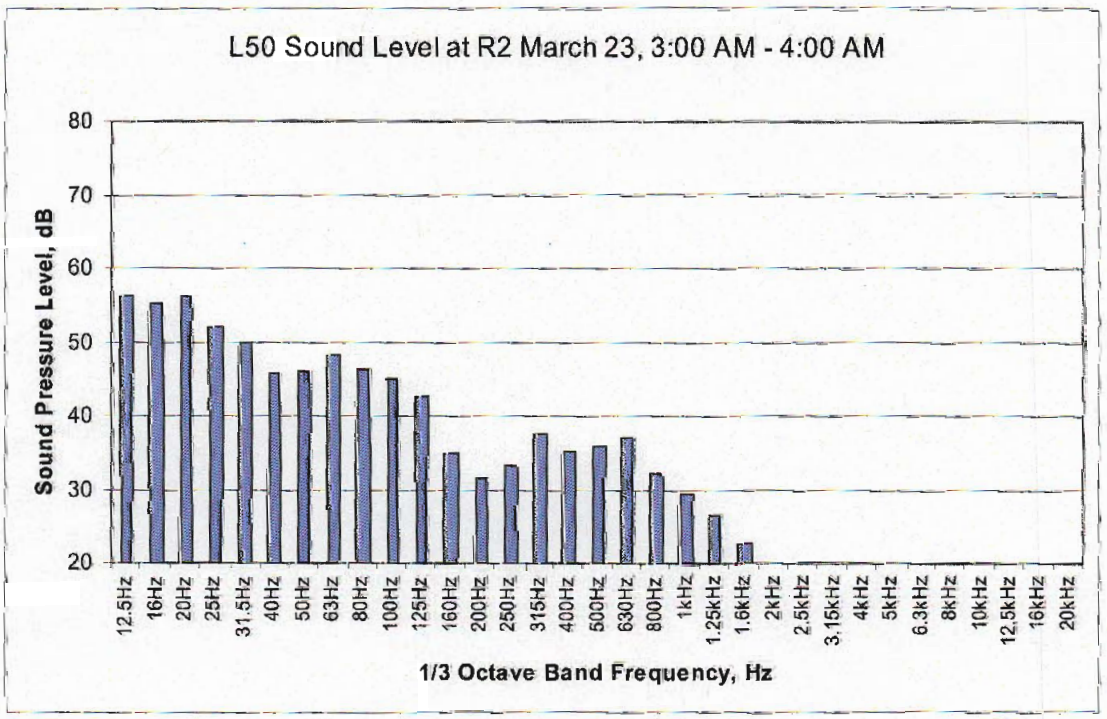
Spectrum Time Slot:	2006-03-23 02:55:00 AM - 02:56:00 AM			
Frequency [Hz]	LZeq [dB]	LZS50 [dB]	LZS90 [dB	LZS1 [dB]
12.50	54.76	54.3	52.0	58.9
16	54.47	54.4	52.6	57.0
20	56.08	55.8	54.3	59.1
25	51.71	51.5	50.1	55.0
31.50	49.74	49.6	48.1	52.0
40	47.14	47.1	45.6	49.6
50	48.72	48.5	47.2	51.0
63	50.95	50.8	49.8	52.9
80	49.76	49.7	48.5	51.7
100	45.98	45.9	45.2	47.5
125	46.23	45.9	44.7	48.8
160	41.82	41.7	39.7	44.8
200	32.98	33.0	32.0	34.0
250	28.03	28.0	27.2	29.3
315	33.13	33.1	32.1	34.9
400	35.36	35.4	34.4	36.9
500	37.36	37.3	36.3	39.1
630	35.91	35.9	34.8	37.8
800	31.78	31.7	30.9	33.6
1000	30.41	30.4	29.3	32.3
1250	28.23	28.2	27.2	30.0
1600	24.2	24.1	23.2	26.5
2000	18.16	18.2	17.2	19.9
2500	17.45	17.4	15.7	20.0
3150	9.09	8.9	8.1	11.7
4000	6.43	6.5	6.1	7.0
5000	7.01	7.1	6.2	8.0
6300	7.47	7.5	7.1	8.0
8000	7.48	7.5	7.1	8.0
10000	7.4	7.5	7.1	8.0
12500	7.31	7.5	7.1	8.0
16000	7.39	7.5	7.1	8.0
20000	7.72	7.5	7.1	8.0
A	41.31	41.3	41.0	42.2
C	58.1	---	---	---

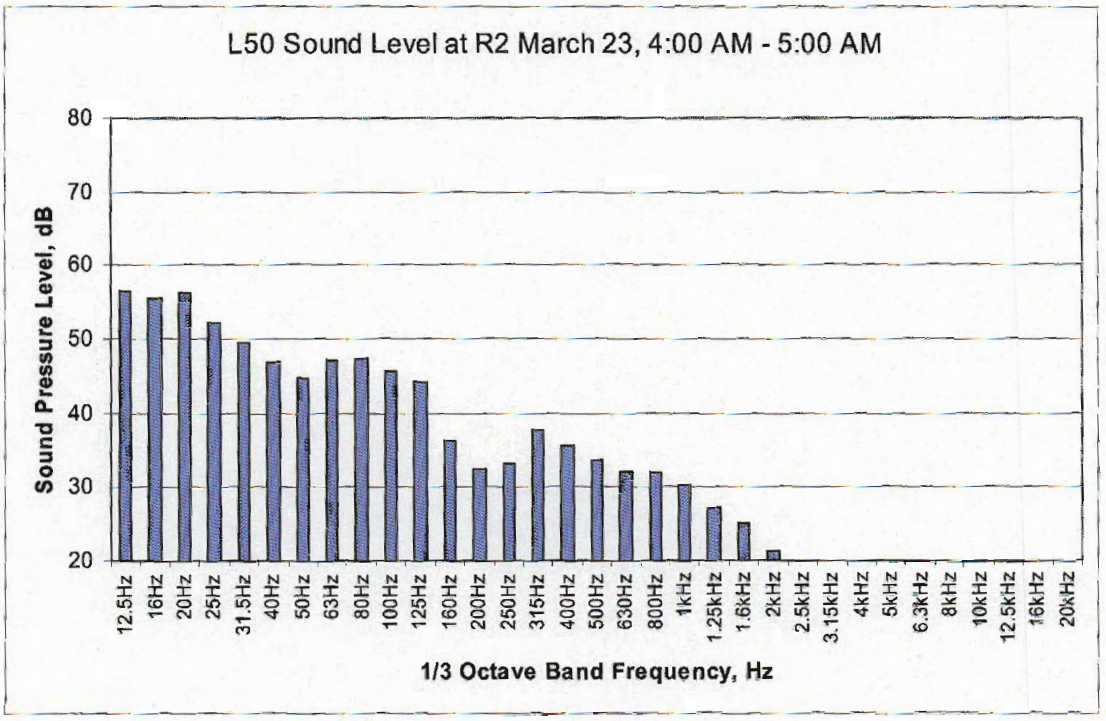
Spectrum Time Slot:	2006-03-24 02:39:00 AM - 02:40:00 AM			
Frequency [Hz]	LZeq [dB]	LZS50 [dB]	LZS90 [dB]	LZS1 [dB]
12.50	54.3	54.1	51.8	57.5
16	53.2	53.1	51.1	55.9
20	55.3	55.1	53.3	57.9
25	51.2	51.1	49.5	53.9
31.50	50.3	49.8	48.2	53.7
40	46.2	46.1	44.7	48.8
50	43.9	43.7	42.5	45.9
63	45.3	45.2	44.1	47.6
80	48.3	48.1	47.1	51.0
100	46.7	46.6	45.4	48.9
125	47.3	47.2	45.3	49.8
160	42.1	41.9	40.4	44.7
200	38.6	38.5	37.5	40.0
250	33.4	33.5	32.5	34.9
315	29.3	29.3	28.3	30.9
400	29.8	29.6	29.0	31.8
500	34.2	34.1	32.5	35.9
630	37.3	37.3	36.2	38.9
800	38.4	38.4	37.7	39.8
1000	36.6	36.6	35.8	38.6
1250	33.3	33.2	31.5	35.8
1600	29.4	29.4	28.3	31.0
2000	24.7	24.6	23.5	26.7
2500	17.6	17.3	15.6	20.6
3150	10.2	10.0	9.2	12.7
4000	6.5	6.5	6.1	7.9
5000	6.8	6.5	6.1	7.9
6300	7.2	7.5	7.1	8.0
8000	7.4	7.5	7.1	8.0
10000	7.4	7.5	7.1	8.0
12500	7.3	7.5	7.1	8.0
16000	7.3	7.5	7.1	8.0
20000	7.5	7.5	7.1	8.0
A	43.7	43.7	43.4	44.3
C	57.01	---	---	---

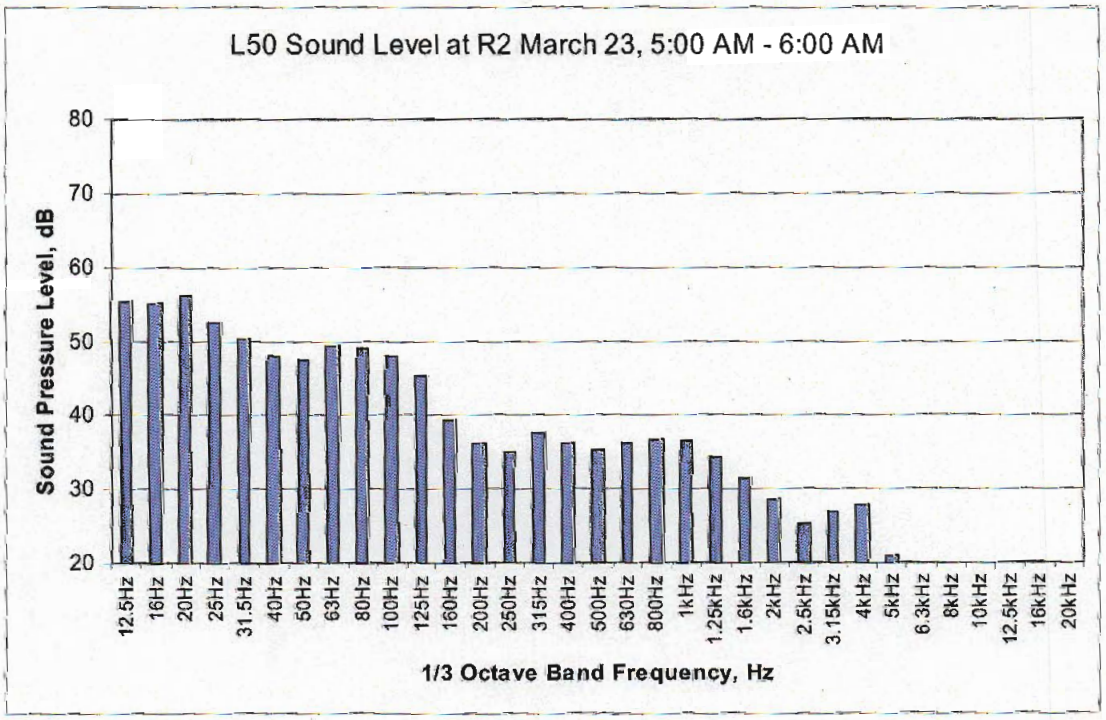
APPENDIX G

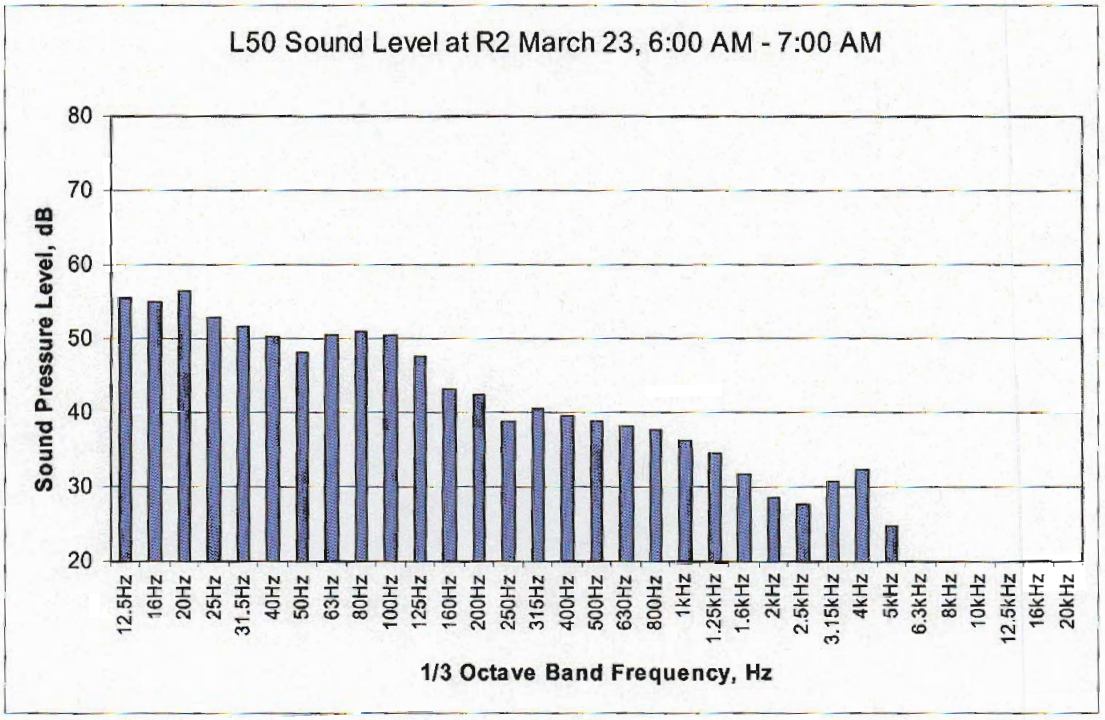
1/3 Octave Band Sound Levels at R2 during Exceedance Periods

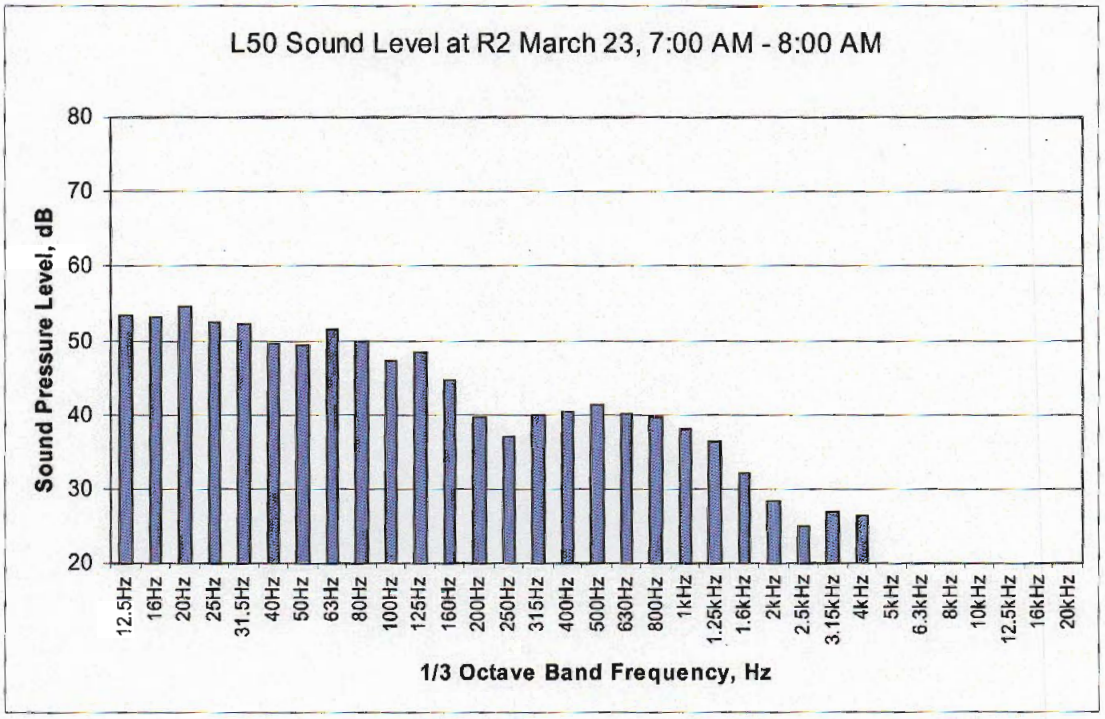

L50 Sound Level at R2 March 23, 2:00 AM - 3:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

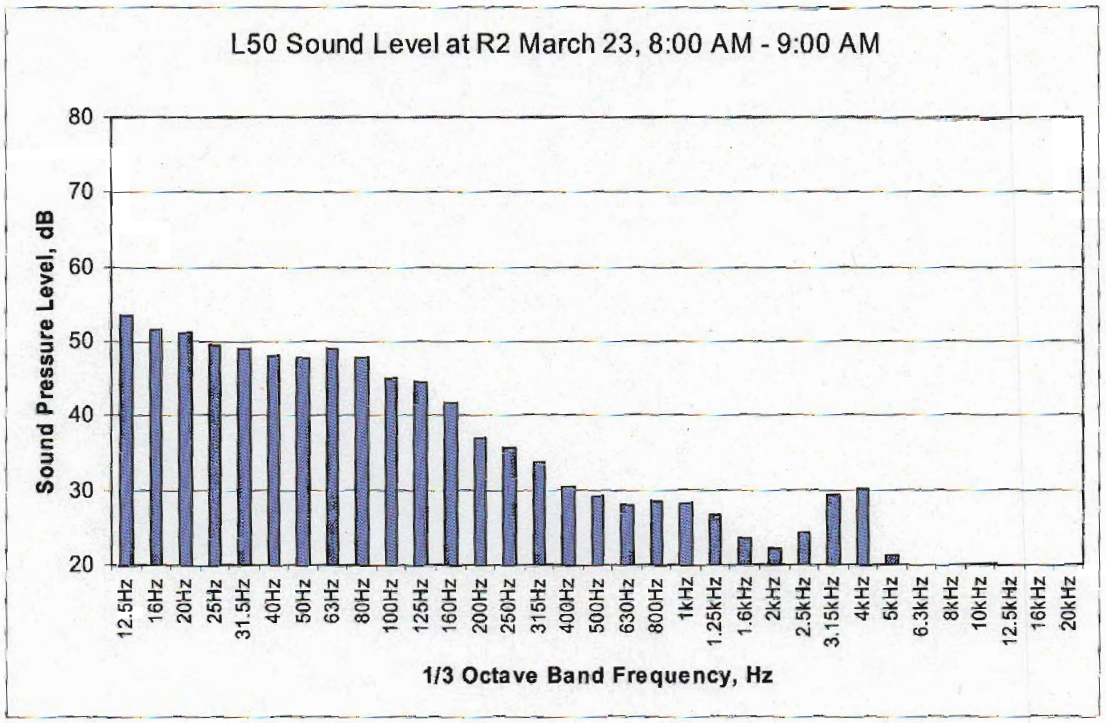

L50 Sound Level at R2 March 23, 3:00 AM - 4:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

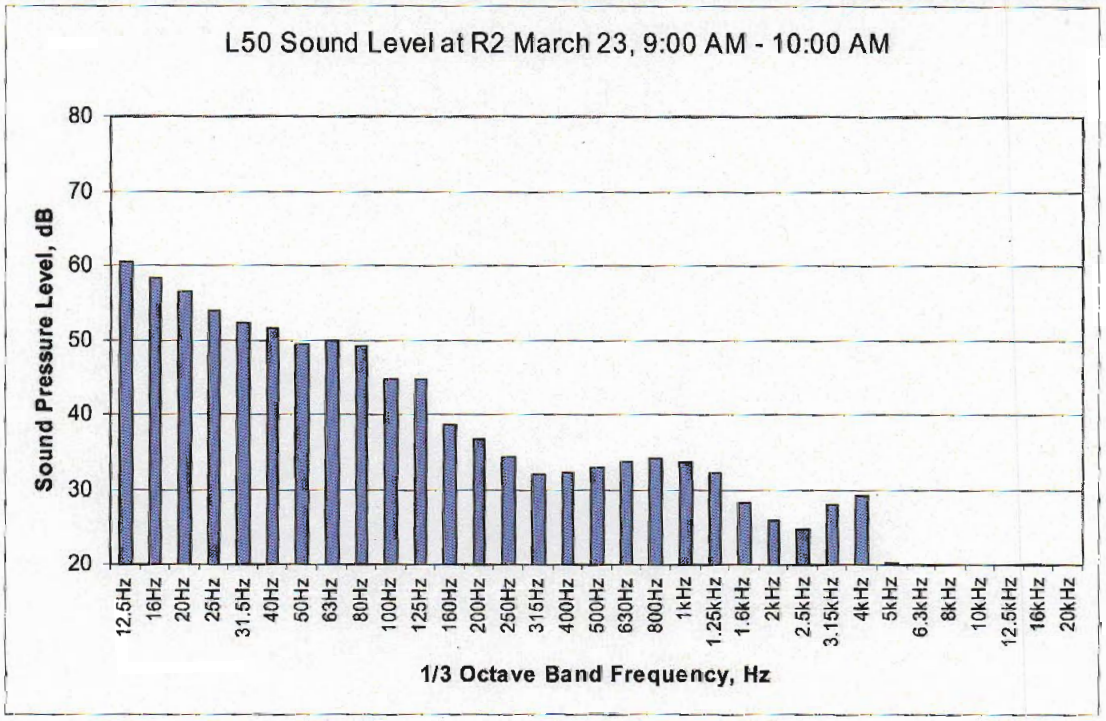

L50 Sound Level at R2 March 23, 4:00 AM - 5:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

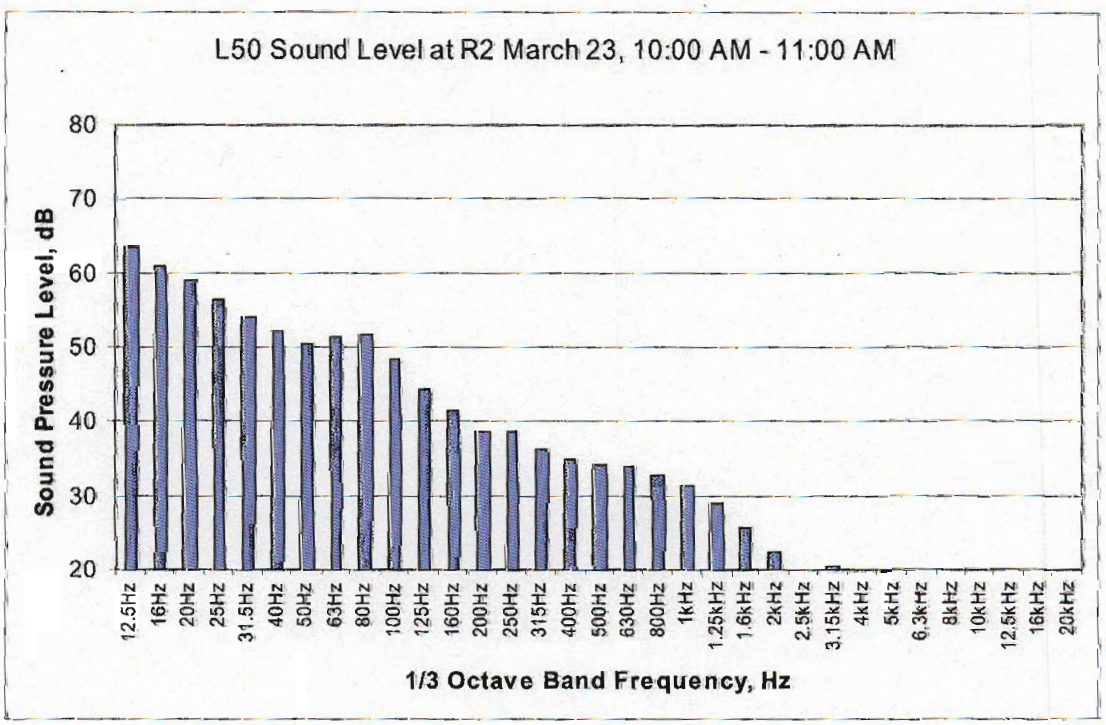

L50 Sound Level at R2 March 23, 5:00 AM - 6:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

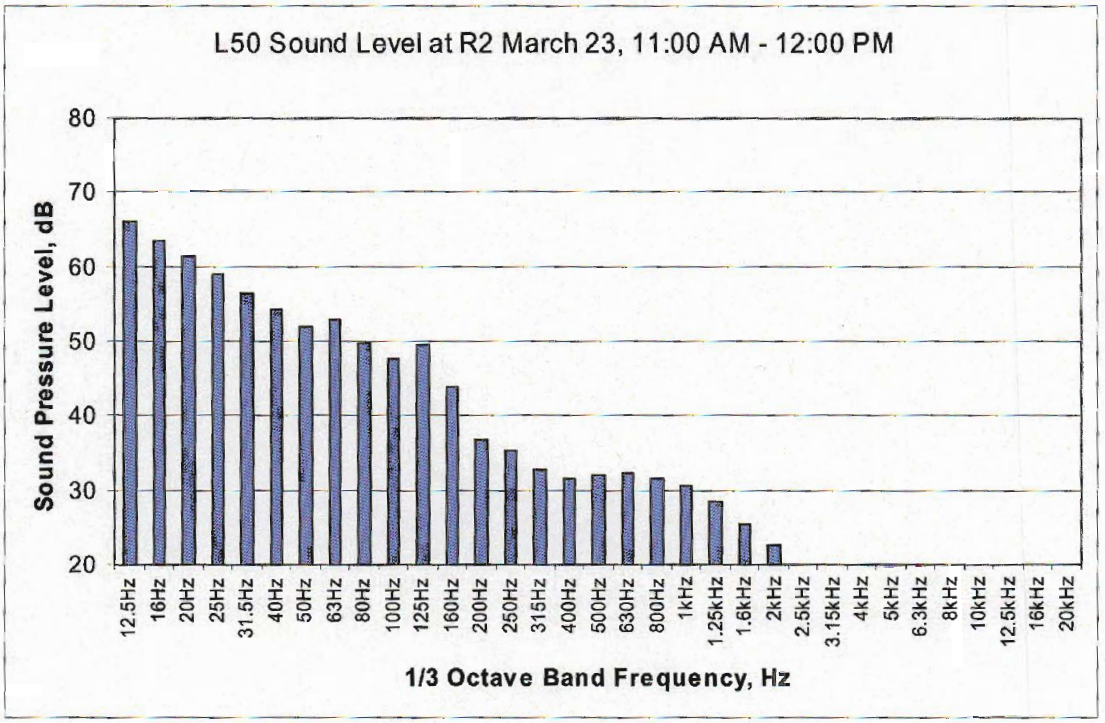

L50 Sound Level at R2 March 23, 6:00 AM - 7:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

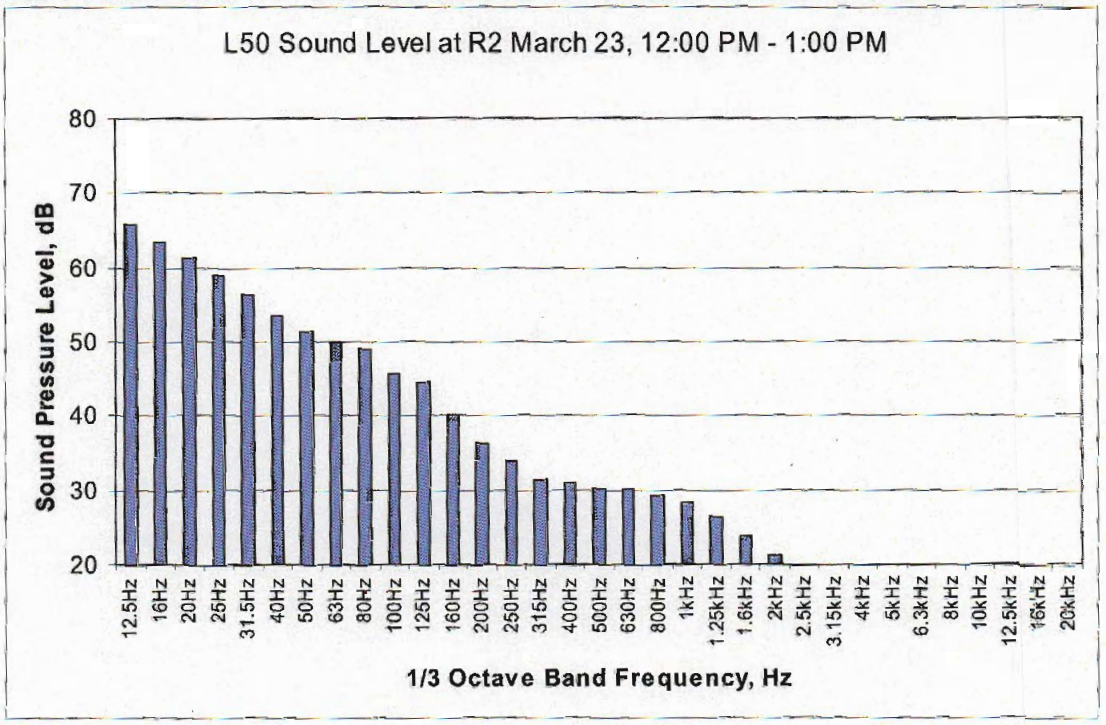

L50 Sound Level at R2 March 23, 7:00 AM - 8:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

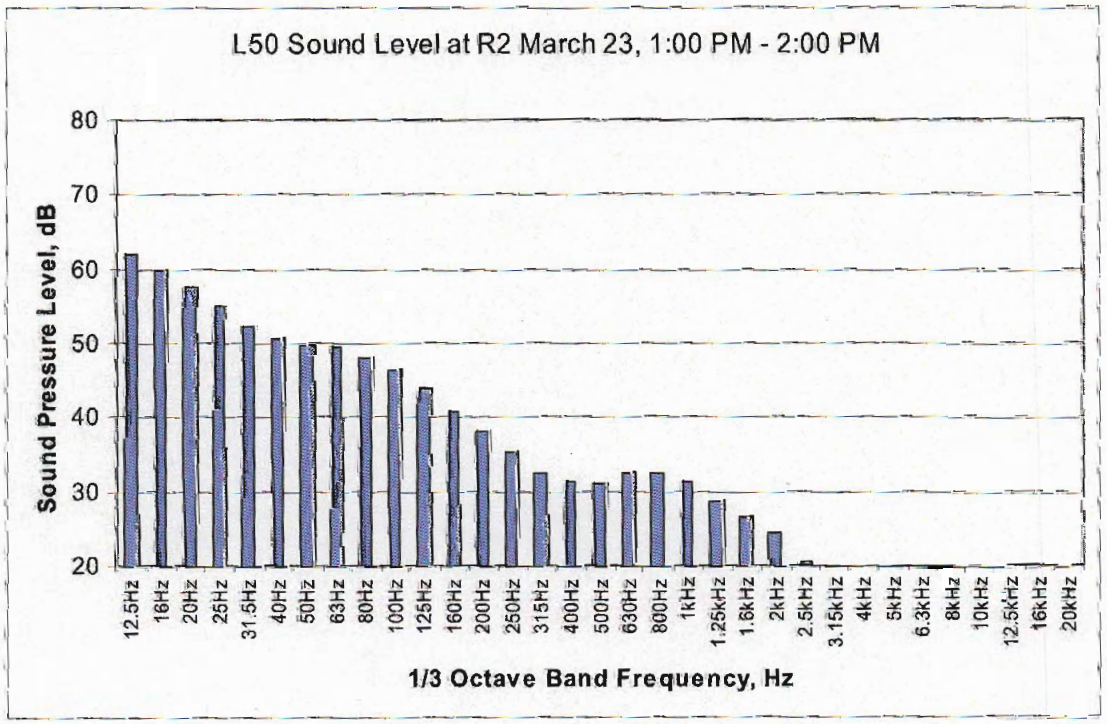

L50 Sound Level at R2 March 23, 8:00 AM - 9:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

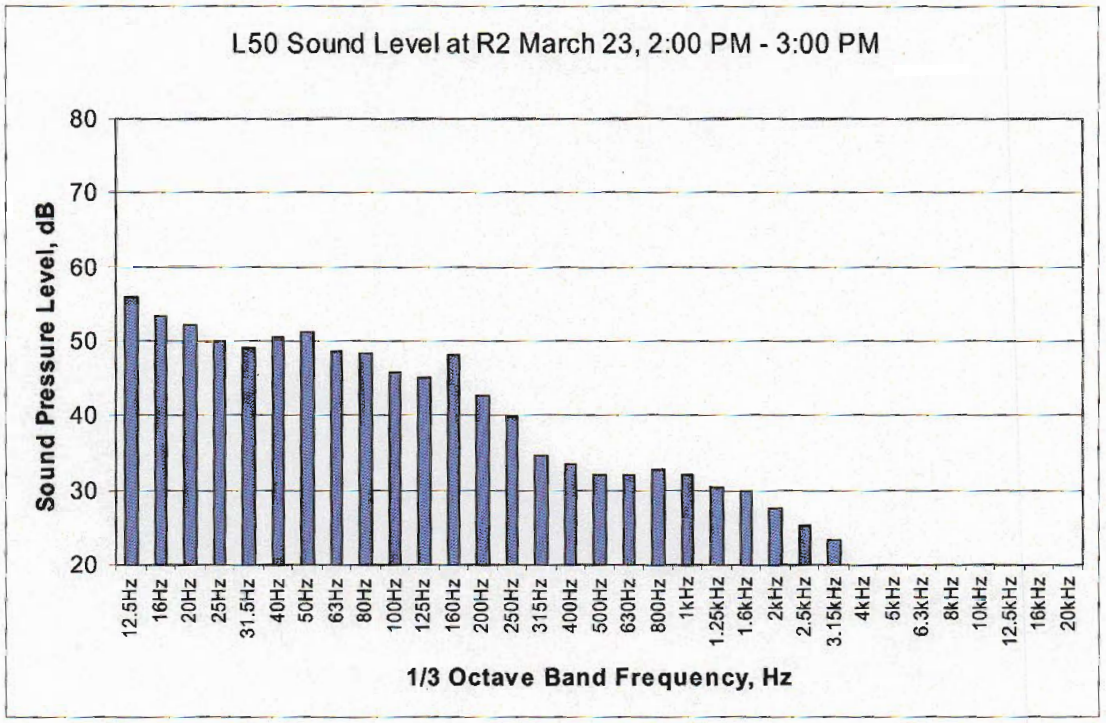

L50 Sound Level at R2 March 23, 9:00 AM - 10:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

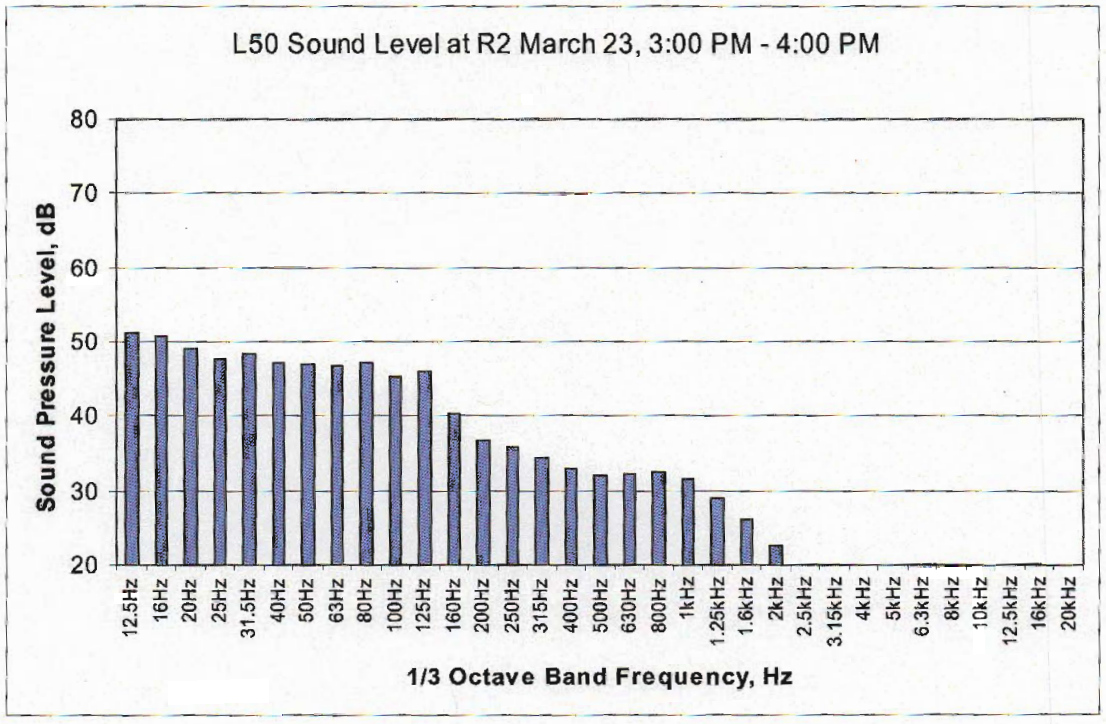

L50 Sound Level at R2 March 23, 10:00 AM - 11:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

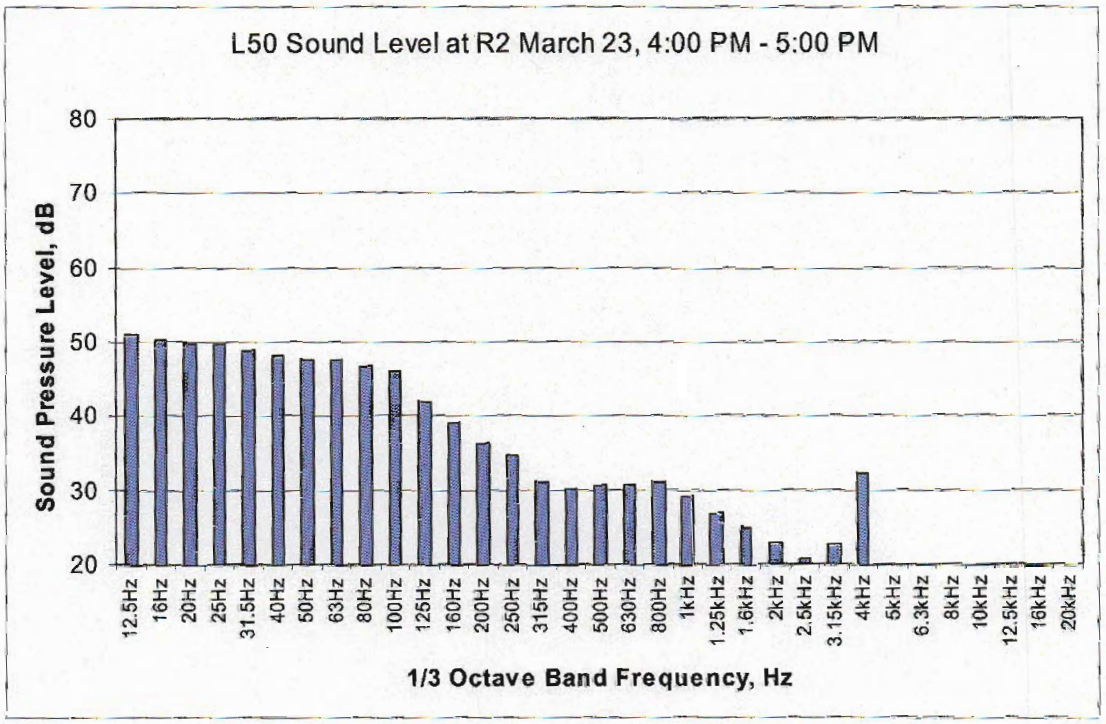

L50 Sound Level at R2 March 23, 11:00 AM - 12:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

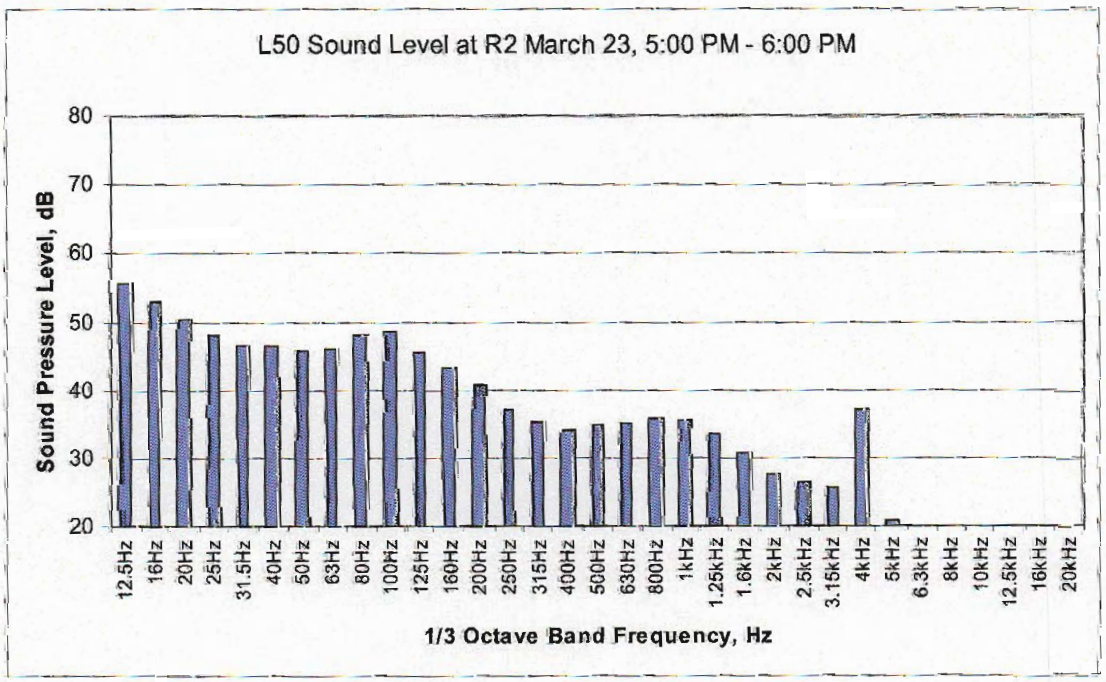

L50 Sound Level at R2 March 23, 12:00 PM - 1:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

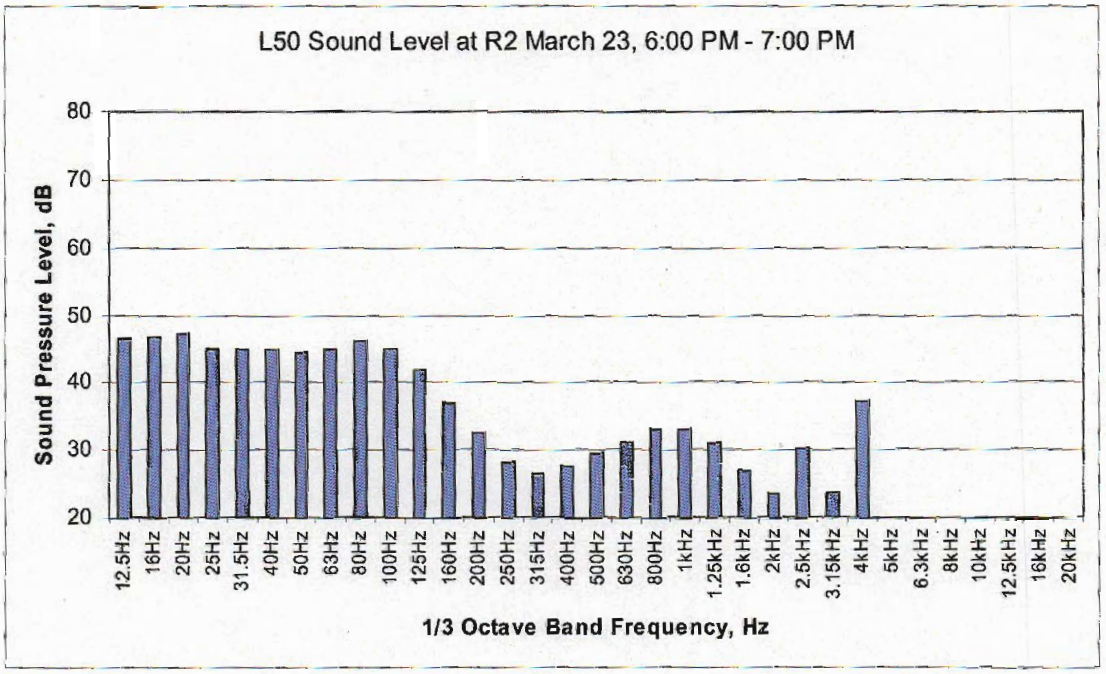

L50 Sound Level at R2 March 23, 1:00 PM - 2:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

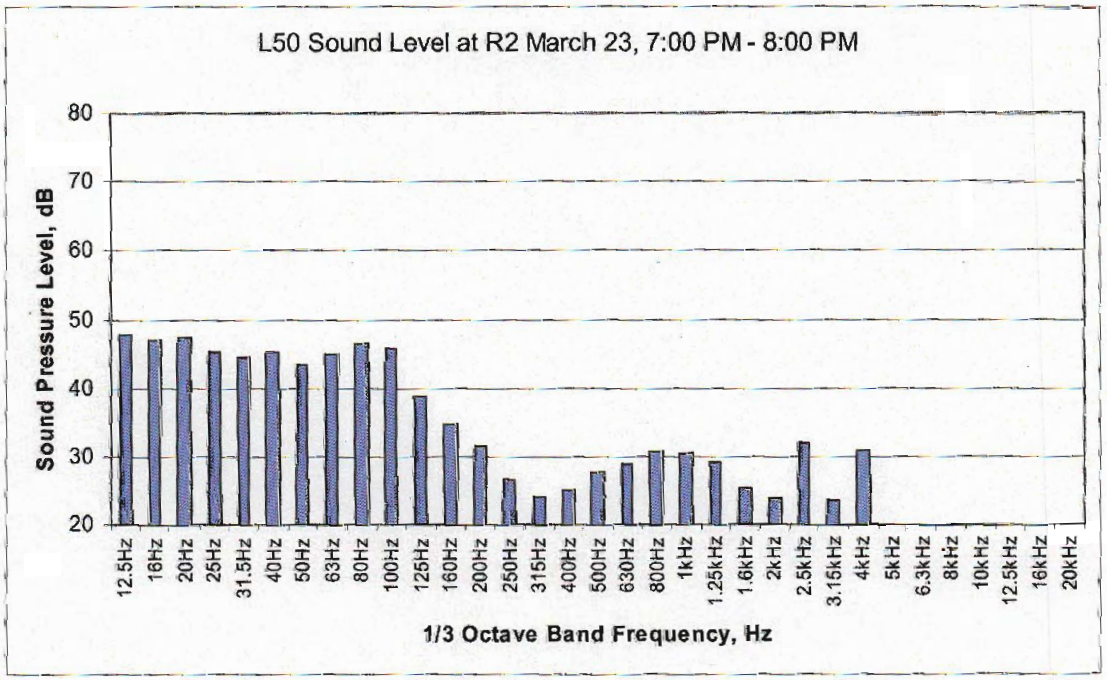

L50 Sound Level at R2 March 23, 2:00 PM - 3:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

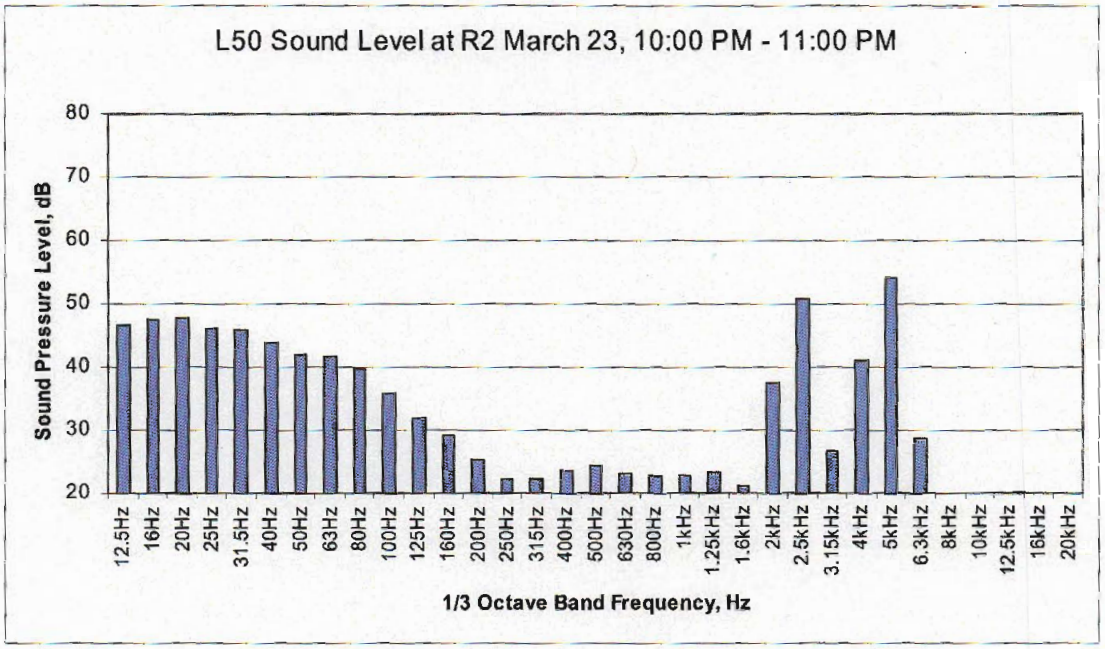

L50 Sound Level at R2 March 23, 3:00 PM - 4:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

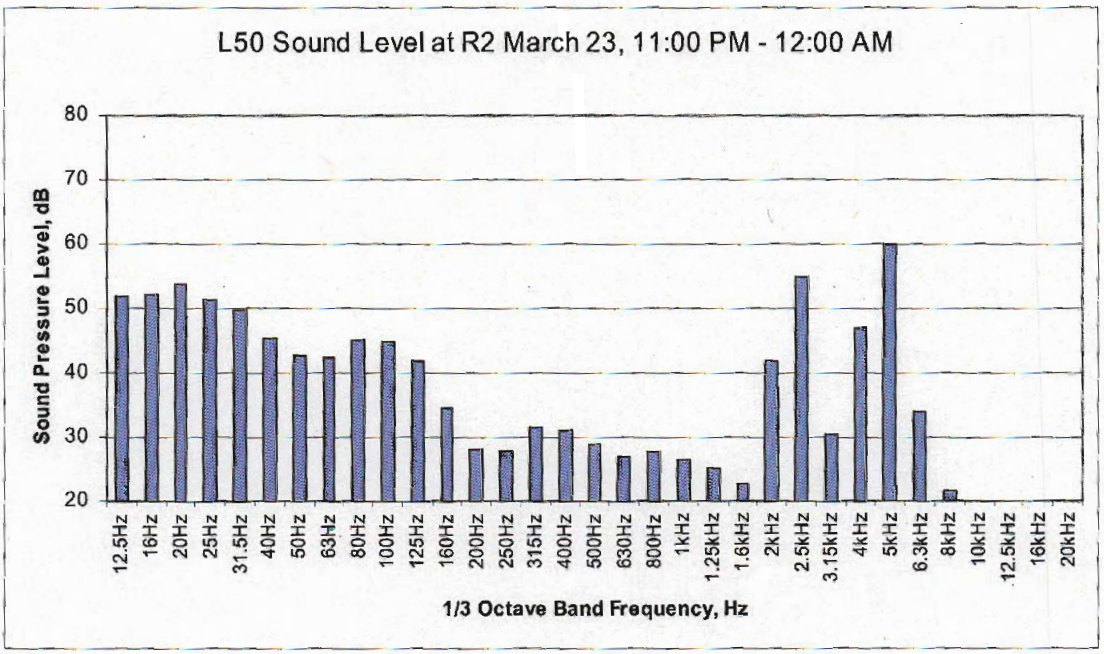

L50 Sound Level at R2 March 23, 4:00 PM - 5:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

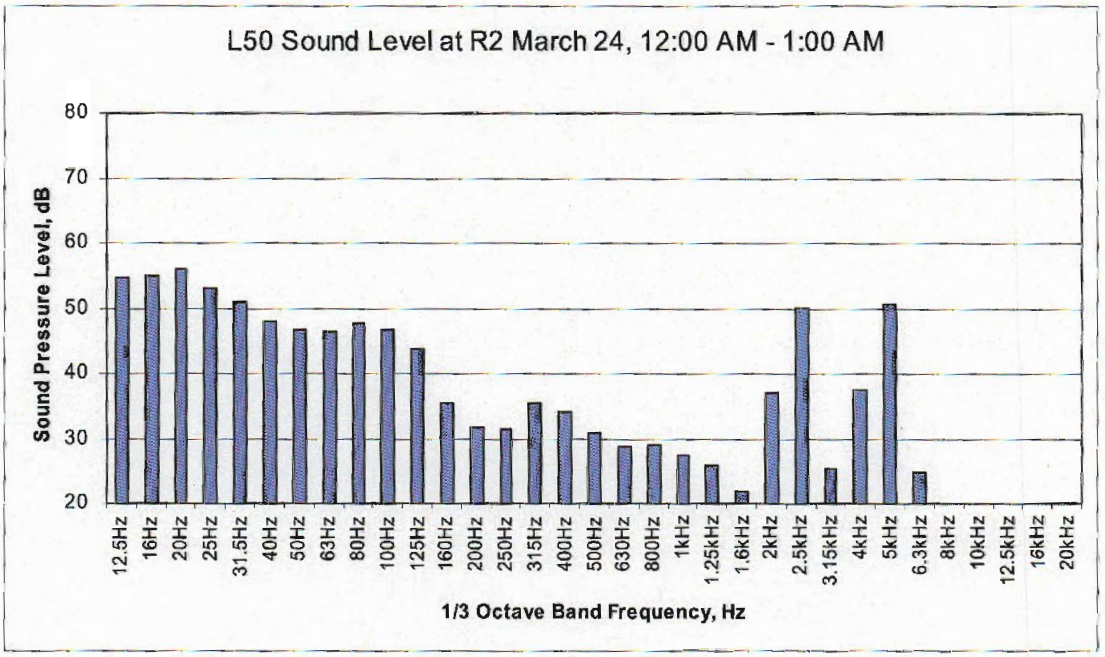

L50 Sound Level at R2 March 23, 5:00 PM - 6:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

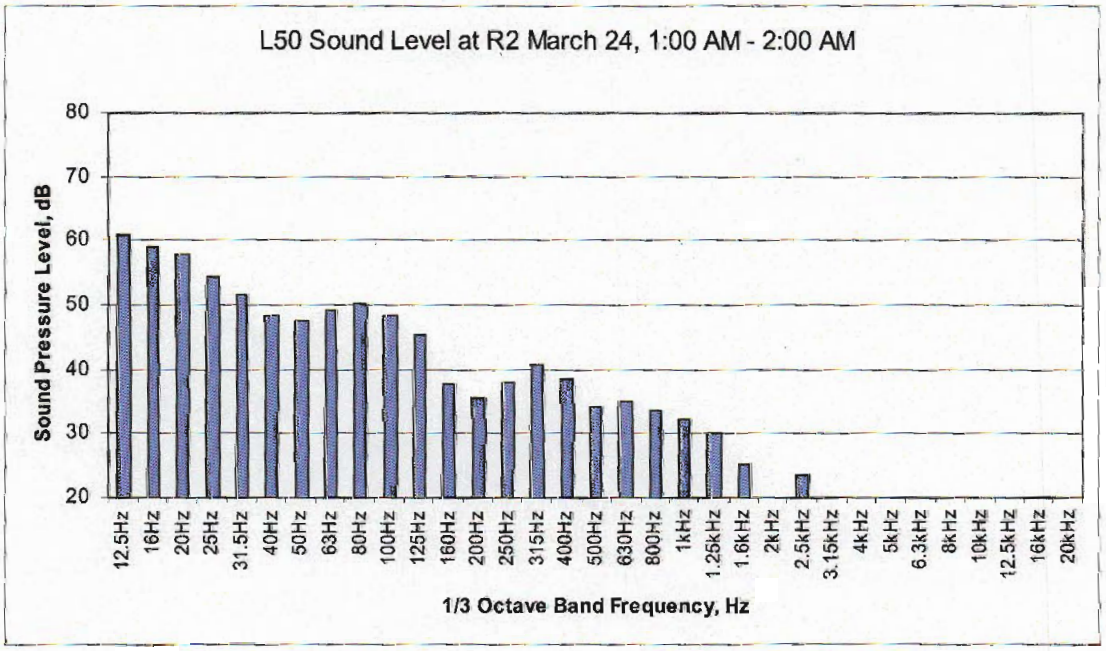

L50 Sound Level at R2 March 23, 6:00 PM - 7:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

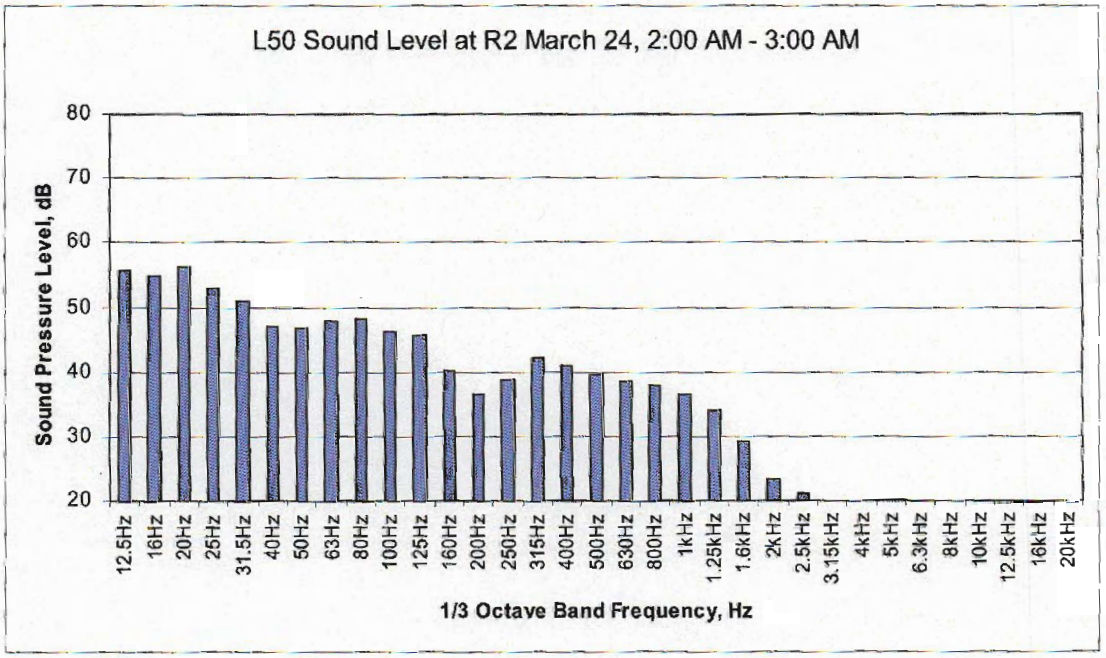

L50 Sound Level at R2 March 23, 7:00 PM - 8:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R2 March 23, 10:00 PM - 11:00 PM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R2 March 23, 11:00 PM - 12:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R2 March 24, 12:00 AM - 1:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R2 March 24, 1:00 AM - 2:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz


L50 Sound Level at R2 March 24, 2:00 AM - 3:00 AM
Sound Pressure Level, dB
80
70
60
50
40
30
20
12.5Hz
16Hz
20Hz
25Hz
31.5Hz
40Hz
50Hz
63Hz
80Hz
100Hz
125Hz
160Hz
200Hz
250Hz
315Hz
400Hz
500Hz
630Hz
800Hz
1kHz
1.25kHz
1.6kHz
2kHz
2.5kHz
3.15kHz
4kHz
5kHz
6.3kHz
8kHz
10kHz
12.5kHz
16kHz
20kHz
1/3 Octave Band Frequency, Hz

APPENDIX H

1/3 Octave Band Sound Levels at R2 for Tonal Analysis

Spectrum Time Slot:	2006-03-23 02:44:00 AM - 02:45:00 AM			
Frequency [Hz]	LZeq [dB]	LZS50 [dB]	LZS90 [dB]	LZS10 [dB]
12.50	55.97	55.8	53.8	57.7
16	55.88	55.5	53.9	57.5
20	56.55	56.3	54.6	58.0
25	52.38	52.3	51.0	53.7
31.50	50.13	50.1	47.7	51.8
40	44.86	44.5	43.2	46.5
50	47.94	47.8	46.2	49.3
63	50.29	50.2	49.1	51.5
80	49.24	49.2	48.2	50.3
100	47.3	47.3	46.2	48.1
125	42.56	42.3	41.1	44.1
160	36.87	36.7	35.7	37.9
200	34.97	34.7	33.5	36.5
250	37.05	36.8	35.7	38.5
315	41.69	41.6	40.4	42.8
400	37.12	37.1	35.6	38.2
500	33.38	33.3	31.9	34.7
630	33.09	33.1	32.2	33.9
800	32.82	32.6	31.5	33.9
1000	30.59	30.6	29.5	31.7
1250	28.34	28.1	26.8	29.8
1600	23.69	23.5	22.1	25.3
2000	16.85	16.8	15.4	18.0
2500	19.49	17.5	14.0	22.6
3150	11.27	10.9	7.6	13.7
4000	5.74	5.6	5.1	6.3
5000	6.1	6.4	5.5	6.9
6300	6.5	6.5	6.1	6.9
8000	6.78	6.5	6.1	6.9
10000	6.94	6.6	6.1	7.4
12500	7.05	7.4	6.7	7.9
16000	7.03	7.4	6.5	7.9
20000	7.16	7.5	7.1	7.9
A	41.51	41.5	40.9	42.1
C	58.1	---	---	---

Spectrum Time Slot:	2006-03-23 02:53:00 AM - 02:54:00 AM			
Frequency [Hz]	LZeq [dB]	LZS50 [dB]	LZS90 [dB]	LZS10 [dB]
12.50	56.06	55.8	53.2	57.9
16	54.99	54.7	53.0	56.8
20	56.56	56.3	54.3	58.3
25	52.18	52.1	50.8	53.4
31.50	50.28	50.2	48.2	51.9
40	45.61	45.5	44.3	46.8
50	46.62	46.4	45.1	47.9
63	49.05	49.0	48.0	50.1
80	47.87	47.8	46.8	48.8
100	47.31	47.2	46.1	48.4
125	47.14	47.3	44.8	48.6
160	36	35.9	35.1	36.9
200	34.61	34.6	33.7	35.6
250	38.66	38.7	37.6	39.7
315	40.62	40.6	39.4	41.7
400	37.35	37.4	36.3	38.1
500	32.72	32.6	31.5	33.8
630	33.6	33.6	32.3	34.8
800	32.09	32.1	31.0	33.2
1000	29.65	29.5	28.3	31.0
1250	26.72	26.6	25.6	27.9
1600	22.57	22.1	21.1	23.9
2000	15.31	15.3	14.2	16.4
2500	18.67	18.4	15.0	21.1
3150	10.5	10.4	8.8	12.0
4000	5.59	5.5	5.1	5.9
5000	6.04	6.4	5.4	6.9
6300	6.51	6.5	6.1	6.9
8000	6.76	6.5	6.1	6.9
10000	6.94	6.6	6.1	7.4
12500	7.03	7.3	6.4	7.9
16000	7.04	7.4	6.5	7.9
20000	7.16	7.5	7.1	7.9
A	41.32	41.4	40.6	41.9
C	57.88	---	---	---

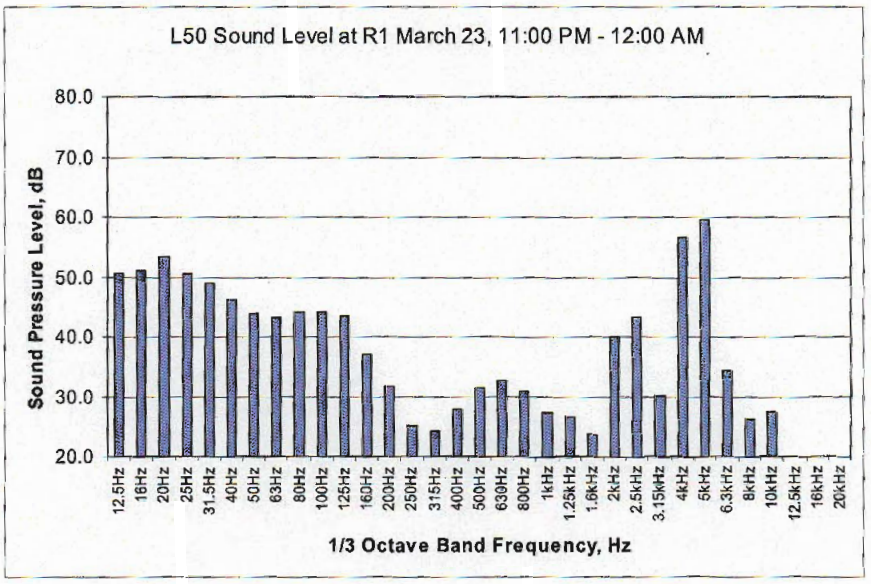
Spectrum Time Slot:	2006-03-24 02:52:00 AM - 02:53:00 AM			
Frequency [Hz]	LZeq [dB]	LZS50 [dB]	LZS90 [dB]	LZS10 [dB]
12.50	55.16	55.0	52.5	57.0
16	55.1	54.9	53.1	56.7
20	56.54	56.3	54.5	58.3
25	53.27	53.2	51.6	54.6
31.50	51.25	51.2	49.8	52.5
40	46.87	46.7	45.3	48.3
50	47.06	47.0	45.9	48.2
63	48.6	48.5	47.4	49.7
80	49.98	49.9	48.8	51.0
100	48.1	48.0	47.2	49.0
125	45.46	45.4	44.4	46.4
160	41.49	41.4	40.3	42.7
200	35.51	35.5	35.0	36.0
250	36.03	36.1	35.2	36.8
315	41.8	41.8	40.3	42.9
400	41.95	42.0	40.0	43.4
500	40.07	40.1	38.5	41.0
630	37.75	37.7	37.0	38.7
800	37.45	37.4	36.4	38.1
1000	38.03	38.2	37.1	38.8
1250	34.6	34.6	33.6	35.6
1600	30.27	30.4	28.7	31.6
2000	24.05	24.1	23.0	24.9
2500	20.79	20.6	19.3	22.2
3150	10.77	10.6	9.4	11.9
4000	6.04	6.2	5.3	6.8
5000	6.09	6.4	5.6	6.9
6300	7.58	6.5	6.1	7.0
8000	9.81	6.6	6.1	7.6
10000	7.04	7.0	6.2	7.8
12500	7.1	7.5	7.1	7.9
16000	7.12	7.5	7.1	7.9
20000	7.24	7.5	7.1	7.9
A	45.68	45.7	45.1	46.2
C	58.53	---	---	---

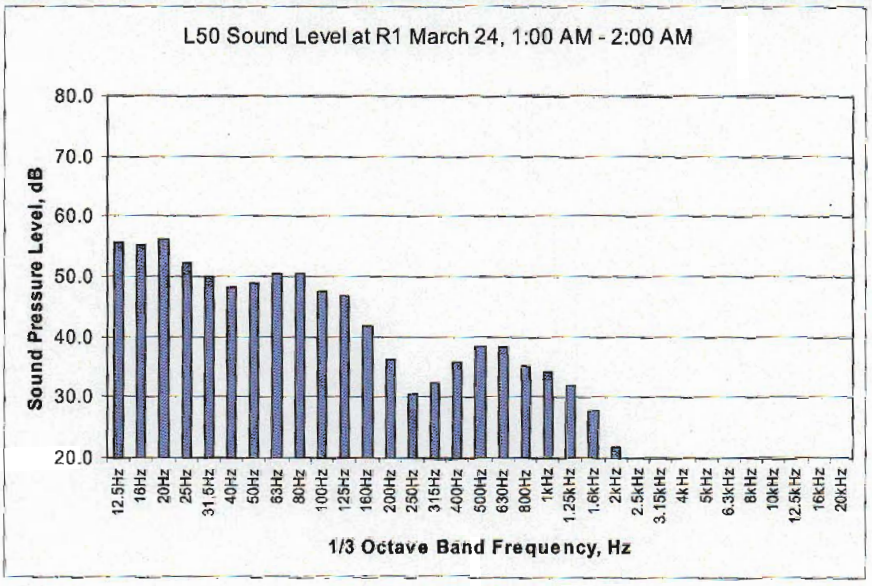
APPENDIX I

ISOLATION ANALYSIS
Separation of Intrusive Tone

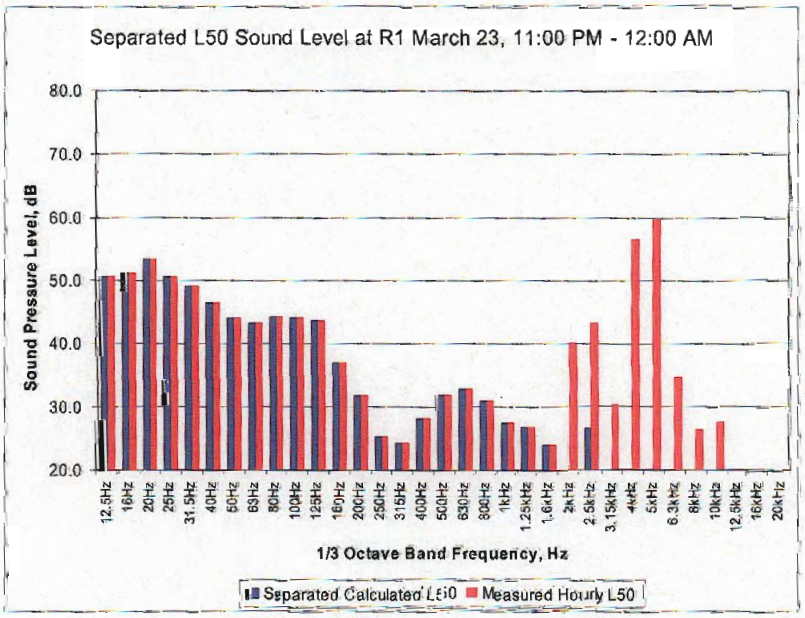
An intrusive tone was introduced into measurements at R1 and R2 for a 1-2 hr period. This was observed, noted and stopped by ATCO personnel without interfering with the continuous measurement. This tone was caused by a low-battery alarm and is not part of the acoustic environment, nor does it share any characteristics of noise generated by CPP. Since this noise is restricted to higher 1/3 Octave Bands it can be easily separated from measurement data to give an accurate value for noise levels during this period as noted in Tables 5 and 6. An example of this separation follows:

The influence of the tone on hourly L_{50} values is clearly visible at frequencies above 2kHz when compared with the contiguous measurement period.

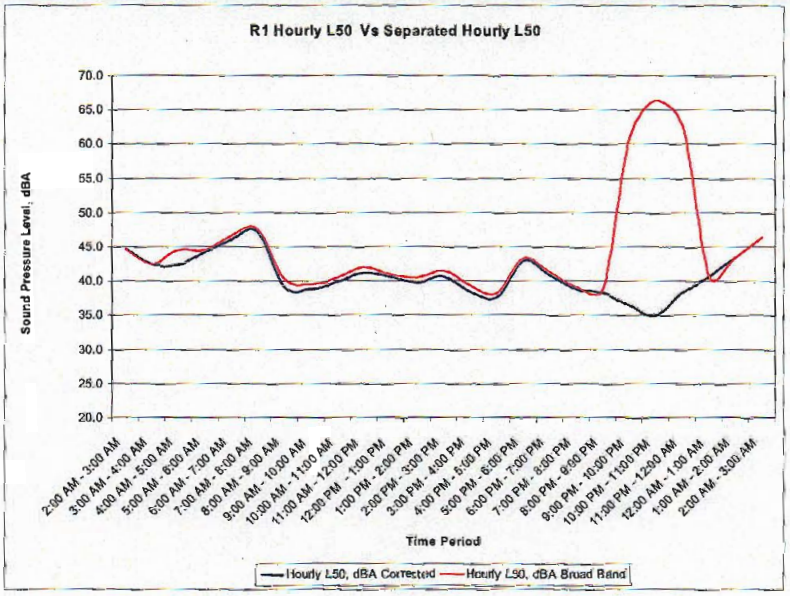




The intrusive sound is removed from measured data and a calculated hourly L_{50} is created for this period.



Calculated hourly L_{50} sound levels show good correlation with measured broad band hourly L_{50}.


R1 Hourly L50 Vs Separated Hourly L50
Sound Pressure Level, dBA
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
2:00 AM - 3:00 AM
3:00 AM - 4:00 AM
4:00 AM - 5:00 AM
5:00 AM - 6:00 AM
6:00 AM - 7:00 AM
7:00 AM - 8:00 AM
8:00 AM - 9:00 AM
9:00 AM - 10:00 AM
10:00 AM - 11:00 AM
11:00 AM - 12:00 PM
12:00 PM - 1:00 PM
1:00 PM - 2:00 PM
2:00 PM - 3:00 PM
3:00 PM - 4:00 PM
4:00 PM - 5:00 PM
5:00 PM - 6:00 PM
6:00 PM - 7:00 PM
7:00 PM - 8:00 PM
8:00 PM - 9:00 PM
9:00 PM - 10:00 PM
10:00 PM - 11:00 PM
11:00 PM - 12:00 AM
12:00 AM - 1:00 AM
1:00 AM - 2:00 AM
2:00 AM - 3:00 AM
Time Period
Hourly L50, dBA Corrected
Hourly L50, dBA Broad Band

APPENDIX J

Measurement Observations

NOISE LEVEL SURVEY

Date: Thursday March 23, 2006

Start Time: 1:23 AM

End Time:

Performed By: Chris Giesbrecht, Danica Skoretz, Denise LeClaire

Microphone Location: R1-Start-Up

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.): Plant audible, crickets, frogs.

Date: Thursday March 23, 2006

Start Time: 1:27 AM

End Time:

Performed By: Chris Giesbrecht, Danica Skoretz, Denise LeClaire

Microphone Location: R2-Start-Up

Instrumentation (Describe Type, Model, Model#, Dynamic Range, etc.):

Time Weighting: Slow (X) Fast ( )

Statistical Descriptors (Circle): L01, L05, L10, L20, L50, L90, L99, Leq

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.): Dogs barking, crickets, frogs

Meteorology Observations:

Start Time: 43 °F @ 1;27 AM

Temperature:	Humidity:	Wind Speed:	Wind Direction:

End Time:

Temperature:	Humidity:	Wind Speed:	Wind Direction:

Date: Thursday March 23, 2006

Start Time: 1:36 AM- Start-Up

End Time:

Performed By: Chris Giesbrecht, Danica Skoretz, Denise LeClaire

Microphone Location: 400 ft from equipment footprint, towards residences

Instrumentation (Describe Type, Model, Model#, Dynamic Range, etc.):

Time Weighting: Slow (X) Fast ( )

Statistical Descriptors (Circle): L01, L05, L10, L20, L50, L90, L99, Leq

Date: March 23, 2006

Start Time: 1:22 AM

End Time: 3:58 AM

Performed By: Denise LeClaire

Microphone Location: R2- across road at entrance to vineyard; R1

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.):

Sound from primarily crickets & frogs; plant quite noticeable; cooling power plume drifting north

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
Between R1 & R2 1:22 AM	Setting up/Starting meter	1:27 AM
1:27 AM	Others leaving and driving to Plant along Clay East Road (C.E.R)	1:28 AM
1:28 AM	Frogs/crickets-continuous	
1:45 AM	Dogs barking in distance	1:48 AM
1:48 AM	Nearby dog barking	1:49 AM
1:49 AM	Bird screeches (owl)	1:49 AM
2:08 AM	Rooster crowing	
2:19 AM	Ducks quacking	
2:22 AM	Nearby dogs barking	
2:28 AM	Started car to leave to meet Chris and Danica	2:33 AM
2:45 AM	Meeting at south fence line of CPP	
3:00 AM	Plant dominant; dogs barking	
3:34 AM	Light turned on at office/home to south of plant as I start car and travel R along Clay East to check meter at R1	3:35 PM

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
3:36 AM	Checking meter at R1; running well	3:42 PM
3:45 AM	Plant less audible Rooster, coyote	
3:49 AM	Rolled up window of car	
3:54 AM	Rolled down car window	
3:56 AM	Airplane flyover plant observed though not audible at R1	3:88 AM

Date: Thursday March 23, 2006

Start Time: 4:50 AM

End Time: 6:00 AM

Performed By: Chris Giesbrecht

Microphone Location: R1

Instrumentation (Describe Type, Model, Model#, Dynamic Range, etc.):

Time Weighting: Slow (X) Fast ( )

Statistical Descriptors (Circle): L01, L05, L10, L20, L50, L90, L99, Leq

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
3:30 AM	Brief motor start across road from fuel gas comp	3:30 Intermittent~2 min
4:07 AM	Denise & Chris car	
4:10 AM	Car turnaround-radio	
4:50 AM	Chris car 4:50	4:52
	General increase in animal sounds	
5:26 AM	Pick up @ house &2nd car	5:33
5:47 AM	Dog-loud, car distance	
6:00 AM	Traffic increases to ~ 1-2/min Rooster crowing; birds chirping is constant	

Date: Thursday, March 23, 2006

Start Time: 6:47 AM

End Time: 8:50 AM

Performed By: Danica Skoretz

Microphone Location: R2- Across Road @ Vineyard

Instrumentation (Describe Type, Model, Model#, Dynamic Range, etc.):

Time Weighting: Slow (X) Fast ( )

Statistical Descriptors (Circle): L01, L05, L10, L20, L50, L90, L99, Leq

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
6:48 AM	Rooster -Chirping birds	
6:51 AM	Mid-size car	
6:53 AM	Mid-size car, rooster, birds	
6:54 AM	Car, birds	
6:55 AM	Pick up truck	
6:56 AM	Man walking with small dog -truck-mid-size	
6:58 AM	Mid-size car, barking dog Van, birds	
7:00 AM	2 mid-size cars (same time) turning on Clay East Road	
7:01 AM	SUV-turning on C.E.R	
7:02 AM	Van in distance	
7:03 Am	2 big dogs walking in vineyard across the street by our truck -Van	
7:04 AM	School bus turning R on to C.E.R Truck turning L on to C.E.R	
7:04 AM	2 dogs by meter, along fence line walking	7:06 AM
7:06 AM	Bus stops down street to pick up kid, turns around, comes back up C.E.R	7:07 AM
7:09 AM	Truck turning L on C.E.R Airplane and birds Pick up truck	

Start Time:	Event Description	Event End Time:
7:11 AM	Truck coming into Vineyard Road	
7:18 AM	Mid-size car Truck pulling a trailer with a bob-cat on it Birds	
7:22 AM	School bus and car turning L onto C.E.R Birds	
7:25 AM	School bus	
7:26 AM	Pick up truck	
7:30 AM	School bus, stops down street to pick up three kids	
7:31 AM	Mid-size truck, school bus turns around down street	
7:32 AM	Bus picks up kid across street (@ vineyard across meter locations)	
7:37 AM	Dogs barking	
7:38 AM	Motorcycle (loud radio on)	
7:40 AM	Truck and small trailer	
7:43 AM	Truck pulling large RV trailer	
7:46 AM	Dogs barking, birds chirping	
7:55 AM	Van	
7:58 AM	Car	

Start Time:	Event Description	Event End Time:
8:00 AM	Truck, truck pulling trailer	
8:05 AM	Truck and trailer	
8:12 AM	Guy riding a bike	
8:15 AM	2 Cars	
8:38 AM	Truck and trailer turning left on C.E.R	
8:41 AM	Guy riding a bike	
8:44 AM	SUV	
8:45 AM	Truck turning left on C.E.R	
8:46 AM	Truck turning left on C.E.R	
8:46 AM	Truck turning left on C.E.R Birds	
8:50 AM	Denise's car drives up I get out of car to talk to her	

Date: March 23, 2006

Start Time: 8:51 AM

End Time: 10:14 AM

Performed By: Denise LeClaire

Microphone Location: R2-across from and at entrance to vineyard

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.): Birds chirping, dog barking, plant is faint hum, animal (farm) sounds-same rooster, cars, pickup trucks, vans.

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
8:55 AM	Danica/Chris - car leaving &taking their place with my car	
8:55 AM	Airplane flyover	8:56 AM
8:57 AM	Car-starting car to move closer to entrance	
8:59 AM	Pickup turning West along C.E.R from vineyard	
9:00 AM	Pickup East on C.E.R. followed by mid-size car	
9:00 AM	Mid-size car from Kirkwood Str. turning West on C.E.R.	
9:01 AM	Air craft flyover	9:04
9:08 AM	Car from Kirkwood Str. turning West on C.E.R.	
9:10 AM	Dog barking	
9:11 AM	Pickup truck traveling from West on C.E.R. to vineyard	
9:11 AM	Pickup truck from Kirkwood Str. traveling West along C.E.R.	
9:13 AM	Van traveling East along C.E.R.	
9:14	Flyover-aircraft	9:16 AM
9:15	Backup Alarm (appears to be from CPP)	
9:19 AM	Motor/engine igniting from South/pick up truck idling then moving and traveling in farm yard	9:20 AM

Start Time:	Event Description	Event End Time:
9:20 AM	Pickup truck in farm yard moving slowly	
9:21 AM	Dog barking	
9:22 AM	Same farm yard pickup truck	9:23 AM
9:22 AM	Wind picking up speed; some gusts	
9:24 AM	Aircraft flyover	9:26 AM
9:27 AM	Truck moving down at CPP	
9:28 AM	Cow mooing	
9:30 AM	Wind/ breeze	
9:30 AM	Geese	
9:31 AM	Van	
9:32	Car	
9:34 AM	Silencers	
9:37	Car	
9:39 AM	SUV traveling East along C.E.R.	

Start Time:	Event Description	Event End Time:
9:40 AM	Van traveling West along C.E.R.	
9:41 AM	Two (2) large moving trucks turning from C.E.R. south along Kirkwood Str.	
9:41 AM	Van traveling East along C.E.R.	
9:42 AM	Car from Kirkwood Str. traveling East along C.E.R.	
9:43 AM	Car pass by- Traveling West along C.E.R.	
9:44 AM	Car stopped and idling at intersection of road to R1 (driver out of car)	
9:45 AM	Car starting and traveling West along C.E.R.	
9:47 AM	Pick up truck from Kirkwood Str. turning W on C.E.R.	
9:47 AM	Ammonia truck from plant traveling West on C.E.R.	9:48 AM
9:49 AM	Pickup from vineyard-traveling on road & turning West on C.E.R.	9:49 AM
9:50 AM	Aircraft flyover	9:51
9:50 AM	Car from Kirkwood Str. turning West onto C.E.R.	9:52
9:51	Wind gusts	
9:52	Plant audible (noticeably); cooling tower noise is audible	
9:54 AM	High aircraft flyover	

Start Time:	Event Description	Event End Time:
9:56 AM	Van from West along C.E.R. turning onto Kirkwood St.	
9:58 AM	Semi- trailer - large ammonia truck traveling to CPP from West along C.E.R.	
9:59 AM	Checking meter (battery showing 10:52 PM)	10:02 AM
10:04 AM	Pickup truck from West along C.E.R. turning onto Kirkwood Str.	
10:05 AM	Driving to check meter at R1	
10:10 AM	Large truck turning onto Kirkwood Str. from West along C.E.R.	
10:12 AM	Pickup traveling West along C.E.R./I'm traveling east to plant	
10:14 AM	Plant-ammonia truck/car traveling around plant	
10:14-10:54	Checking meters at CPP fence line and at 400 foot point; running smoothly	

Date: March 23, 2006

Start Time: 11:00 AM

End Time: 12:11 PM

Performed By: Denise LeClaire

Microphone Location: R1

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.):

Backup alarm at ranch near old cement plant clearly audible; wind picking up during day; truck traffic to plant; aircraft flyover; cloud cover.

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
11:00 AM	Taking photo of meter location	11:03 AM
11:05 AM	Plant louder/ wind gusting West to East	11: 06 AM
11:07 AM	Large jet, aircraft flyover (significantly louder than plant)	11:08 AM
11: 08 AM	Strong wind gusts; plant audible when gusts occur	11:08 AM
11:09 AM	Another aircraft-smaller jet	
11:09 AM	Pickup traveling along C.E.R. East to West	11:09 AM
11:11 AM	Wind gusting	11:11 AM
11:12 AM	Another aircraft-large jet	11:13 AM
11:14 AM	Plant audible; wind calmer	11:15 AM
11:17 AM	2 motor bikes/1 pickup traveling West along C.E.R.	11:17 AM
11:20 AM	Large semi-trailer-traveling East to West along C.E.R.	11:21 AM
11:24 AM	Helicopter flyover; plant inaudible	11:27 AM
11:26 AM	Aircraft flyover-high jet	11:26 AM
11:28 AM	Strong wind gusts	11:28 AM
11:28 AM	Pickup truck traveling West to East on C.E.R.	11:28 AM

Start Time:	Event Description	Event End Time:
11:29 AM	Plant audible	
11:30 AM	Wind gusts-very strong	
11:32 AM	Plant louder (wind-related)	
11:32 AM	Aircraft flyover; very high level	11:33 AM
11:32 AM	Horn beeping	
11:33 AM	Strong wind gusts/plant inaudible	
11:35 AM	Car-traveling East to West on C.E.R.	
11:35 AM	Large ammonia truck traveling East to West along C.E.R. to plant	11:36 AM
11:37 AM	Two pick up trucks on C.E.R. traveling opposite directions; 1 turning off at Kirkwood Str.	
11:37 AM	Motor bike from CPP	
11:40 AM	Cars(2) traveling West to East along C.E.R.	
11:43 AM	Back up alarms from ranch east of R1 are audible	
11:46 AM	Car from Kirkwood Str turning West along C.E.R.	
11:46 AM	Large truck traveling West to East along C.E.R.	11:47 AM
11:47 AM	Wind gust	

Start Time:	Event Description	Event End Time:
11:51 AM	Plant audible; wind speed negligible	11:51 AM
11:57 AM	Van along private road traveling north; turning West onto C.E.R.	
11:58 AM	Red pickup traveling slowly north along private road to C.E.R., turning & stopping/parking at intersection	
12:00 PM	Backup alarms from ranch location south of R1	12:00 PM
12:02 PM	Strong wind gusts	
12:04 PM	Plant audible	12:04 PM
12:06 PM	School bus alarm	12:09 PM
12:09 PM	Pick up stopped at intersection (picking up school children) driving slowly along private road	12:11 AM
12:11 PM	Starting car and moving to R2 location for observations	

Date: Thursday, March 23, 2006

Start Time: 12:19 PM

End Time: 1:54 PM

Meter Checks: 1:55 – 2:57 PM

Start Time: 2:57 PM

End Time: 3:16 PM

Performed By: Denise LeClaire

Microphone Location: Near R2 at vineyard entrance

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.):
An air blower of some sort and backup alarms, forklift operating at ranch across from plant; forklifts with backup alarm at plant; trucks moving in areas behind R2 sound similar to plant.

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
12:19 PM	Pickup with horse trailer turning West from Kirkwood Str. onto C.E.R.	
12:21 PM	Pickup on C.E.R. turning South on Kirkwood Str.	
12:22 PM	SUV traveling fast from West to East on C.E.R.	
12:23 PM	Truck from Kirkwood Str. turning West onto C.E.R.	
12:23 PM	Wind gusts	
12:26 PM	Plant audible	12:26 PM
12:26 PM	Same fast pickup truck traveling East to West on C.E.R.	
12:27 PM	Pickup truck from Kirkwood Str. turning West onto C.E.R.	
12:28 PM	Pickup truck from Kirkwood Str. turning East on C.E.R. (diesel pickup)	
12:30 PM	Pickup truck from Kirkwood Str. turning into R1- checking on meter. Getting out of car. Sacramento County rep. taking noise measurements.	
12:32 PM	Large truck from plant traveling West along C.E.R.	12:32 PM
12:45 PM	Plant audible/wind calm	12:45
12:45 PM	Sacramento County rep. leaving R1 turning onto C.E.R. traveling West	
12:50 PM	Car turning from C.E.R. onto Kirkwood Str.	
12:51 PM	SUV from Kirkwood Str. turning West on C.E.R.	

Start Time:	Event Description	Event End Time:
12:51 PM	Truck from West C.E.R. turning onto Kirkwood Str.	
12:53 PM	Pickup truck along C.E.R. traveling fast East to West	12:56 PM
12:57 PM	Pickup truck-West to East along C.E.R.; turning onto Kirkwood Str.	
12:59 PM	Car from Kirkwood Str. - westbound on C.E.R.	12:59 PM
1:00 PM	Pickup truck from West C.E.R. turning onto Kirkwood St.	1:01 PM
1:02 PM	Van/horse trailer from West C.E.R. turning onto Kirkwood Str.	1:02 PM
1:02 PM	Possible aircraft flyover or plant sounding similar; no airplane visible; wind calm	1:05 PM
1:10 PM	Noise - sawing/cutting	1:10 PM
1:12 PM	Distant train horn (blast)	1:12 PM
1:12 PM	Car turns onto Kirkwood from West C.E.R.	1:12 PM
1:13 PM	Sounds like aircraft flyover; no visible jet	1:14 PM
1:15 PM	Wind gusts/ Sign rattles	
1:16 PM	Calm conditions; Plant a slight hum	
1:17 PM	Sounded like truck on road-no truck	
1:18 PM	Faint back up alarm	

Start Time:	Event Description	Event End Time:
1:21 PM	Truck from West C.E.R. turning onto Kirkwood Str.	1:21 PM
1:22 PM	Motorbike traveling from West to East along C.E.R.	1:23 PM
1:23 PM	Sawing/cutting sounds	1:23 PM
1:24 PM	Aircraft flyover-small plane-maybe prior noise Visible on horizon; quickly hidden behind hill	1:26 PM
1:27 PM	Aircraft noise from Southwest (airport for small craft there?)	1:27 PM
1:28 PM	Plant	
1:29 PM	Pickup turning from Kirkwood westbound onto C.E.R.	
1:29 PM	Booms (2 relatively loud)	
1:30 PM	Plant audible	1:31 PM
1:31 PM	Saw noise to southwest	1:31 PM
1:32 PM	Truck from Kirkwood Str. turning West onto C.E.R.	
1:33 PM	Car traveling from West C.E.R. turning onto to Kirkwood Str.	
1:34 PM	Pickup truck from East traveling West along C.E.R.	
1:35 PM	Sounds- truck from West C.E.R. traveling East sounding like a buzz saw/small jet engine	
1:36 PM	Wind gusts/signs rattling	1:37 PM

Start Time:	Event Description	Event End Time:
1:38 PM	Plant hum	
1:38 PM	Pickup truck turning onto Kirkwood Str. from West C.E.R.; Car from Kirkwood turning onto C.E.R. to Qest	
1:39 PM	Truck/ cab pickups traveling West to East along C.E.R.	
1:39 PM	Delivery truck from traveling from West turning from C.E.R. onto Kirkwood Str.	
1:42 PM	Pick up truck from Westbound C.E.R. turns south on Kirkwood Str.	
1:42 PM	Aircraft flyover	
1:44 PM	Aircraft flyover	1:46 PM
1:47 PM	Aircraft flyover-to West - low on horizon/small craft	1:48 PM
1:48 PM	Motorcycle traveling West to East on C.E.R. and turns onto Kirkwood Str.	
1:51 PM	Hum of plant (calm wind) ; also sounds like aircraft-none at horizon/no evident vapor trail	
1:53 PM	Pickup truck from Kirkwood turning westbound on C.E.R.	
1:54 PM	Leaving to check meters all meters	

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
2:57 PM	Aircraft flyover	
2:58 PM	(2) trucks from vineyard turning onto Clay, then onto Kirkwood Str.	
2:59 PM	Truck (large) from plant traveling West along C.E.R.	
3:03 PM	Aircraft flyover	
3:03 PM	Large truck traveling West along C.E.R.	
3:04 PM	Pickup from West along C.E.R. turns onto Kirkwood Str.	
3:05 PM	Pickup from Kirkwood Str. turning onto C.E.R. Westbound	
3:05 PM	SUV from Kirkwood Str. turning West onto C.E.R	
3:06 PM	Aircraft flyover	3:08
3:06 PM	Pickup truck traveling West to East along C.E.R.	
3:06 PM	Car traveling East to West along C.E.R.	
3:08 PM	Pickup truck traveling from West to East along C.E.R.	
3:10 PM	Pickup truck from East traveling along C.E.R. turning onto Kirkwood Str.	
3:10 PM	Car traveling from East C.E.R. turning onto Kirkwood Str.	
3:12	Car Eastbound on C.E.R. (delivering flyers and stopping at mailboxes	

Start Time:	Event Description	Event End Time:
3:13 PM	Aircraft flyover	3:14
3:14 PM	Pickup traveling from West along C.E.R.	
3:16 PM	Pickup from West traveling East along C.E.R.	

Date: Thursday March 23, 2006

Start Time:3:18 PM

End Time: 4:52 PM

Performed By: Danica Skoretz, Chris Giesbrecht

Microphone Location: In view of both R1 & R2 (13700 Clay East Rd)

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.):

Lots of vehicle traffic; barnyard sounds

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
3:19 PM	Heavy truck	
3:20 PM	Dogs barking-distance Rooster	
3:22 PM	3 cars SUV Mini Van and car	3:23 PM
3:25 PM	School Bus, stops, turns around	3:26 PM
3:28 PM	SUV, Pick up	
3:30 PM	Motor start up Rooster	3:32
3:34 PM	Van	
3:35 PM	Pick up truck	
3:41 PM	Van	
3:42 PM	Airplane	
3:44 PM	Mid-sized car	
3:45 PM	Pick up truck	
3:49 PM	Airplane Rooster	3:53 PM(airplane)
3:53 PM	School bus turning right from Kirkwood Str. on to C.E.R; drop off by R1	
3:55 PM	4 children walking by R1 School bus driving away	

Start Time:	Event Description	Event End Time:
4:06 PM	Pick up truck	
4:09 PM	Airplane	
4:13 PM	3 cars- Harley with stereo	
4:20 PM	Tractor running, observed, fence repair, 4 people in crew welding; includes small CAT, pick up with trailer (across C.E.R., South of plant E)	

Date: Thursday March 23, 2006

Meter check from 9:00-9:30 PM
8 L_{eq} 20 min measurements started @ 12:15 AM

Start Time: 7:35 PM / 10:30 PM
9:00 PM / 11:50 PM
End Time:

Performed By: Chris Giesbrecht, Danica Skoretz

Microphone Location: Across road from R2 (by vineyard)

Instrumentation (Describe Type, Model, Model#, Dynamic Range, etc.):

Time Weighting: Slow (X) Fast ( )

Statistical Descriptors (Circle): L01, L05, L10, L20, L50, L90, L99, Leq

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.): Continuous crickets, frogs, rooster croaking not as often.
-Residence from R2 were outside talking
-A worker from the vineyard property came by to talk to us.

Meteorology Observations: Weather Station

Start Time:
Temperature: 12-14°C Humidity: Wind Speed: Wind Direction:

End Time:
Temperature: Humidity: Wind Speed: Wind Direction:
-Partly cloudy

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
7:42 PM	Residents R2 (man and woman) are outside talking, dog barking	7:45 PM
8:05 PM	Vineyard employee asking questions about why we are parked at entrance	8:10 PM
8:20 PM	Pickup truck and trailer	
8:35 PM	Car	
8:40 PM	Car	
9:02 PM	Pickup and trailer	
9:04 PM	Meter check at R2-all okay	
11:50 PM	Car-Denise LeClaire drives up -talks to us about meter setup	11:51 PM

Date: March 23, 2006-March 24, 2006 Checking Meters at R1 @ 11:55 PM and R2 at 12:40 AM

Start Time: 11:55-12:40 at R1

End Time: 12:44- 2:30 at R2

Performed By: Denise LeClaire

Microphone Location: R1 and R2

General Background Noise Observations (Describe noise environment in general. E.g., background noise of insects; plant audible, etc.): High pitched whine (large battery dead), plant audible; chugging away in steady state; plumes straight up; crickets, frogs and owls; occasional dog barking; plant is dominant noise source

Meteorology Observations: Calm wind, overcast

Start Time:			
Temperature:	Humidity:	Wind Speed:	Wind Direction:
End Time:			
Temperature:	Humidity:	Wind Speed:	Wind Direction:

DETAILED OBSERVATIONS- Witness Sound Events

Start Time:	Event Description	Event End Time:
12:00 AM	Me-turning off battery-reason for high pitched whine	* Delete from events
12:03 AM	Chris and Danica traveling toward plant to conduct 20 – minute L_{eq}'s	
12:05 AM	Me-closing car door	
12:07	Car on main Twin Cities Highway	
12:07	Dogs barking	
12:14	Car on Kirkwood Str.	
12:15	Plant sound-surging-similar to airplane sound	
12:20	Car on Twin Cities Highway	
12:26	Crickets/frogs starting	
12:27	Dogs barking	
12:37	Creature on the gravel-bird?	
12:40	Leaving R1 Site	
12:44	Shutting off battery at R2	
12:47	Car from Kirkwood Str. turning West onto C.E.R.	
12:49	Plant audible but less than at R1; more cricket/frog sounds	

R2

Start Time:	Event Description	Event End Time:
12:55	Barking dogs-distant	
12:56	Plant noise receding; crickets and frogs louder	
12:59	Donkey braying	
1:00	Plant louder	
1:02	Dog barking	
1:05	Plant fainter; crickets, etc, more perceptive	
1:07	Barking dogs	
1:08	Turning car on for heat	
1:12	Car on road-from plant-Chris and Danica- checking the meter at R1	
1:15	Chris/Danica leaving R1 and traveling along C.E.R. toward R2 site	
1:21	Chris/Danica returning	
1:22	Running heat in car	
1:24	Plant barely perceptible though closed car window	
1:27	Dogs Barking	

R2

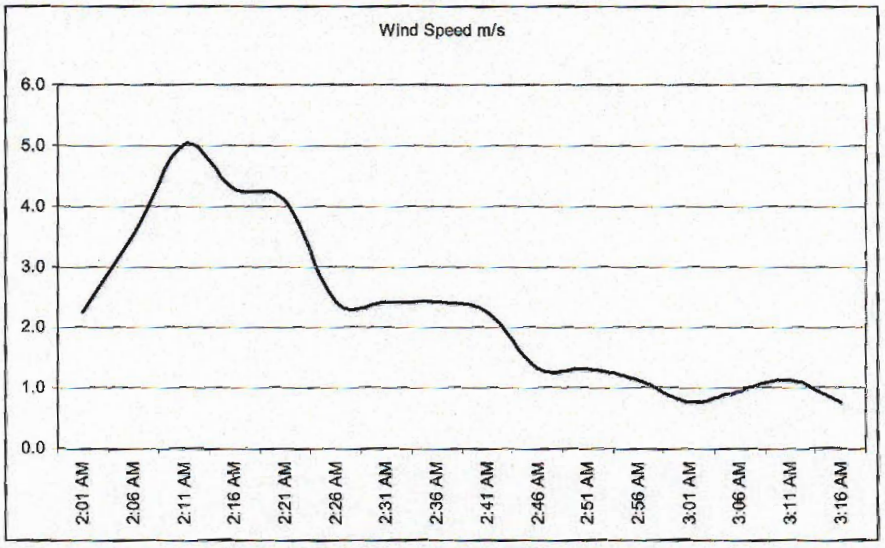
Start Time:	Event Description	Event End Time:
1:33	Plant more perceptible-dominating	
1:45	Animals quieter tonight; fewer dogs; no rooster	
1:50	Window of car down	
1:58	Stronger wind; plant audible	
2:00	Starting car	2:01
2:05	Car from West along C.E.R. turning onto Kirkwood Str.	
2:19	Plant audible; farm animals quiet tonight	
2:30	Leaving site	

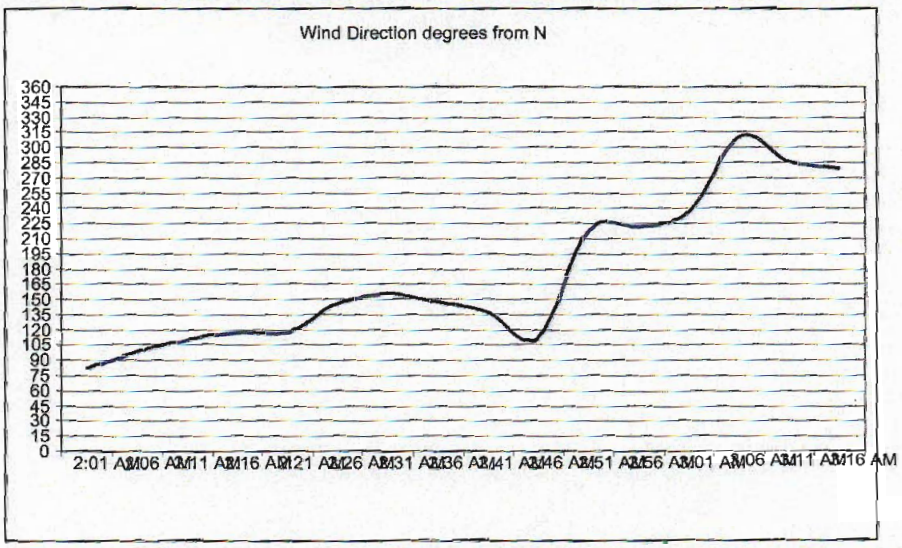
APPENDIX K

Influence of Meteorology

A CONCAWE report published in 1981 titled "The propagation of noise from petroleum and petrochemical complexes to neighboring communities" presents a correlation between atmospheric conditions and noise propagation developed through experimental results. The atmospheric factors include wind speed, wind direction, and Pasquill stability class. During early morning periods, measured noise propagation from CPP show effects to those expected by the CONCAWE model.

The following charts show trends in wind speed and direction during the early morning period on March 24. Wind speed decreases from an average 5 m/s to 1m/s. At the same time the wind direction shifts towards 270° from N which is close to the direction of R1 and R2. During the time period approaching 3:00 AM the sky was partly cloudy indicating a Pasquill stability class of E or F.



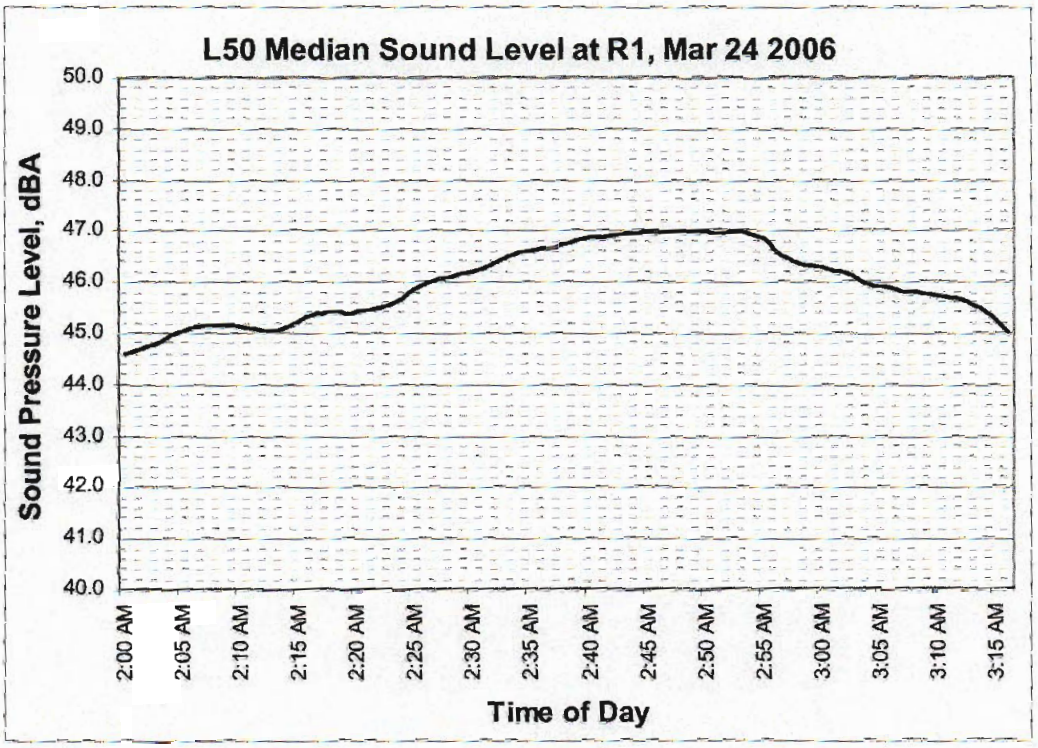


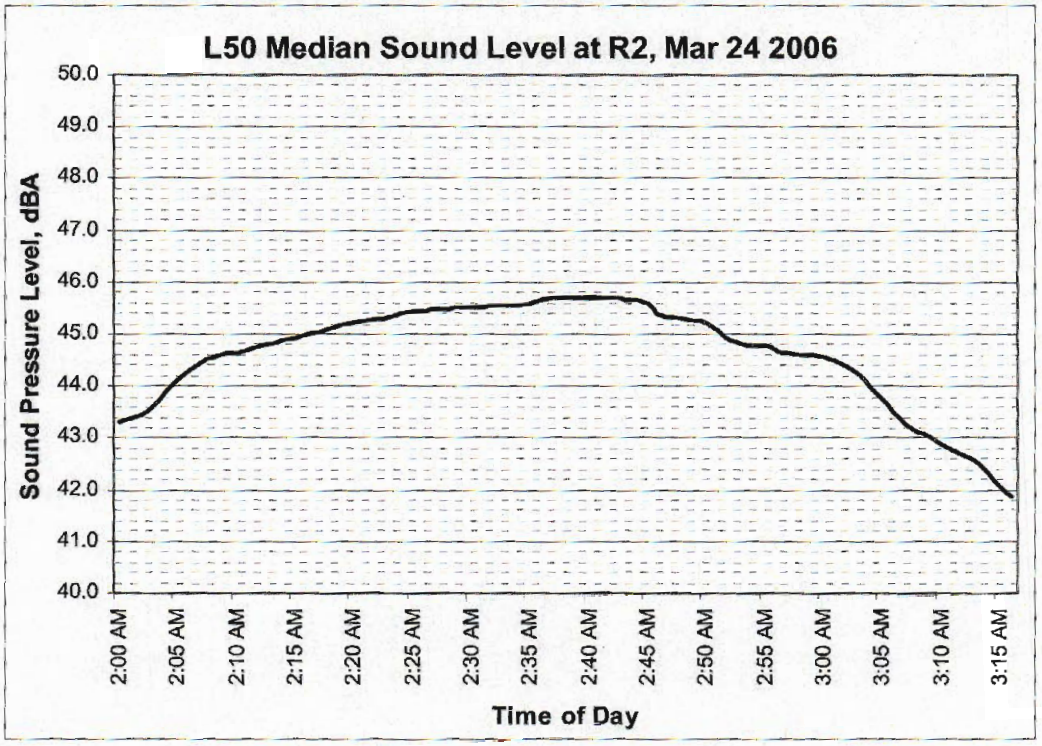
*North is in the 0°/360° direction, R1 and R2 are approximately in the 250° - 260° direction

Under these conditions (approaching 3:00 AM), CONCAWE meteorological category 5 is used by the model to predict meteorological attenuation. Under category 5, the correction for meteorological conditions becomes negative at all frequencies from 63 Hz to 4 kHz. Negative correction implies an increase in receptor noise levels. The table below shows the meteorological attenuation expected by the CONCAWE model at 1400m (the approximate distance from the CPP site to R1).

	Octave Band Center Frequency, Hz						
Meteorological	**63**	**125**	**250**	**500**	**1000**	**2000**	**4000**
Attenuation, dB	-1.75	-3.75	-5.75	-5.75	-5	-2.5	-5

During the period of measurement, an increasing trend in the L_{50} median sound level is present at R1 and R2. This trend is not a result of an increase in CPP noise emissions as its operations remain continuous, and is best explained by a change in meteorological conditions. The following figures show this trend.




L50 Median Sound Level at R2, Mar 24 2006
Sound Pressure Level, dBA
50.0
49.0
48.0
47.0
46.0
45.0
44.0
43.0
42.0
41.0
40.0
2:00 AM
2:05 AM
2:10 AM
2:15 AM
2:20 AM
2:25 AM
2:30 AM
2:35 AM
2:40 AM
2:45 AM
2:50 AM
2:55 AM
3:00 AM
3:05 AM
3:10 AM
3:15 AM
Time of Day