Hillsborough County, Florida

Solid Waste Energy Recovery Facility — Application for Power Plant Site Certification

Volume II — Appendices

Submitted By
The Hillsborough County
Board of County Commissioners

1834

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VOLUME II - APPENDICES

CHAPTER 10. APPENDICES

PAGE

Meteorology and Air Quality

The meteorological and ambient air quality data used in the air quality analysis of the PSD (Appendix 10.1.5) is presented in Sections 2.3.7.1, 2.3.7.2 and 2.3.7.3 of the application.

In general, the meteorological data from Tampa International Airport is compared in Section 2.3.7.1 to other available meteorological data. The Tampa data are found to be the most representative of the area in the immediate vicinity of the site. The refined air quality analysis presented in the PSD (Appendix 10.1.5) uses hourly meteorological data from Tampa International Airport for the 5-year period 1970 through 1974.

Sections 2.3.7.2 and 2.3.7.3 of the application present ambient air quality data and the program used to obtain that data. The Hillsborough County EPC (HCEPC) is responsible for monitoring air quality data within the County. HCEPC runs 65 monitoring stations and receives information from other private monitors totaling an air quality network of 83 stations, many of which monitor for more than one pollutant. A complete set of Standard Operating Procedures govern all aspects of the monitoring activities including installation, calibration, collection, and validation. A quality assurance program which governs the network operation is contained in HCEPC's "Air Monitoring Quality Assurance Plan" and published in Environmental Quality. This plan is summarized in Section 2.3.7.3 of the application. Hillsborough County EPC 1983 ambient air quality data were used in conjunction with the air quality analysis presented in the PSD.

Noise

A complete technical analysis of baseline ambient noise conditions was completed for this application and is contained in its entirety in Appendix 10.12. This study includes detailed methodologies which were utilized in order to estimate operational impacts associated with the facility. Appendix 10.12 also includes the correspondence relative to this issue.

(Winkler technique), ammonia, total kjeldahl nitrogen and total phosphate were preserved as specified in "Methods for Chemical Analysis of Water and Wastes" (EPA-600/4-79-020). All samples were immediately placed on ice for transport to the laboratory. Temperatures and pH were measured according to methods specified in either "Standard Methods for the Examination of Water and Wastewater" (APHA, 1982) or "Methods for Chemical Analysis of Water and Wastes" (EPA 600/4-79-020). Results of these analyses may be found in Appendix 10.9.5. The material presented in that appendix supplements the discussion presented in Section 2.3.4 of the application.

Ecology

A limited biological sampling program to examine benthic invertebrates in the two streams adjacent to the site was conducted on October 31, 1983. At five stations, as described in Section 2.3.6, single 0.0225 m^2 sediment grabs were taken using a petite ponar dredge. Samples were sieved through a No. 30 mesh screen and immediately placed on ice. Upon return to the laboratory, each sample was sorted and identified. The two taxonomic keys used primarily were:

- Tennack, R.W., 1953. Freshwater Invertebrates of the United States. Ronald Press Co., NY.
- U.S. EPA., 1973. An Introduction to the Identification of Chironomid Larvae. Analytical Quality Control Laboratory, Cincinnati, OH.

In addition, further correspondence and information related to ecology is presented in Appendix 10.11. That appendix includes the findings of the Hillsborough County Environmental Protection Commission relative to the occurrence of any jurisdictional wetlands onsite, as well as a comprehensive listing of wetland vegetation indicators as prescribed in Chapter 1-11.03(g) of the Rules of the Hillsborough County Environmental Protection Commission.

fecal streptococci and total virus particles (as plaque forming units). Analysis techniques specified in Standard Methods for the Examination of Water and Wastewater (AOHA, 1982) and by the U.S. Environmental Protection Agency will be followed. Virus groups found in the effluent stream will be identified in addition to obtaining a total virus count.

Once construction of both facilities is completed, monthly sampling of the circulating cooling waters will be conducted. This program will be undertaken for the first year of operation to assure that no viruses are detected. These samples will also be analyzed for the indicator bacteria mentioned above.

Stack Testing

Air quality monitoring and stack testing programs are outlined in Section 5.6 of the application and in Appendix 10.1.5 "Prevention of Significant Deterioration" (See Volume III - Air Quality).

As described in Section 5.6 of the application, air quality monitoring in the site is not being proposed because of the adequacy of the existing monitoring network. However, continuous stack monitoring devices for oxygen or carbon dioxide and opacity will be installed, calibrated, operated in accordance with Chapter 17-2.710 FAC and 40 CFR 51. As noted previously in this appendix, performance (compliance) testing is assumed to be required in accordance with Chapter 17-2.700 and 40 CFR 60.

Combustion Residue

A chemical analysis of the combustion residue will be conducted after commencement of operation. This analysis will measure at a minimum levels of Cadmium, Chromium, Zinc, and Lead, to determine the nature and potential toxicity or hazardousness of the residue.

Results of the residue analysis will be forwarded to the Florida DER.

APPENDIX 10.5.3

OPERATIONAL MONITORING

Chapter 5 of the application describes the environmental effects of the operation of the plant and directly associated facilities, and also describes the County's plans and programs for monitoring the environmental impacts resulting from plant operation. As noted in the introduction to this appendix, there may be additional monitoring required by DER as conditions of certification. Clarification and further description of the monitoring programs presented in this appendix will be submitted to DER as they are developed. As noted in the Instruction Guide for Certification Applications [DER Form 17-1.211(1)] "The program for the plant operational period may be submitted to the department no later than six months and preferably one year before the plant start-up target date."

Currently proposed environmental monitoring during the operational phase of the facility is limited to three areas:

- virological/bacteriological monitoring of the treated domestic wastewater used as cooling water;
- stack testing (continuous monitoring); and,
- combustion residue analysis

Cooling Towers

A virological and bacteriological monitoring program will be conducted at the co-located Northwest Brandon Subregional Wastewater Treatment Plant.

Samples of influent and chlorinated effluent will be collected daily for one week during compliance testing. Sufficient sample volumes will be collected to allow the accurate quantification of virus particles. Samples will be analyzed for total bacteria, total and fecal coliform bacteria,

APPENDIX 10.12

NOISE TECHNICAL ANALYSIS

APPENDIX 10.12

NOISE TECHNICAL ANALYSIS

Existing Noise Environment

This section provides the background information necessary to evaluate, quantify, and locate potential increases of noise levels (above baseline or existing ambient noise levels) due to the proposed construction and operation of the Hillsborough County Resource Recovery Facility.

Noise is most often and most simply defined as unwanted sound. The magnitude of air pressure fluctuations produced by sound is referred to as the sound level and is measured in decibels (dB). The sound pressure disturbance that humans are capable of hearing is very small, relative to atmospheric pressure. Nevertheless, the range of pressures from the faintest to the loudest sound is very large. The decibel scale compresses this large range of pressures using a logarithmic function into a meaningful scale from 0 dB which corresponds to the faintest audible sound, to in excess of 140 dB which produces pain in humans. Also, because human hearing sensitivity is frequency dependent, the A-weighting filter, which simulates this human hearing frequency dependency, is used in measuring and reporting environmental noise levels and is annotated "dBA".

Since the decibel scale presents a compressed view of actual sound pressure variations, the manner in which the decibel scale is related to these pressure variations is complicated. A 26 percent change in the energy level changes the sound level one dB. The most sensitive human ear would not detect this change, except in an acoustical laboratory. A doubling of the energy level would result in a 3-dB increase which would be barely perceptible in natural environments. A tripling in energy level would result in a clearly noticeable change of 5-dB in the sound level. A change of ten times in the energy level would result in a 10-dB change in the sound level. This would be perceived as a doubling (or halving) of the apparent loudness.

The noise descriptors used in this analysis are the equivalent sound level, L_{eq} and the exceedence levels L_{10}, L_{50}, and L_{90}. The equivalent sound level is a single value of sound level for any desired duration, which includes all of the time-varying sound energy in the measurement period. The equivalent noise level correlates reasonably with the effects of noise on people for wide variations in environmental sound levels and time patterns. It is also easily measurable by available equipment. The exceedence levels present the noise levels which are exceeded in a given percentage (defined by subscript) of the time. For example, the L_{10} is the noise level which is exceeded 10 percent of the time and is regarded as a measure of the more serious intruding noise levels, whereas the L_{90} is the noise level exceeded 90 percent of the time and is considered the ambient noise level (Peterson 1980).

The County of Hillsborough has criteria for ambient noise levels, also in equivalent sound levels and are used for comparison of monitored data as well as the predicted data. These elements, categorized by land use for the appropriate time periods, are presented in Table 1.

Table 1 HILLSBOROUGH COUNTY NOISE CRITERIA
(Sound Levels by Receiving Land Use)

Receiving Land Use Category	Time	Sound Level Limit dBA (Leq)
Residential, Public Space, Open Space	7 a.m.-10 p.m.	60
	10 p.m.-7 a.m.	55
Commercial or Business	7 a.m.-10 p.m.	65
	10 p.m.-7 a.m.	60
Manufacturing or Industrial	At All Times	75

Source: HCEPC (1976)

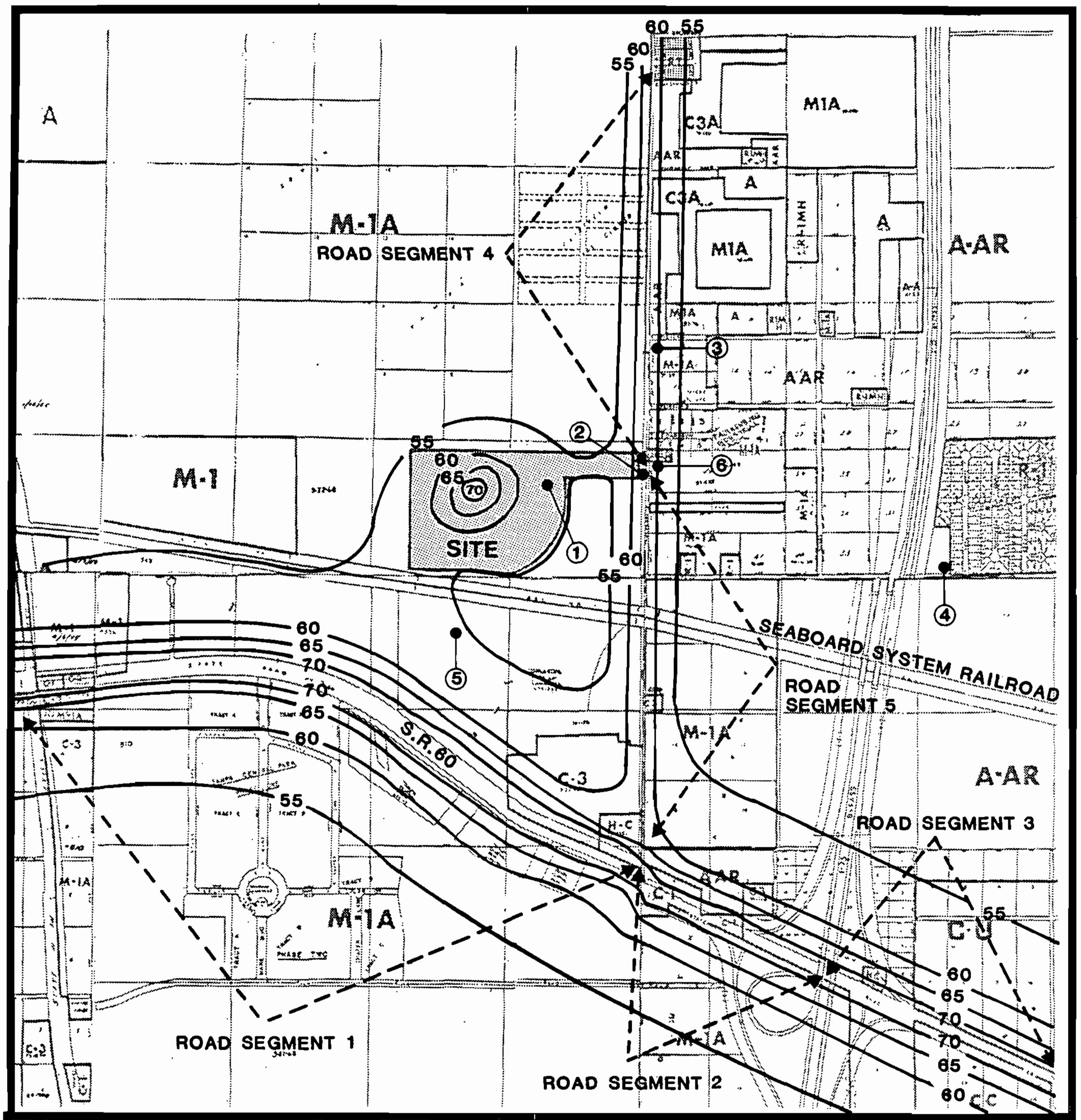
Since the operation of the facility (designed with noise control equipment) should not result in significantly increasing noise levels, the major noise source would be the truck traffic approaching and departing from the proposed facility. Because the terrain grade does not vary greatly, noise levels of trucks accelerating from a stop should not be greater than the noise levels associated with normal road speeds. To aid in assessing potential increases over the current noise levels, a baseline noise monitoring program was implemented. The program was designed to represent the current traffic induced noise levels in the area. Sound level measurements were obtained in the vicinity of the site by Camp Dresser and McKee (CDM) as well as by the Hillsborough County Environmental Protection Commission (1983). The work plan and correspondence related to the ambient noise monitoring program is included in Exhibit A of this appendix.

The baseline sound level survey was designed to provide a gross survey of ambient noise conditions during day and night time periods. The survey determined representative ambient noise levels at locations on and adjacent to the facility site. The locations for this noise inventory are the circled numbers 1 through 6 as shown on Figure 1 and the basis for their selection is described in Table 2.

Noise measurements were made using a hand-held meter which measures dBA sound pressure levels. The meter is a Columbia Research Laboratories, Inc., Sound Pressure Level Meter, Model SPL-103, Serial Number D2204.

Spot noise measurements were made at each of the above indicated locations in order to determine a representative sound pressure level for the daytime period (7:00 a.m. to 10:00 p.m.) and a representative sound pressure level for the nighttime period (10:00 p.m. to 7:00 a.m.). Measurements at each location were conducted every five seconds for twenty-five to sixty seconds with a full 360° sweep so that omnidirectional noise sources did not overly influence the ambient noise estimates for a particular location. The one minute equivalent sound levels (Leq) for two representative peak hours and one nighttime hour are presented in Table 3.

Measurements were taken by CDM at five monitoring locations (1 through 5) during the approximate time periods noted below:



LEGEND TO ZONING BASE MAP

A	Agricultural	**C-C**	Community Commercial	**C-3A**	Limited Light Industrial
A-AR	Acreage Agricultural Residential	**C-U**	Community Unit	**C-3**	Commercial Light Industrial
R-1	Single Family Residential	**H-C**	Highway Commercial	**M-1A**	Restricted Industry
R-1MH	Single Family Residential & Mobile Home	**C-1**	Neighborhood Commercial	**M-1**	Industrial

HILLSBOROUGH COUNTY
ENERGY RECOVERY PROJECT

FIGURE 1
NOISE MONITORING SITE LOCATIONS,
ROAD SEGMENT LOCATION,
AND IMPACT ANALYSIS

CAMP DRESSER & McKEE

Table 2 INFORMATION ON SELECTED NOISE MONITORING LOCATIONS

Monitoring Site Number	Rationale for Selection
1	This location was selected to collect existing ambient noise levels at the boundary of that portion of the site where development would occur (between the proposed facility and the nearest residential receptors).
2	This location was chosen because it is near the closest residence, while remaining on the site property. This location is representative of the ambient conditions at L.B. Foster Pipe Company just to the south.
3	This location was selected because it is in the vicinity of the closest main residential area to the site and Faulkenburg Road. It is also zoned Acreage-Agricultural Residential (A-AR).
4	This location was selected because it is the closest established neighborhood to the site. It is zoned R-1 (Single Family Residential).
5	This location is the nearest site to the proposed facility that is planned for development. Currently undeveloped, this location is within the Interstate Park of Commerce. It is anticipated that warehousing/light industrial activities will locate here in the future.
6	This location was selected because it is at the closest residence to the proposed site and site access road. This area is zoned A-AR. An M-1A district (Restricted Industry) presently used for mixed light industrial and limited residential surrounds the A-AR district. Four single family dwellings are located along this stretch of Faulkenburg Road.

Table 3 NOISE BASELINE DATA SUMMARY
2-3 NOVEMBER 1983

Site	Time	Leq
1 (CDM)	8:00 AM	56
	6:00 PM	53
	10:00 PM	49
2 (CDM)	8:00 AM	60
	6:00 PM	56
	10:00 PM	56
3 (CDM)	8:00 AM	66[a]
	6:00 PM	66[a]
	10:00 PM	50
4 (CDM)	8:00 AM	52
	6:00 PM	55
	10:00 PM	49
5 (CDM)	8:00 AM	49
	6:00 PM	51
	10:00 PM	44
6 (HCEPC)	8:00 AM	63[a,b]
	6:00 PM	61[a,b]
	10:00 PM	55[b]

Source: HCEPC (1983a), CDM

[a] Currently exceeds Hillsborough County EPC noise criteria.

[b] 1-Hour Leq.

Date	Daytime	Nighttime
November 2, 1983	3:30 p.m.-4:00 p.m. 5:30 p.m.-6:00 p.m. 8:30 a.m.-9:00 p.m.	11:15 p.m.-11:45 p.m.
November 3, 1983	8:30 a.m.-9:00 a.m. 12:15 p.m.-12:45 p.m.	5:15 a.m.-5:45 a.m.

During each measurement, the monitoring station, noise level in dBA, time, temperature and weather conditions, wind speed and direction, and other notes (such as major noise sources) were recorded.

In addition to these measurements, the Hillsborough County Environmental Protection Commission (HCEPC) provided 24-hour monitoring data at monitoring Site 6. The HCEPC set up a Metrosonics 602 sound level analyzer approximately 50 feet east of Faulkenburg Road. The County's three peak hour Leqs corresponding to CDM's noise measurement periods are presented in Table 3. Material related to the Hillsborough County EPC 24-hour monitoring near the site is included in Exhibit B of this appendix.

Because heavy duty trucks emit higher noise levels than light trucks and cars, the percentage of each category for each road segment was identified for the resultant noise environment modeling discussed later. Therefore, a traffic count was conducted along Faulkenburg and Woodberry Roads for the two segments (see Figure 1, road segments 4 and 5) of the Faulkenburg Road to determine the current traffic mix. Because hourly mix data was not available for State Road 60, these percentages were applied to the daily traffic data for that road segment. The specific hourly traffic counts for the two peak hours (8:00 AM and 6:00 PM) and the one nighttime hour (10:00 PM) for the five road segments (see Figure 1) and for the two possible cases for traffic configuration on Faulkenburg Road are presented in Table 4.

Case 1 assumes that the county will direct the specific routes to be utilized by the transfer trailers coming from the County's NW Transfer Station and packer trucks coming from the NE area of the County. Since the north portion of Faulkenburg Road (Segment 4) is much more utilized by residential traffic and trailers would be directed to use the south portion of Faulkenburg Road (Segment 5). Case 2 does not assume any such traffic

Table 4 TRAFFIC DATA USED IN PEAK HOUR ANALYSIS

Segment	Daytime 8:00 AM	Daytime 6:00 PM	Nighttime 10:00 PM
SR60 Segment 1 -- 55 mph			
Average Hourly Traffic (existing)	3474	4089[a]	1234
Average Hourly Traffic (with Facility)	3506	4089[a]	1240
SR60 Segment 2 -- 55 mph			
Average Hourly Traffic (existing)	3853	4489[a]	1355
Average Hourly Traffic (with Facility)	4004	4489[a]	1358
SR60 Segment 3 -- 55 mph			
Average Hourly Traffic (existing)	3853	4489[a]	1355
Average Hourly Traffic (with Facility)	3914	4489[a]	1357
Faulkenburg Segment 4			
Average Hourly Traffic (existing)	478	556[a]	168
Case 1 - Average Hourly Traffic (w/Facility)	487	556[a]	174
Case 2 - Average Hourly Traffic (w/Facility)	592[a]	556	174
Faulkenburg Segment 5			
Average Hourly Traffic (existing)	401	467[a]	141
Case 1 - Average Hourly Traffic (w/Facility)	584[a]	467	150
Case 2 - Average Hourly Traffic (w/Facility)	479[a]	467	150

[a] Peak traffic volume hour used in Isopleth Analysis in Figure 7 and Table 6

routing from the county, and estimates the traffic split as 60 percent for Segment 4 and 40 percent for Segment 5 (versus 10 percent and 90 percent respectively for Case 1).

Resultant Noise Environment

Construction Impacts. There are two basic areas of concern associated with potential noise related impacts. One area is with short-term noise impacts from construction and the other area is with longer-term impacts from facilities operation. While construction noise impacts are important, their short-term nature and availability of effective mitigative measures minimizes their significance in what is essentially a noise analysis for long-term land use impacts.

Noise at a given construction site will depend on the phase of construction and the type of equipment being used. Construction noise will vary with time of day. Additionally, the noise produced by construction equipment depends on the phase of construction and the type of equipment being used.

The noise produced by construction equipment depends upon the source of power used to run the equipment, and the material properties and operational characteristics of the equipment. A noise characterization, based on the dominant noise sources of commonly used construction equipment is:

- Earth moving equipment, including excavating machinery such as bulldozers, shovels, front-end loaders, and trucks
- Materials handling equipment, such as cranes, concrete mixers, and concrete pumps
- Stationary equipment, such as pumps and compressors

Typical construction equipment noise ranges are shown in Table 5.

Construction noise impacts, as mentioned, will be of short duration. Because of the shielding due to vegetation, coupled with the industrialized nature of the local area, these temporary noise levels should result in only a slightly adverse impact on the local area.

Table 5 CONSTRUCTION EQUIPMENT SOUND LEVELS

Equipment	Sound Level at 50 ft. (dBA)
Earth Moving	
Compactors (Rollers)	72 - 75
Front Loaders	72 - 85
Backhoes	72 - 93
Tractors	76 - 93
Scrapers, Graders	80 - 94
Trucks	83 - 95
Material Handling	
Concrete Mixers	75 - 88
Concrete Pumps	82 - 85
Cranes (Movable)	76 - 87
Cranes (Derrick)	86 - 89
Stationary	
Pumps	69 - 71
Generators	71 - 83
Compressors	75 - 87
Impact Equipment	
Pneumatic Wrenches	82 - 89
Jack Hammers & Rock Drills	81 - 98
Impact Pile Drivers (Peaks)	95 - 110
Miscellaneous	
Vibrator	69 - 81
Saws	71 - 82

Source: US EPA (January 1976)

Operational Impacts. The operation of the proposed facility involves many activities and pieces of equipment and machinery that are major noise generators. Noise levels may exceed 90 dBA in the tipping area of a mass-burning plant if refuse trucks dump within an enclosed building housing both tipping bays and charging floor. Studies at refuse transfer stations and refuse burning plants with enclosed tipping areas show noise levels of 93 to 96 dBA and up to 102 to 104 dBA. The primary sources of noise at all locations were the packer-ejection mechanism during truck dumping, truck traffic, and release of the air brakes on the packers and transfer vans. All the noise levels, with the exception of truck traffic, were significantly attenuated or reduced outside the building and with increasing distance from the buildings.

Additionally, induced and forced draft fans generally have high decibel levels. Single frequency noise levels are primary concerns with this equipment.

Walls (cinder block) and doors (heavy wood) will cause decibel loss during transmission through the material, ranging from 25 to 40 dBA. Thus, if a 100 dBA noise source is in operation within the facility structure, directly outside the structure about 75 dBA level would be noted.

CDM's Noise Impact Model (NIM), which is based on conventional techniques (White 1975, BLM 1982, Von Giecke 1977), was used to predict the reduction of sound pressure levels from a noise source over distance outdoors. The basic algorithm used in the model represents the standard formulation of attenuation of noise over distance. This formula has been verified for a variety of sources by the U.S. EPA, Department of Commerce, and Department of Transportation. A flow diagram of the NIM algorithm is illustrated on Figure 2. It was assumed that the facility would be an omnidirectional noise source; therefore, the sound would be radiated equally in all directions from the source. Decibel loss over distance from this point source was calculated using a normal atmospheric attenuation factor of 6dB loss with a doubling of distance.

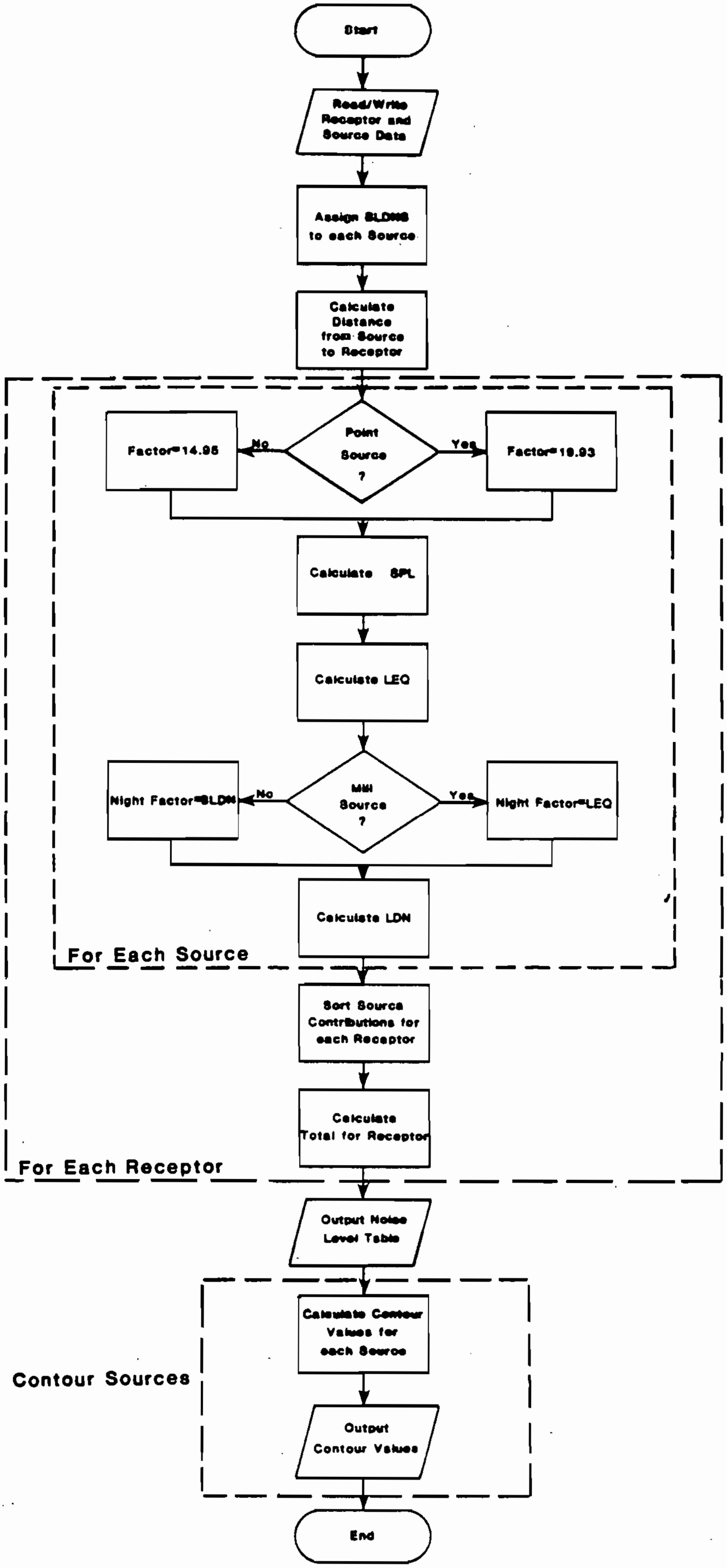


Figure 2 CDM Noise Model (NIM)
Algorithm Flowchart

For the noise analysis, it was assumed that there would be an enclosed tipping bay and that trucks, overhead cranes, and fans within the facility would be operating concurrently. The reference noise source level and distance was assumed to be 75dBA at 50 feet from the facility.

For the noise analysis a sensitive receptor is defined as a residential area, school, hospital, or other type of community institution. There are two existing groups of receptors potentially affected by noise impacts. The closest sensitive receptor is the residence directly across from the entrance to the site about 1,700 feet east of the proposed source (Site 6 on Figure 1). Although not considered a "sensitive receptor", another receptor potentially affected by noise is the L.B. Foster Pipe Company (a light industrial area) about 1400 feet east of the facility (represented by Site 2 on Figure 1).

The predicted sound pressure reduction over the 1,400 feet to the light industrial use area would be about 29 dBA. The perceived sound pressure level from the proposed facility would be about 46 dBA (75 minus 29). This is well below the current observed daytime ambient level. The predicted sound pressure reduction over the 1,700 feet to the nearest residence would be about 30 dBA. The perceived sound pressure level from the proposed facility at this residential location would be about 45 dB (75 minus 30). This is well below the current observed daytime ambient level at this location. All other potential sensitive receptors are beyond this distance and, therefore, would not be impacted by noise levels from the operation of the proposed facility itself.

Conclusions

From this analysis it can be seen that daytime operations of the proposed facility would not result in any perceived noise impacts at the closest sensitive receptors. Nighttime ambient noise monitoring conducted by HCEPC at the closest residence indicate nighttime noise levels of 55 dBA. With the expected facility noise levels at the location of the sensitive receptors to be in the vicinity of 44 to 46 dBA, no significant impact is anticipated.

Efforts will be made during the design phases of this project to include appropriate mitigative measures for reducing expected noise levels. Mitigative measures presently being considered include:

- locating major noise producing components, such as ID (induced draft) fans on the far side of the structure from sensitive receptors;
- locating individual components which can be separated from the structure, i.e., condensors at remote locations on the site;
- use of structural noise screens and where appropriate, planting of vegetative buffers; and
- requiring the use of higher performance standards for noise producing equipment.

It should be noted that while an additional effort will be made to minimize noise levels, the expected sound levels at the receiving receptors will be well below Hillsborough County EPC noise criteria. The rules of the Hillsborough County Environmental Protection Commission (Rule 1-10) allow a dBA sound level limit of 55 and 60 for a receiving residential land use category between the nighttime hours of 10 p.m. and 7 a.m. and daytime hours of 7 a.m. to 10 p.m., respectively. The predicted noise levels of the proposed facility will be well below these limits.

Noise levels from the facility at other residential areas in the vicinity of the site will be well below existing day and nighttime ambient levels. There would be no impact to ambient noise levels in the vicinity of the nearest established neighborhood, Woodberry Estates, which is located about 2,700 feet east of the proposed resource recovery site and 4,200 feet east of where the proposed facility would be situated on the site.

As the design of the facility becomes finalized the expected level of noise to be experienced at the closest sensitive receptors will again be evaluated. The predicted nighttime noise levels will be calculated and the need for further mitigative measures will be considered as appropriate. The facility can be designed to minimize the potential adverse impact to local nighttime ambient noise levels.

The operation of the proposed facility will increase daytime truck traffic levels along roadways in the vicinity of the site. Truck traffic will be restricted to daytime hours, more specifically 8 a.m. to 5 p.m. As a result of the truck traffic, noise levels can be expected to increase somewhat in the vicinity of the site's access road, Faulkenburg Road, and State Road 60.

The noise that would be generated by traffic related to the proposed facility was determined by using the FHWA Level 2 Highway Traffic Noise Prediction Model, Stamina 2.0 (1982). The results compared the existing modeled sound levels with and without the proposed resource recovery facility. The existing modeled noise levels, which are presented in Table 6 and 7, compare well with the 1 minute Leqs monitored by CDM and with the 15-minute Leqs monitored by the County. Table 6 presents the predicted 1-hour equivalent sound levels for two daytime peak traffic hours and one nighttime traffic hour for each of the six receptors with and without the facility traffic and facility noise sources. Table 7 presents the peak traffic noise with and without the facility at the given intervals of distance from the roadway. The hour which has the highest traffic volume for each road segment was used to determine the composite "peak" traffic hour in Table 7. These hours are typically associated with the afternoon rush hour.

The noise level at a point away from the roadway is a function of:

- The distance from the roadway
- The relative elevations of roadway and receiver
- Traffic volume on the roadway
- The percentage of light-duty (two axles and four tires), medium duty (two axles and six tires), and heavy-duty (more than three axles) vehicles
- Vehicle speed
- Roadway grade
- Topographic features such as trees, shrubbery, and buildings
- The noise source height of the vehicles

Table 6 NOISE IMPACT ASSESSMENT SUMMARY FOR HILLSBOROUGH COUNTY RESOURCE RECOVERY FACILITY

Case	Receptor Site Locations					
	1	2	3	4	5	6
Leq Noise Level without Facility (6:00 PM) Peak Day Traffic	49.4	62.6	62.9	45.4	51.9	62.6
Leq Noise Level with Facility (6:00 PM) Peak Day Traffic	52.4[a]	62.6	62.9	45.4	54.9[a]	62.6
Leq Noise Level without Facility (8:00 AM) Day Traffic	48.7	62.0	62.3	44.8	51.2[a]	62.0
Leq Noise Level with Facility (8:00 AM) Case 1 Day Traffic	52.2[a]	62.8	62.4	45.0	54.4[a]	62.8
Leq Noise Level with Facility (8:00 AM) Case 2 Day Traffic	52.2[a]	62.8	63.2	44.9	54.3[a]	62.8
Leq Noise Level without Facility (10:00 PM) Peak Night Traffic	44.2	57.4	57.7	40.2	46.7	57.4
Leq Noise Level with Facility (10:00 PM) Peak Night Traffic	51.0[a]	57.6	57.9	40.3	52.0[a]	57.6

[a] Increase due to facility operations

NOTE: All values are 1-hour equivalent sound levels. See Figure 1 for location of receptors.

Table 7 PEAK HOUR NOISE LEVEL ATTENUATION FROM ROADWAYS - HILLSBOROUGH RESOURCE RECOVERY FACILITY

			Predicted Noise Levels						
			Without Facility				With Facility		
Roadway Section	Distance	Leq[a]	L10	L50	L90	Leq[a]	L10	L50	L90
SR60 #1	50	73.9	76.5	73.1	69.6	73.9	76.5	73.1	69.6
	100	69.2	71.4	68.7	66.1	69.2	71.4	68.7	66.1
	150	66.4	68.3	66.0	63.7	66.4	68.3	66.0	63.7
	200	64.3	66.1	64.0	61.9	64.3	66.1	64.0	61.9
	300	61.2	62.8	61.0	59.2	61.2	62.8	61.0	59.2
	500	57.2	58.6	57.0	55.5	57.2	58.6	57.0	55.5
	1,000	51.5	52.6	51.3	50.1	51.5	52.6	51.3	50.1
SR60 #2 & SR60 #3	50	74.3	76.9	73.5	70.2	74.3	76.9	73.5	70.2
	100	69.6	71.7	69.2	66.6	69.6	71.7	69.2	66.6
	150	66.8	68.6	66.4	64.3	66.8	68.6	66.4	64.3
	200	64.7	66.4	64.4	62.4	64.7	66.4	64.4	62.4
	300	61.6	63.2	61.4	59.7	61.6	63.2	61.4	59.7
	500	57.6	58.9	57.4	56.0	57.6	58.9	57.4	56.0
	1,000	51.9	53.0	51.8	50.6	51.9	53.0	51.8	50.6
Faulkenburg #4	50	62.9	66.4	60.0	53.7	63.2	66.7	60.4	54.1
	100	58.4	61.7	56.6	51.4	58.7	61.9	56.9	51.9
	150	55.8	58.9	54.5	50.1	56.1	59.1	54.8	50.5
	200	54.0	56.8	52.9	49.0	54.2	57.0	53.2	49.4
	300	51.5	53.9	50.8	47.6	51.7	54.2	51.0	47.9
	500	48.5	50.4	48.1	45.8	48.7	50.6	48.4	46.1
	1,000	45.2	46.4	45.1	43.9	45.4	46.5	45.3	44.1
Faulkenburg #5	50	62.2	65.8	59.1	52.5	63.2	66.7	60.4	54.1
	100	57.8	61.2	55.9	50.6	58.7	62.0	57.0	52.0
	150	55.4	58.4	54.0	49.6	56.2	59.2	55.0	50.8
	200	53.7	56.5	52.7	48.9	54.5	57.2	53.6	49.9
	300	51.6	53.9	51.0	48.2	52.2	54.5	51.7	48.9
	500	49.5	51.0	49.3	47.6	49.9	51.4	49.7	48.0
	1,000	48.1	48.8	48.0	47.2	48.2	49.0	48.2	47.4

[a] Hourly Leq

Trucks traveling along Faulkenburg Road will probably maintain a relatively steady speed of 45 mph. At the railroad tracks and at the access road to the site these trucks will have to slow down to about 20 mph or stop.

Nevertheless, the model treated the velocity as a constant higher velocity to maintain the conservatism of the analysis. Trucks hauling along State Road 60 will maintain a speed of 55 mph. Faulkenburg Road and the proposed access road will not have grades that could increase truck generated noise levels.

The maximum hourly truck volume expected to be added to Faulkenburg Road from the proposed project is 106 vehicle trips. At this volume, the median sound level expected from the trucks along with the current existing trucks traveling along Faulkenburg at 100 feet from the roadway is between 58 to 59 dBA with or without the facility. The closest residence along Faulkenburg Road is about 100 feet from the roadway. Truck traffic could be expected to slightly increase ambient noise levels by 0.5 to 1 dBA during this maximum truck volume period along Faulkenburg Road south of the sites entrance. As stated earlier, an increase of 3dB is barely perceptible in the natural environment. The Hillsborough County EPC noise criteria allows a sound level limit of 75 dBA at manufacturing or industrial receiving land uses, a level of 65 dBA at commercial or business receiving land uses, and a sound level limit of 60 dBA at residential land uses between the hours of 7 a.m. and 10 p.m. The peak hourly traffic with the facility traffic is not expected to exceed the County criteria at any of the receptors except at Site 6. Based on the one 24 hour measurement made by HCEPC at this site, the noise criteria are currently being exceeded.

Monitoring by the county at Site 6, which is at the residence along the east side of Faulkenburg Road indicate the existing daytime equivalent noise levels (Leqs) range between 61-64 dBA and nighttime Leqs range from 55-58 dBA. Modeling of the existing traffic levels at all of the monitoring sites, as shown on Table 6 at the indicated peak and nighttime hours along with the steady noise source of 75 dBA at 50 ft from the facility, again predicts an insignificant increase of only 0.5 to 1.0 dBA above existing monitored and modeled data.

Figure 1 also presents the contour analysis using data from the modeling runs. Contours are shown as broad lines and are in 5 dBA increments ranging from 75 to 55 dBA. These contours represent the worst case (maximum noise levels) for each receptor from peak traffic for the hour with the highest existing traffic volume as indicated on Table 4 and the peak hourly traffic associated with the facility operations. Care must be exercised when interpreting these results because the contour lines were generated using rush hour traffic values which occur only two hours a day and thus are not representative of a 24-hour period. This map indicates no substantial increase of noise levels (between 0-1 dBA) due to this facility.

REFERENCES

Bureau of Land Management. 1982. Guidelines for preparing noise impact analysis. Transportation and Noise Analysis Handbook, 17 February 1982.

Camp Dresser & McKee Inc. (CDM) 1983. Project file: Hillsborough County noise monitoring data sheets. 2-3 November.

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_______. 1983. Letter of transmittal from P. Berry to P. Kennedy of CDM, 11 November 1983.

Peterson, A.P.G. 1980. Handbook of noise measurement. Ninth Edition. Gen. Rad. Inc. Concord, Massachusetts.

United States Environmental Protection Agency. 1971. Noise from construction equipment and operations, building equipment and home appliances, 31 December 1971. NTID300.1.

Von Gierke, H.E. 1977. Guidelines for preparing environmental impact statements on noise. Sponsored by the Office of Navel Research, AO/A-044-384. June, 1977. National Academy of Sciences.

EXHIBIT A

WORK PLAN AND CORRESPONDENCE RELATED TO NOISE MONITORING PROGRAM

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices
And/Or To Other Than The Addressee
To: ______________ Loctn.: ______________
To: ______________ Loctn.: ______________
To: ______________ Loctn.: ______________
From: ______________ Date: ______________
Reply Optional [ ] Reply Required [ ] Info. Only [ ]
Date Due: __________ Date Due: __________

TO: Buck Oven

FROM: Dennis Wile

DATE: September 13, 1983

SUBJECT: Hillsborough County Resource Recovery Project; Plan of Study, Noise Assessment

Since Hillsborough County has a noise ordinance, I recommend that Bob Jones (Environmental Specialist, Hillsborough Environmental Protection Commission, 9th Avenue, Tampa, 33605, 813/272-5960) be contacted to determine possible violations of the County's receiving land use standards of 60 dB(A), 7 AM to 10 PM, and 55 dB(A), 10 PM to 7 AM, for any residential area that might be impacted. No predicted levels have been indicated by this report.

Enclosed are recommended levels for construction equipment that might be used during the construction. All contractors and subconstractors coming onto or leaving the site should be required to meet the state's noise standards for motor vehicles as monitored and enforced by the Florida Highway Patrol.

Concerns over startup times (7:00 AM) and other voluntary compliance with reasonable hours for construction (startup or shutdown) during weekdays and weekends should be adhered to. All pumps should be contained by berms or adequate acoustic wall construction and the noisiest of reciprocating engines should be equipped with hospital-type mufflers to provide relief for any residential site that may be affected by construction activity.

If the ambient levels for the site will be exceeded once the plant is in operation, consideration should be given to operational engineering noise control to minimize such noise impact on residential sites nearby.

Transportation to and from the site should be routed to minimize noise or dangerous traffic impact on any nearby residential site once the plant is in operation. All trucks hauling recoverable material to the plant for waste fuel should also meet the in-use truck standards in Florida regulations. It would be advisable to publish a telephone number for the plant in the event complaints may develop. Immediate response should be the hallmark of the management in handling such events and attempts to furnish relief should be made posthaste.

DEW:mpt

Attachment

COUNTY OF HILLSBOROUGH
P.O. BOX 1110 TAMPA, FLORIDA 33601

NORMAN W. HICKEY, COUNTY ADMINISTRATOR

October 20, 1983

Mr. Hamilton S. Oven, Jr.
Administrator
Power Plant Siting Section
Florida Dept. of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Re: Hillsborough County Solid Waste Energy
Recovery Program - Plan of Study

Dear Mr. Oven:

This letter describes the proposed ambient noise monitoring program and analytical procedures to be used in evaluating potential noise impacts from the proposed Hillsborough County energy recovery project. The material presented herein expands upon Section 6.2.9 of the Plan of Study for Completion of the Application for Certification of Proposed Electrical Power Generating Plant Site submitted to FDER in August, 1983.

Due to the scale of the proposed facility (ultimately capable of processing 1,600 tons per day of MSW) and the type of equipment required for its construction and operation (fans, trucks, etc.), the evaluation of potential noise issues was included in the Plan of Study for the Application for Site Certification. However, it is important to realize that noise impacts are not expected to be major at the facility as presently envisioned.

Preliminary noise analyses conducted during this project's site selection activities indicated that noise impacts from plant operation would not be a problem. Influencing factors leading to this conclusion include:

- readily available and commonly used mitigation measures that can be easily integrated into facility design.

- adequate buffer distances between the proposed plant location and nearby sensitive receptors.
- existing ambient noise levels which are presently within the limits set for various land uses by Hillsborough County's Noise Criteria.

Since the operation of the facility (designed with noise control equipment) should not result in major noise problems, the objective of the noise analysis to be conducted for the Application for Site Certification is principally threefold:

1. Determine potential noise impacts and required mitigation measures associated with construction activities.
2. Determine potential noise impacts and required mitigation measures associated with project related truck traffic.
3. Verify and present the conclusions developed during the preliminary noise analysis, i.e., plant operation will not result in major noise problems.

The principal analytical techniques to be used to predict noise impacts will be similar to those presented in the following references:

"Direct Environmental Factors at Municipal Wastewater Treatment Works", EPA-430/9-76-003.

"Highway Noise - General and Control", Transportation Research Board, Report 173.

"Highway Noise - A Design Guide for Prediction and Control", Transportation Research Board, Report 174.

Hillsborough County Noise Criteria (Rules of the Hillsborough County Environmental Protection Commission, Chapter 1-10, 1976) will be used in evaluating the significance of noise impacts at receiving land uses. In addition, the items noted by Dennis Wile of FDER in his memo to Buck Oven (dated September 13, 1983) will be addressed.

Preliminary ambient noise data was obtained by Camp, Dresser and McKee, Inc. in the vicinity of the site during the preliminary site selection activities for this project. In support of the noise analyses to be conducted for this project, additional data collection activities are planned. This includes obtaining more ambient noise information on and near the site and estimating traffic mix along Faulkenburg Road.

The proposed noise inventory is designed to provide a gross survey of ambient noise conditions during day and night time periods. The inventory will determine representative ambient noise levels at locations on and adjacent to the facility site. The locations proposed for this noise inventory are shown on Figure 1 and the basis for their selection is described in Table 1.

Noise measurements will be made with a hand-held meter which measures dBA sound pressure levels. Spot noise measurements will be made at each of the indicated locations in order to determine a representative sound pressure level for the daytime period (7:00 a.m. to 10:00 p.m.) and a representative sound pressure level for the nighttime period (10:00 p.m. to 7:00 a.m.). From this data a representative combined day/night weighted measure can be calculated. Measurements at each location will be conducted with a full 360° sweep so that omnidirectional noise sources will not overly influence the ambient noise estimates for a particular location. If the Hillsborough County Environmental Protection Commission (HCEPC) provides 24-hour monitoring data, these data will be used to supplement the measurements described above.

Traffic mix information will be obtained by spot checks along Faulkenburg Road. This data will be used to estimate the existing truck traffic volume and associated noise levels.

If you have any questions or comments, please do not hesitate to call. Please see that the appropriate agencies, including the HCEPC Noise Group, are provided with a copy of this Noise Work Plan.

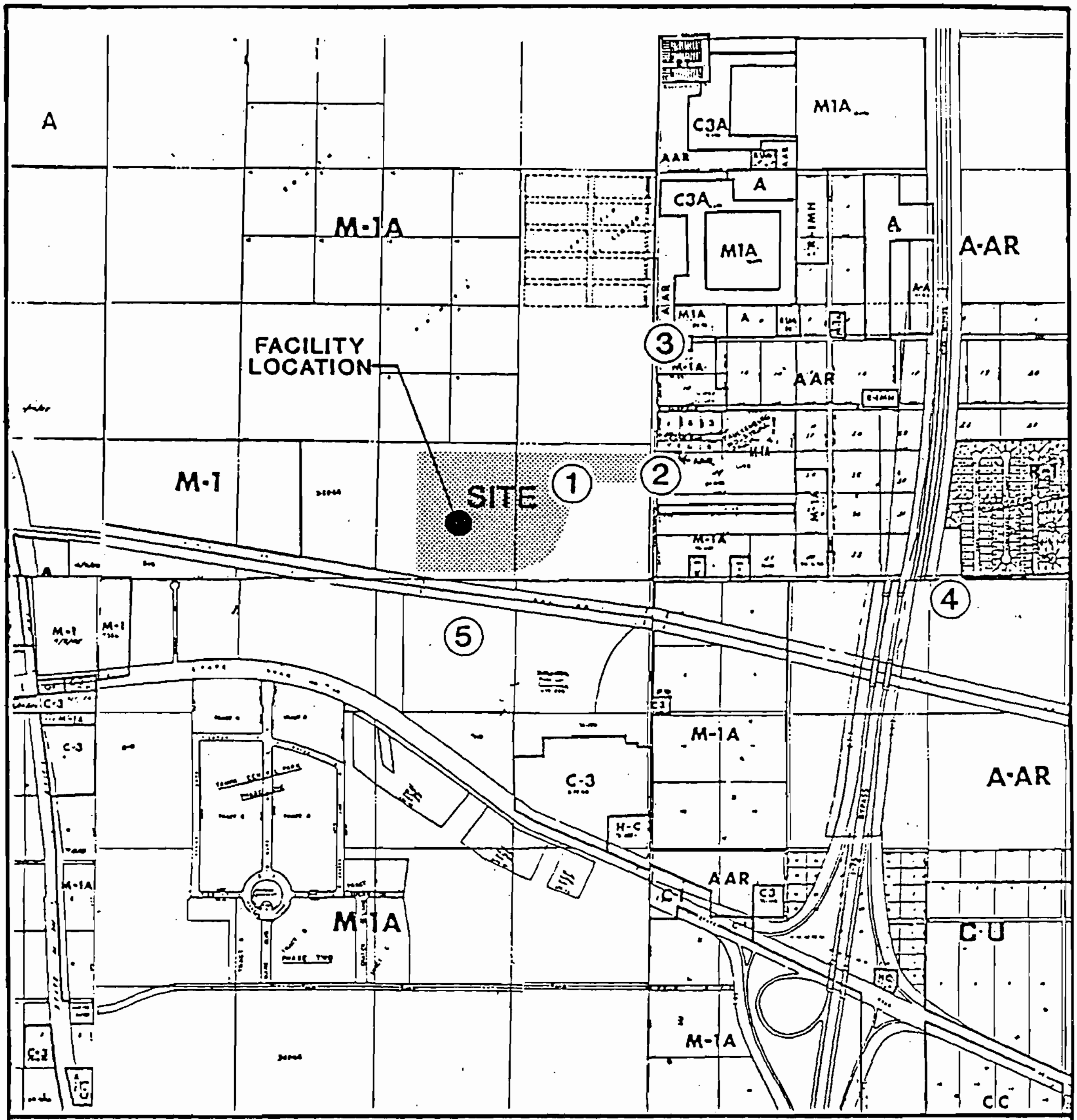
We plan to conduct the data collection activities described in this letter during early November, so any recommended changes or comments received before November 4, 1983, could be easily integrated into our data collection activities.

Very truly yours,

Marc J Rogoff

Marc J. Rogoff, Ph.D
Resource Recovery Program Coordinator

MJR/pd
Attachment
cc: Warren N. Smith, Director, Dept. of Solid Waste
Phillip C. Kennedy, CDM



ZONING DISTRICTS

A	Agricultural	C-C	Community Commercial	C-3A	Limited Light Industrial
A-AR	Acreage Agricultural Residential	C-U	Community Unit	C-3	Commercial Light Industrial
R-1	Single Family Residential	H-C	Highway Commercial	M-1A	Restricted Industry
R-1MH	Single Family Residential & Mobile Home	C-1	Neighborhood Commercial	M-1	Industrial

Hillsborough County Resource Recovery Facility
and Wastewater Treatment Plant

Hillsborough County Division of Public Works

Department of Solid Waste
Department of Water and Wastewater Utilities

FIGURE 1
NOISE MONITORING LOCATIONS

CAMP DRESSER & McKEE

TABLE 1

Additional Information on Selected Noise Monitoring Locations

Location Number	Basis for Selection
1	This location was selected to collect existing ambient noise levels at the boundary of that portion of the site where development would occur (between the proposed facility and the nearest residential receptors).
2	This location was selected because it is at the closest residence to the proposed site and site access road. This area is zoned A-AR (Acreage Agricultural Residential). An M-1A district (Restricted Industry) presently used for mixed light industrial and limited residential surrounds the A-AR district. Four single family dwellings are located along this stretch of Faulkenburg Road.
3	This location was selected because it is in the vicinity of the closest main residential area to the site and Faulkenburg Road. It is also zoned A-AR.
4	This location was selected because it is the closest major residential development to the site. It is zoned R-1 (Single Family Residential). Ambient levels at the location are expected to increase once Route I-75 is open for traffic.
5	This location is the nearest site to the proposed facility that is planned for development. Currently undeveloped, this location is within the Interstate Park of Commerce. It is anticipated that warehousing/light industrial activities will locate here in the future.

COUNTY OF HILLSBOROUGH

Date: October 25, 1983

TO: Bob Jones, Environmental Protection Commission

FROM: Patricia V. Berry, PVB Solid Waste Department

SUBJECT: NOISE MONITORING FOR THE FAULKENBURG ROAD RESOURCE RECOVERY FACILITY SITE

The Hillsborough County Resource Recovery Project is moving ahead in the development of a solid waste energy recovery facility to be located north of State Road 60 and west of Faulkenburg Road.

The County is obtaining the necessary environmental permitting through the Florida Department of Environmental Regulation's Application for Certification of Proposed Electrical Power Generating Plant Site. A copy of our Plan of Study was distributed to your office in September.

To fulfill the requirements for determining the ambient noise levels at the property, our consultants, Camp, Dresser and McKee, Inc., will be monitoring the vicinity with hand-held noise meters. These readings will be analyzed to determine if mitigative measures are necessary to lessen the noise impact from the Project.

We are requesting, by this memo, that twenty-four (24) hour noise monitoring also be conducted at the site by the Environmental Protection Commission to assure that the most accurate ambient readings are obtained.

As per our previous discussion, please contact this office so that we can schedule a time that is convenient for you to set up the monitor. We will provide you with a layout of the property and will accompany you to the site to locate a monitoring station.

PVB/pd

EXHIBIT B

MATERIAL RELATED TO HILLSBOROUGH COUNTY 24-HOUR MONITORING NEAR THE SITE

COUNTY OF HILLSBOROUGH

MEMORANDUM

Date 7 November 1983

To Patricia V. Berry, Solid Waste Department

From Bob Jones, EPC.

Subject: Noise Monitoring for the Faulkenburg Road Resource Recovery Facility Site

In reply to your memo dated October 25, 1983, sound level measurements were taken at a site designated by your consultants which was across Faulkenburg Road from the entrance to the proposed site.

A chart of the readings requested is enclosed. The L_{dn} was computed to be 74 dBA.

I feel the majority of the noise generated during the testing period was due to traffic on Faulkenburg Road. 50% of the time the noise level was 60 dBAs or less. The graph shows the increase starting at 0500 and is fairly steady between 55 and 60 dB level from 0630 to 1830.

There is a great amount of truck traffic on Faulkenburg and with the completion of the extension of Faulkenburg south of 60, I believe truck traffic may increase. There is no doubt that the L_{dn} at the sampling site will increase with the completion and operation of the Resource Recovery facility.

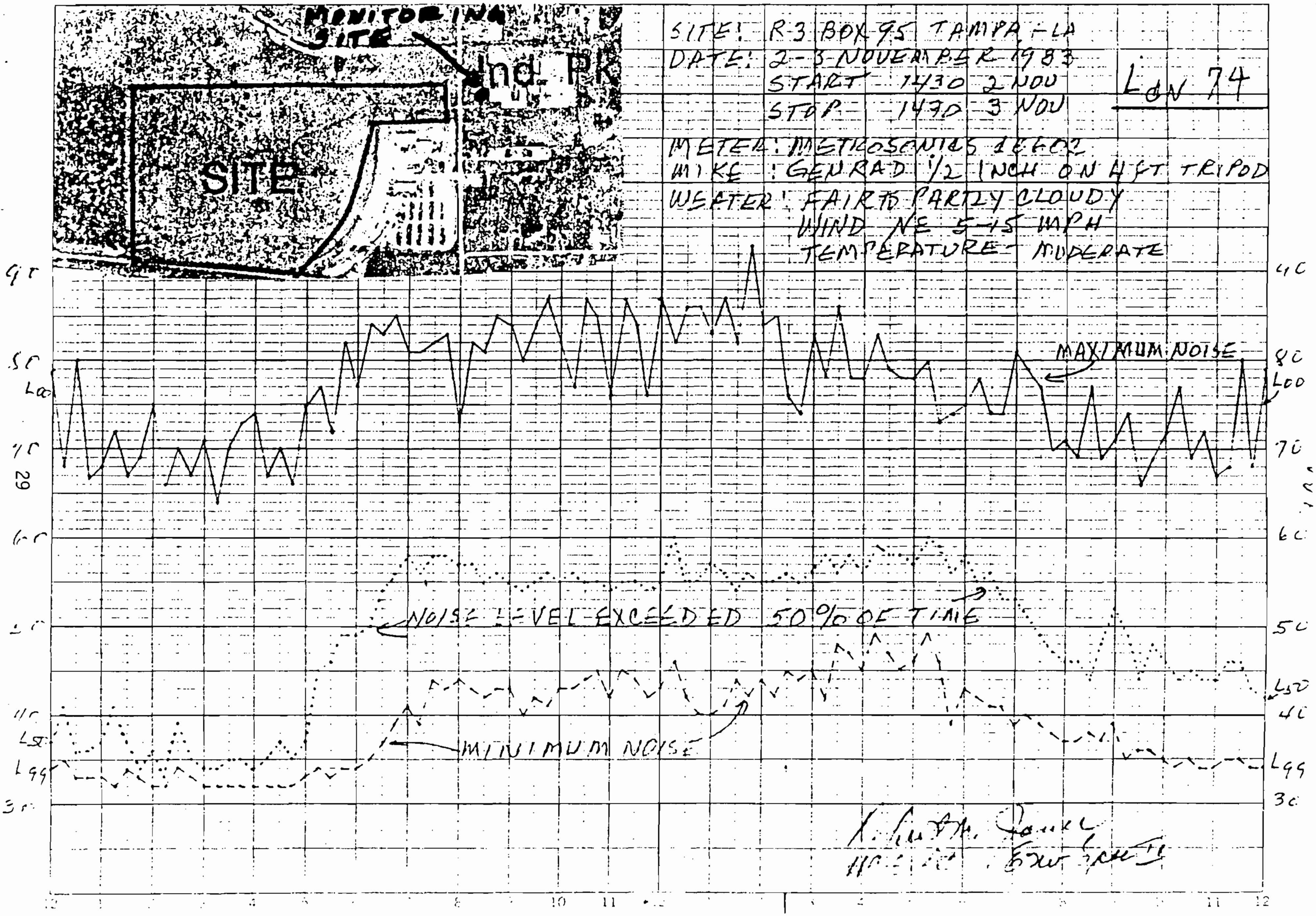
If you need further noise monitoring, please let me know.

BJ/rr
Enc.

K+E 1 DAY BY HOURS X 100 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 2050

Best Available Copy



SITE: R-3 BOX 95 TAMPA - LA
DATE: 2-3 NOVEMBER 1983
START 1430 2 NOV
STOP 1430 3 NOV

L_{dn} 74

METER: METROSONICS 1EEO2
MIKE : GENRAD 1/2 INCH ON 4 FT TRIPOD
WEATER: FAIR TO PARTLY CLOUDY
WIND NE 5-15 MPH
TEMPERATURE - MODERATE

Leq Reading

Start 1430 11-2-83
Stop 1430 11-3-83
Survey for
Solid Waste Dept
across street from
entry to [illegible] site
wea / Fair
w/ V NE Calm TO 15mph

Leq

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064 15
060 1445 ↑ 1st Reading

Starting time 1430

Lmax Reading

Lmax

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075
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079 16
075
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083 15
074 1445
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↑ 1st Reading

starting time 1430

L50 Readings

L50

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056
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056 1500
055 1445   1st reading
```

Starting time 1430   11-2-83

L99 Readings

045
042
044
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043
042
045 1500
044 1445 - 1st reading

Starting time 1430 11-2-83

Jones

PRELIMINARY

OPERATING INSTRUCTIONS

for

db-602 Sound Level Analyzer

by: METROSONICS, INC.
Box 18090
Rochester, NY 14618

GENERAL

The db-602 is a completely self-contained sound level analyzer. One portable box contains all sound measuring, computer/memory storage and display circuits with a rechargeable battery and charging circuitry.

A completely automatic data taking and analyzing system, the db 602 Sound Level Analyzer offers several modes of operation. It can perform as a sound level meter with digital readout. In this mode, calibration of the unit is easily accomplished since the display includes SPL (sound pressure level) and shows exactly what the unit is recording.

While the signal is being processed, its magnitude is being sampled and stored in a unique electronic memory. This working memory consists of 100 storage registers, each 1 dB wide, with a capability of retaining over 65,000 samples per register.

The 602 performs L_n and L_{eq} measurements. L_n is a value that the measured sound exceeded "n" percent of the time. As an example, the value for L_{99} is the level that was exceeded 99% of the time. L_{50} is the value that was exceeded 50% of the time and so forth from L_1 to L_{99}. L_0 is the value not exceeded or the highest peak value measured during the test duration.

L_{eq} (equivalent sound level) is defined as the constant sound level which in a given situation and time period, would convey the same sound energy as does the actual time varying sound. L_{eq} is useful in relating to the effects of non-steady sound, as commonly encountered in community environments. L_{dn} is L_{eq} modified with a 10 dB penalty applied to nighttime sounds (10 pm to 7 am).

The SINGLE INTERVAL compute mode provides for automatic computation of any L_n number by dialing the "N" value on two front panel thumbwheel switches. Computation from data in the working memory is updated each second during the test and does not affect new data being recorded. A test duration clock is also provided to display the total test time. In the MULTIPLE INTERVAL mode, calculation of four (4) preset L_n values are automatically performed at predetermined intervals and stored in a second, longer storage memory.

With available options, L_{eq} and L_{dn} are automatically calculated and displayed on the front panel. Additionally, contents of the memory can be read out and P_I or L_n versus level scans presented to external printers, plotters, or computers.

BATTERY CHARGING

The internal 6 volt sealed lead-acid battery can be recharged from either a 120 volt ac or 12 volt dc power source. Ac power connections to the db-602 power connector are supplied. To charge from a 12 Vdc source, connect the positive lead to pin D and the negative lead to pin E of the power connector P1.

When an external power source is connected, the internal battery will recharge in all operating modes and the off mode. Full battery charge is indicated by an illuminated dot in the lower right corner of the display (when the db-602 is connected to an external source). Internal circuits prevent the battery from damage of overcharge.

Charging circuits are fully automatic and are self-regulating. Protection is accomplished by fuses mounted on the internal chassis. A 3AG 1 ampere fuse is utilized in the ac charging circuit and a 3AG 4 ampere fuse in the dc circuit. The following table lists the pin functions of the power connector:

Pin	Function
A	Ac Hot
B	Ac Neutral
C	Chassis Ground
D	12 Vdc Positive
E	12 Vdc Negative Return (chassis ground)
F	Load Inhibit
G	Spare
H	Spare

NOTE

Recharging time is normally 8 to 10 hours with 90% of full battery capacity being accomplished in the first hour.

CONTROLS

The following is a list of the front panel controls or indicators on the db-602 Sound Level Analyzer.

Control or Indicator	Position	Function
FUNCTION switch	OFF	Disables all internal circuitry and clears memory. Normal position for battery charging.
	STANDBY	Inhibits measured data from being stored in working memory and the Test Duration Clock from advancing. All other functions remain operational.
	MULTIPLE INTERVAL	Operating mode for storage of L_n values at discrete time intervals. Operates in conjunction with working memory and MULTIPLE INTERVAL switch.
	SINGLE INTERVAL	Operating mode for storing data into working memory.
	CLEAR MEMORY	Clears memory when selected and after ACTIVATE BUTTON is pressed.
DISPLAY MODE switch	OFF	Turns off display to reduce battery power drain. Normal position when sound measurements are being made over an extended period of time.
	TEST DURATION	Displays in hours and minutes on front panel the total cumulative test time data was measured from last "clear memory". A maximum of 99 hours 59 minutes can be displayed. Time displayed is less all inhibit time from external inhibit functions such as a wind velocity detector and from the STANDBY mode.
	L_n COMPUTE	Displays the computed L_n values of the data stored in memory. Computed value is updated once per second.

Control or Indicator	Position	Function
DISPLAY MODE switch (cont.)	SOUND LEVEL dB	Provides direct display of sound level being measured. RESPONSE switch controls averaging of display value.
	L_{eq} (optional 600-02 feature)	Calculates and displays L_{eq} of the values stored in memory. The computed value is updated once per second.
	L_{dn} (optional 600-02 feature)	Calculates and displays L_{dn} of the values stored in memory. The computed value is updated once per second.
	TIME SET HOURS (operable only with L_{dn} option)	When selected, display indicates local time on internal clock. ACTIVATE button will advance hour until released.
	TIME SET MIN	Same as hours except minutes are advanced. NOTE The internal L_{dn} Clock must be reset to the correct time after the FUNCTION switch is set at OFF.
	L_n Scan	When selected, provides a readout of all 100 values of L_n, starting at L_{99} and ending at L_0, at a one per second rate. Scan starts when ACTIVATE button is pressed. Values are also provided at Output connector for digital printers (or XY plotters when 600-05 is installed. NOTE MULTIPLE INTERVAL pushbutton switches L_a, L_b, L_c, L_d must all be "up" to obtain the L_n scan.

Control or Indicator	Position	Function
DISPLAY MODE switch (cont.)	P_1 SCAN	When selected, calculates and displays the percentage of time that the measured sound was present at each 1 dB level of the 100 dB range to a resolutio of 0.1 percent. Scan starts when the ACTIVATE button is pressed and begin at the lowest level of the selected amplitude range and continues in 1 dB steps to the highest level. Output is provided at Output connector for digital printers (or XY plotters when 600-05 option is installed).
RESPONSE switch	FAST or SLOW	Selectable averaging of response to either fast or slow by controlling time constant of RMS detector. Fast/Slow rate is defined by ANSI S1.4-1971 Type 1.
INPUT switch	MK-A	Provides input circuitry to match low level common microphones 1/2" or 1" diameter with a sensitivity greater than 25 dB re 1V/Pa and with a dynamic range from 20 to 120 dB.
	MK-B	Provides input circuitry to match low level common microphones 1/2" or less diameter with a dynamic range of 30 to 130 dB.
	Input Levels 50 to 130 in 10 dB steps	Provides variable attenuation to calibrate high level input sources to the analyzer.
L_n and TIME DIAL		For manually selecting value of L_n to be displayed with DISPLAY MODE switch at L_n COMPUTE.
ACTIVATE switch		When pressed, initiates desired operation by Display and Mode switches selected.

Control or Indicator	Position	Function
MULTIPLE INTERVAL switch		
Thumbwheel switches	L_a, L_b, L_c, L_d	Programs each of four sets of registers, (a, b, c, d) to calculate and store manually selected values of L_n. Any L_n may be programmed into each of the four registers, with the exception that L_{00} in register "a" calculates and stores L_{eq} when this option is installed. NOTE L_{00} should not be programmed into L_a if the L_{eq} option is not installed.
	TIME X 15 MIN	For manually selecting the time interval between multiple interval readings. Programmable in steps of 15 minutes (i.e., 04 is 1 hour).
Pushbutton switches	L_a, L_b, L_c, L_d	Selects the set of storage registers L_a, L_b, L_c, or L_d to be read out during the 602 scan cycle.

THEORY OF OPERATION

Operation of the db-602 Sound Level Analyzer can best be understood with reference to the simplified block diagram in Figure 1.

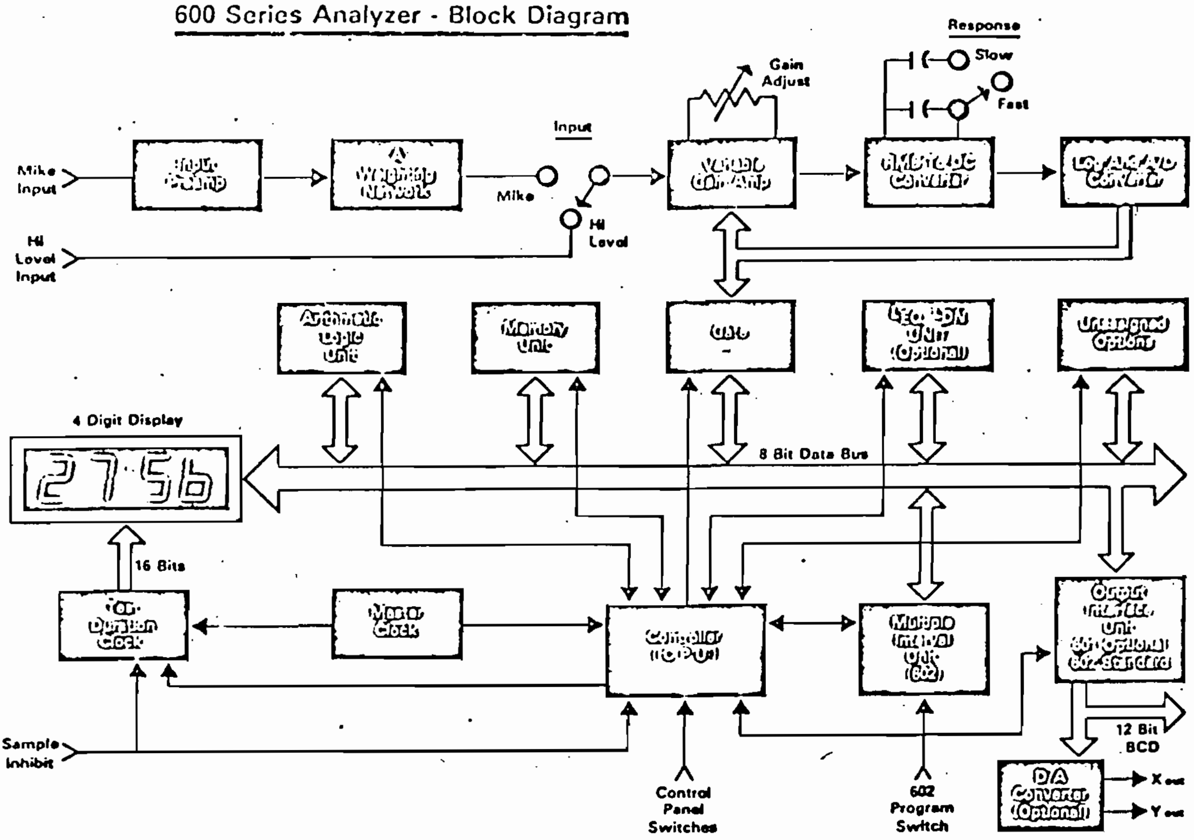

Figure 1

DATA LOGGING

Inputs to the db-600 series are through two separate audio circuits. The low level circuit accepts signals from external microphones with sensitivities of -24 to -50 dB relative to 1V/Pa. and can process signals with a wide 100 dB dynamic range. "A" weighting is performed on signals by built-in precision filter networks. The unit is designed to utilize METROSONICS, B&K and GR microphones with their associated preamplifiers.

The high level input accepts ac signals from magnetic tape recorders, sound level meters and other precision audio sources. Both the input preamplifier and the A-weighting networks are bypassed when this input is used. Dynamic range of extended signals is limited primarily by the input device used. A wide range input switch matches the analyzer to the full scale of the input source.

The signal is rectified in a true RMS detector and converted into digital format. Data is then gated on to the internal data bus. Simultaneously the signal is sampled by the computer circuits. The central processor directs this amplitude information into the built-in 100 storage register electronic memory for later analysis.

DATA ANALYSIS

For L_n calculation, the algorithm utilized in the microprocessor is similar to the technique in manual analysis. Total number of samples are counted in the arithmetic logic unit, then multipled by the desired L percent, programmed by the front panel switch. The arithmetic logic determines the level above which the sum of the samples in the level counters equal the L percentage value selected. This information is displayed on the front panel LED display.

L_{eq} calculation utilizes the digital information on the data bus. The antilog is taken of each sample and added to the antilog of the preceding samples. The summation of the antilogs is then divided by the number of samples. The log of this value yields L_{eq}.

A separate digital memory computes L_{dn}. The actual test starting time is entered into the L_{dn} memory through the DISPLAY MODE switch and the central processor. The 10 dB penalty is then automatically added to the sampled value for the hours between 10 pm and 7 am.

The db-602 includes a Multiple Interval Unit (MIU). The MIU's long term storage memory records L_n computations of up to four (4) variables at programmed time intervals. Selected variable can be any of the L_n values or L_{eq}, as programmed by thumbwheel switches on the db-602 control panel.

Time interval between computations is programmable from 15 minutes to 24 hours 45 minutes in units of 15 minutes. At the end of each interval, the four (4) computations are performed and put into the longer storage MIU memory. The sample storage memory is then cleared to begin another time interval.

A total of 96 separate sets of storage registers are provided. For example 96 sets of readings can be taken once every hour for 4 days, or once every day for over 3 months.

DATA READOUT

Data readout is selected by the DISPLAY MODE switch and is automatically presented on the front panel digital display.

Along with test duration, L_n compute, sound level, L_{eq}, and L_{dn}, the db-602 automatically computes and scans the 100 data prints of L_n and P_1, and the 96 sets of storage registers for L_n. The latter sets of data are transferred by the Output Interface Unit in parallel BCD code for readout by external peripheral equipment.

The 600-05 Analog Plotter Interface (optional) utilizes a built-in digital to analog converter to convert the BCD code to a dc signal to drive an XY plotter. This allows direct graphing of percentile at each sound level (histograms), accumulated level versus L_n, or L_n values versus time.

OPERATION

Initial

1. Set FUNCTION switch at STANDBY for 1 minute. (Although the db-602 is a solid state instrument, a brief warm-up period is required for the input amplifiers and capacitors to reach voltage and thermal stabilization).

2. If operating with a microphone input, calibrate the db-602 according to the following calibrating procedures.

   a. Set INPUT switch at MK-A or MK-B depending on the type of microphone and desired range, see CONTROLS section.

   b. Set the FUNCTION switch at STANDBY, DISPLAY MODE switch at SOUND LEVEL dB.

   c. Place the calibrator over the microphone and adjust the gain adjust control (below the display) to read the calibrator output level.

3. If operating with a high level output source calibrate the db-602 according to the following procedures.

   a. Calibrate external source according to its instructions using a calibrated source.

   b. Leave the source connected and set FUNCTION switch at STANDBY, DISPLAY MODE switch at SOUND LEVEL dB.

   c. With the calibrated source connected, observe the value displayed. Advance the INPUT switch starting from 50 until the display can be adjusted by the gain adjust control for the correct (calibrated source) value. When a sound level meter is used as the source, the INPUT switch setting is normally the full scale reading of the meter.

NOTE

If INPUT switch is changed after calibration, then the value recorded or displayed will have to be corrected by the value and direction the INPUT switch was moved from the calibrated position.

4. Set FUNCTION switch at CLEAR MEMORY and press ACTIVATE button.

NP

5. If operating with the L_{dn} option the internal clock must be set to the local standard time, see CONTROLS section.

DATA LOGGING

Single Interval Mode (used when data is to be taken and analyzed over only one time period).

1. Set FUNCTION switch at SINGLE INTERVAL and DISPLAY MODE switch at OFF.

Multiple Interval Mode (used when data is to be taken and analyzed over more than one time period.

1. Set MULTIPLE INTERVAL L_a thumbwheel switches to the L_n value to

be stored in the first set of registers. Similarly set the L_b, L_c, and L_d thumbwheel switches for the L_n values to be stored in the next three registers respectively. L_{eq} may be stored by setting L_a to 00. THE FIRST REGISTER SHOULD NOT BE SET TO 00 IF LEQ IS NOT INSTRUCTED AS ERRONEOUS READINGS WILL BE PUT INTO ALL REGISTERS

2. Set MULTIPLE INTERVAL TIME thumbwheel switches to the desired time for each interval. The switches program the db-602 in multiples of 15 minutes, i.e., "04" is one hour, "96" is 24 hours.

read carefully

3. Set FUNCTION switch at MULTIPLE INTERVAL and DISPLAY MODE switch at OFF. by placing the FUNCTION switch into the CLEAR MEMORY position and pressing the ACTIVATE switch. The 602 must be cleared before programming the front panel switch settings into the unit.

WARNING

Do not reset any of the MULTIPLE INTERVAL L_a, L_b, L_c, L_d or TIME switches during a test. If this occurs erroneous data will be placed in the memory and the test must be reinitiated.

4. Data logging can be inhibited during tests by either placing the FUNCTION switch in the STANDBY position or applying a ground to pin F of the power connector manually, through a wind sensor or other external means. Inhibiting data will stop the test duration clock from running but will not affect other clocks in the db-602. The amount of valid data can thus be easily determined.

DATA READOUT

Single Interval Mode

After the sound levels have been recorded and stored in memory perform the following steps.

1. Place the FUNCTION switch at STANDBY to stop further measurements from taking place.

2. Set the DISPLAY MODE switch at TEST DURATION and record the total test time.

3. Refer to the DISPLAY MODE portion of the CONTROLS section and record the values as necessary by selecting the desired function (i.e., L_n, L_{eq}, L_{dn}, L_n scan, P_1 scan).

NOTE

Graphs of L_n vs level can be plotted manually by advancing the L_n & TIME dial and recording the displayed value.

Multiple Interval Mode

After the sound levels have been recorded and stored in memory perform the following steps.

1. Place the FUNCTION switch at STANDBY to stop further measurements from taking place.

2. Set the DISPLAY MODE switch at TEST DURATION and record the total test time.

3. L_n for each of the set of registers can be read by depressing the desired L_n pushbutton, setting the FUNCTION switch at L_n SCAN and pressing the ACTIVATE BUTTON. The L_n values over the time period will be recalled and presented sequentially at a one per second rate at the front panel display and at the output connector on the side of the db-602.

4. Similarly all four L_n registers can be scanned for output data. After a scan has been completed rotate the DISPLAY MODE switch back through the TIME SET-HOURS position to the L_n SCAN position before pressing the ACTIVATE button. This resets the scan counters. All data is in a circulating memory and can be recalled when desired until the scan memory is manually cleared.

NOTE

L_{eq}, cummulative L_n and P_1 functions are available from the working memory during the multiple interval mode. However, this data covers the time frame from the start of the last working memory erase (start of the last time interval).

DATA INTERFACES AND OTHER ACCESSORIES

1. Digital Printer. Data is available to an external digital printer in 3 digit BCD parallel code, TTL/DTL compatible positive logic. Print command, a TTL compatible positive 10 millisecond pulse accompanies each data output.

   Data is presented to the output connector at the same time as it appears on the front panel display. Table 3 lists the functions appearing on each pin of the output connector.

2. XY Plotter. Analog signal information is available at the output connector for direct graphing of data. Data of 10 volts represents full scale readings of both the X and Y axis. If graphs with greater resolution are required, sensitivity of the XY plotter may be increased.

3. Autotimer. The 600-06 Autotimer (optional) is programmable for automatically starting and inhibiting sampling signals into the db-602 working memory.

   A. Program the TIME BEFORE TURN-ON Thumbwheel switches to the desired "off" time, or time before starting.

   B. Program the ON TIME Thumbwheel switches to the desired "on" time.

   C. Set the INTERVAL switch to either the SINGLE or MULTIPLE position and press the ACTIVATE button. In the SINGLE position the timer will proceed through one off-on cycle and then inhibit the db-602 memory from taking additional data. In the MULTIPLE position the off-on cycle will be repeated until manually stopped.

4. Sampling Time Selector. The 600-08 Sampling Time Selector (optional) provides selection of any of 10 preset sampling intervals. Set the front panel switch to 1/16, 1/8, 1/4, 1/2, 1, 2, 4, 8, 16 or 32 seconds per sample, as desired. Increased sampling rate will provide finer resolution while longer sampling rate permits extended field usage.

5. Preset Level Actuator. The 600-09 Preset Level Actuator (optional) activates external devices when a preset level is exceeded.

   A. Turn the DISPLAY MODE switch to the PRESET LEVEL position.

   B. Preset the L_n AND TIME SELECT switch to the desired level and press the ACTIVATE button. A contact closure will be made at the miniature phone plug in the front panel.

6. B&K and GR Options 600-09 and 600-10 (optional). Correct power and interface is automatically supplied for the B&K 2619 or the GR 9600 preamplifiers. Voltages and corresponding input connector pins are shown on Table 2.

Table 2 - Input Connector Pin/Functions

Pin	Function
A	Low level input
B	Hi level input
C	mk-602 Return
D	Mike return
E	Shield return (ground)
F	Mike + 3V
G	Mike + 15V
H	Mike + 28V
I	Mike +200V **
J	Heater + 12V **
K	Heater return **
L	Spare
M	Spare
N	Spare

* 600-10 Option only

** 600-09 Option only

APPENDIX 10.16

STACK HEIGHT ANALYSIS AND RECOMMENDATIONS

Information pertaining to facility stack height is included in "Volume III-Air Quality" of this Application for Power Plant Site Certification.