NATIONAL BUREAU OF STANDARDS REPORT

10 219

NOISE SURVEY OF JERSEY CITY OPERATION BREAKTHROUGH PROTOTYPE SITE

Applied Acoustics and Illumination Section
Sensory Environment Branch
Building Research Division
Institute for Applied Technology
National Bureau of Standards
Washington, D. C. 20234

U.S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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NATIONAL BUREAU OF STANDARDS REPORT

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NOISE SURVEY OF JERSEY CITY OPERATION BREAKTHROUGH PROTOTYPE SITE

by

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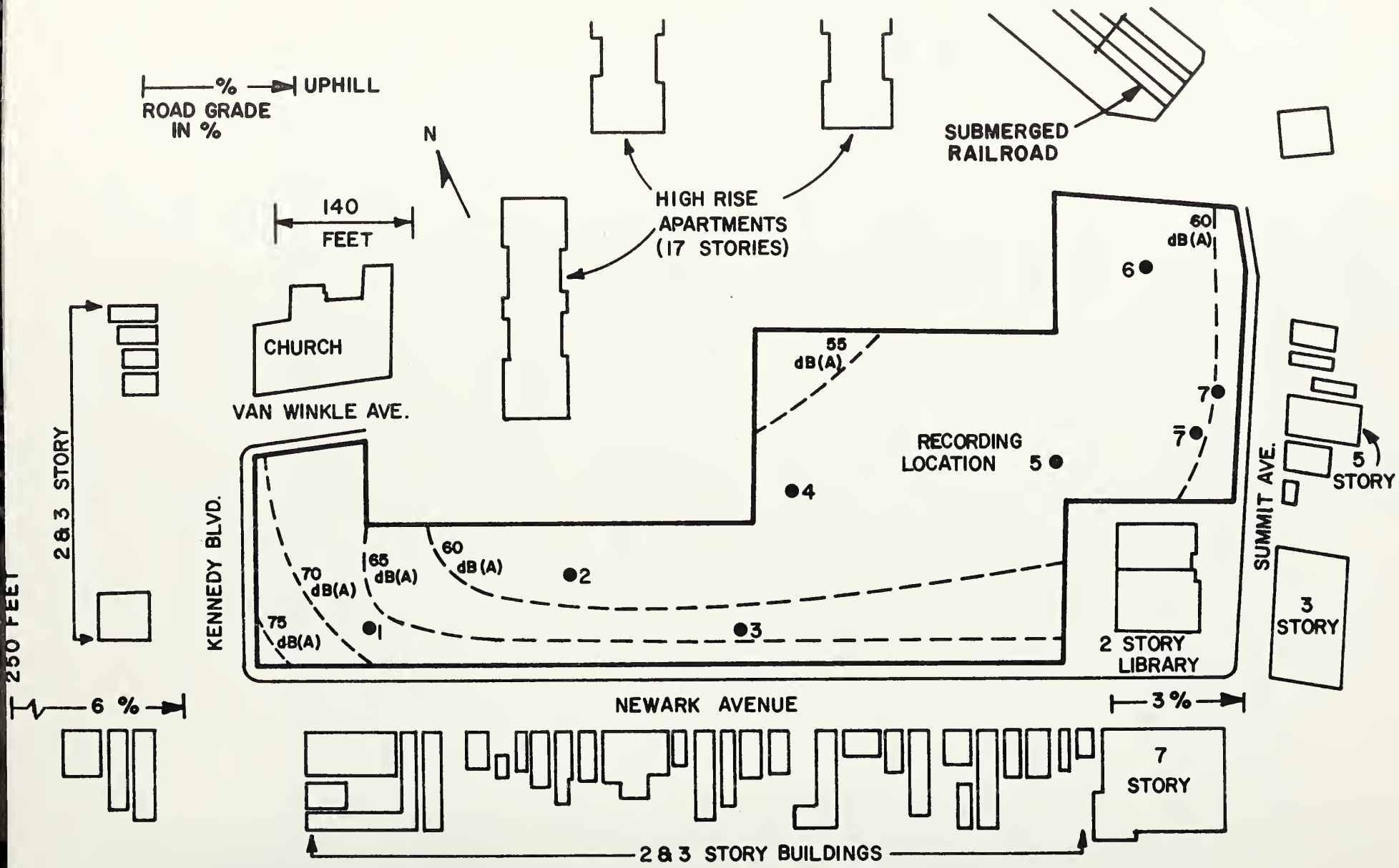
1. Introduction

A noise survey of the Jersey City Operation BREAKTHROUGH prototype site was performed from Thursday, September 24, through Sunday, September 27, 1970. Data were taken intermittently essentially around the clock.

The site is located near the business district of Jersey City and is bounded on three sides by Kennedy Blvd. (also called Hudson Blvd.), Newark Ave., and Summit Ave. as shown in Figure 1. All are two-way streets with 25 mph traffic. Kennedy Blvd. is a four lane road (plus an emergency lane on each side) and temporarily is banned for truck traffic. Newark Ave. and Summit Ave. are two lane roads (plus a parking lane on each side). Newark and Summit Avenues have essentially the same total traffic flow. Newark Ave. is considered a major truck route. Summit Ave. also has heavy truck traffic. Since traffic lights are at all intersections, the nature of the traffic is essentially stop and go. The gradients above 3% are shown in Figure 1 with arrows in the uphill direction. The arrows show the limits of this grade also.

The entire site is vacant of any buildings. A municipal parking lot is in the center of the site. The back end of the lot is entirely fenced off from the adjacent apartment buildings which are about 17 stories in height. There are no local grades or problems regarding the terrain of the site. The site slopes with the gradient of Newark Ave. There is a good deal of high grass and weeds, especially at the northeast end of the lot.



INITIAL SURVEY dB(A) CONTOURS AND FINAL RECORDING LOCATIONS

Figure 1

2. Objective of Survey

The Jersey City, New Jersey, prototype site for Operation BREAKTHROUGH is an "in-city" urban site having noise environment subjectively considered to be typical of that of many urban centers. Thus an excellent opportunity to obtain objective acoustical data is offered by the site. The primary objective of the survey was to provide a quantitative analysis of the existing acoustical environment at the site. This baseline information will be used to characterize the exterior auditory environment. It will also be used as a basis for a preconstruction prediction of the resultant interior acoustical environment when given the attenuation characteristics of the exterior shell of the housing systems. It will provide the housing system producer with a quantitative statement of the noise environment so that adequate protection may be incorporated in the design prior to construction. The secondary objective was to compare the physical data with guidelines that constitute a "non-instrumental" acoustical site assessment technique.

3. Procedure

Upon arrival at the site a sound level meter (hand-held) was used to obtain A-weighted sound level readings at 28 locations in order to establish the estimated equal sound level contours shown in Figure 1. The seven locations for obtaining data were selected on the basis of these contours and the planned building positions. Location 4 was selected specifically because of its proximity to the planned total energy plant. Three minutes of tape recorded data were taken at each measuring time and location.

The maximum number of locations for which data could be contained on one 5" reel of tape for one complete circuit on the site was seven. Upon selection of the seven locations, data were recorded by a team of two persons. Two teams rotated shifts throughout the four days. Location 7 was changed to $\overline{7}$ at 3:00 P.M. on September 25 due to changes in terrain caused by a bulldozer. Data for both were analyzed together.

Data acquisition was performed using a B & K Model 4131 condensor microphone with B & K Model UA 0082 windscreen at a height of 6 feet, a B & K Model 2203 sound level meter, a Nagra Model III single channel tape recorder, and monitoring headphones as shown in Figure 2. Scotch Type 203 magnetic recording tape run at 7-1/2 ips NAB was used. A calibration tone of 124 dB at 250 Hz was recorded at the beginning of each tape with a B & K Model 4220 pistonphone.

Three traffic counters set up by the Police Department were used to count one direction of traffic on Kennedy Blvd. (north), on Newark Ave. (west), and on Summit Ave. (south). The counters tabulated the accumulation of vehicles crossing a pneumatic tube for 1/2-hour time periods.

Estimates of aircraft flyovers and percentage of truck traffic were made by the acoustical survey team during the survey.

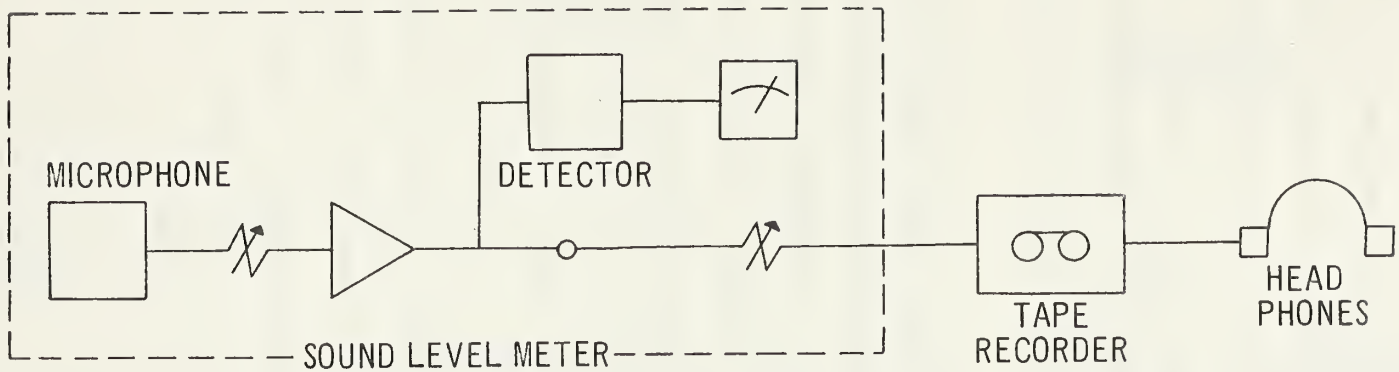


Figure 2. Block diagram of data acquisition system.

4. Analysis of Data

Upon completion of the site survey, all tapes were analyzed in the laboratory. Each three-minute tape segment was replayed using the Nagra III tape recorder in conjunction with a B & K Model 2606 measuring amplifier with an A-weighting network, a B & K Model 2305 graphic level recorder (GLR) with a 25 dB potentiometer, and a B & K Model 4420 statistical distribution analyzer (SDA). A power amplifier and loud speaker were used for monitoring. A block diagram of the instrumentation used is shown in Figure 3.

The pistonphone tone at the beginning of each tape was used to ensure proper calibration. Gain settings were adjusted, for each tape segment, so that the center of the range of A-weighted sound levels fell near the center of the 25 dB range of the GLR. The writing speed of the GLR was set at 100 mm/s. The SDA was set to interrogate the GLR and thus add a count corresponding to the position of the GLR stylus to one of the twelve registers of the SDA every 0.1 secs. The first register recorded the number of times the A-weighted sound level was below the range of the GLR. The middle ten registers recorded the number of times the A-weighted sound level was in the corresponding 2.5 dB nest (step) of the 25 dB range of the GLR. The twelfth register recorded the number of times the A-weighted sound level was above the range of the GLR.

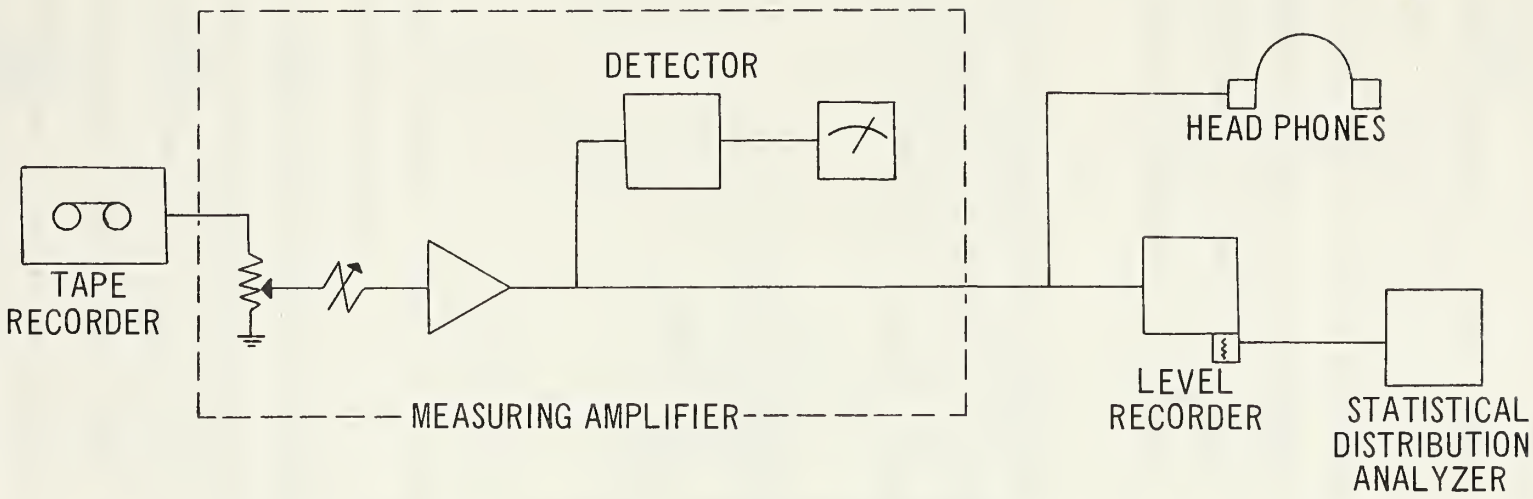


Figure 3. Block diagram of data analysis system for measuring the statistical distribution of the A-weighted sound levels.

The following data were punched onto computer cards for each tape segment: the tape reel number, the site location, the time and date, the sound level corresponding to the lower limit of the range of the GLR, the number of the lowest register of the SDA which contained a count, the total number of counts in all twelve registers, and the number of counts in each register. These data were fed into a digital computer which was programmed to compute the "average" A-weighted sound level and the statistical distribution of A-weighted sound levels for each tape segment.

The average A-weighted sound level was determined for each tape segment by converting the sound level corresponding to the median value of each 2.5 dB step to a pressure ratio and then applying the following equation:

$$L_A = 20 \log_{10} \left(\frac{1}{N} \sum_{i=1}^{K} n_i p_i \right),$$

where p_i = pressure ratio corresponding to nest i

n_i = number of counts in nest i

K = number of nests

N = total number of counts in all nests

L_A corresponds to the average, on an energy basis, A-weighted sound level.

In addition to data analysis in terms of A-weighted sound level, 1/3-octave band analyses were performed for certain identifiable noise sources (helicopter, jet plane, and propellor-driven plane flyovers as well as background noise before or after flyover) and for a three minute segment of data considered to be a "worst" condition. The maximum sound level for each 1/3-octave band was determined using the Nagra III tape recorder and a B & K Model 3347 spectrum analyzer with a monitoring speaker as shown in Figure 4.

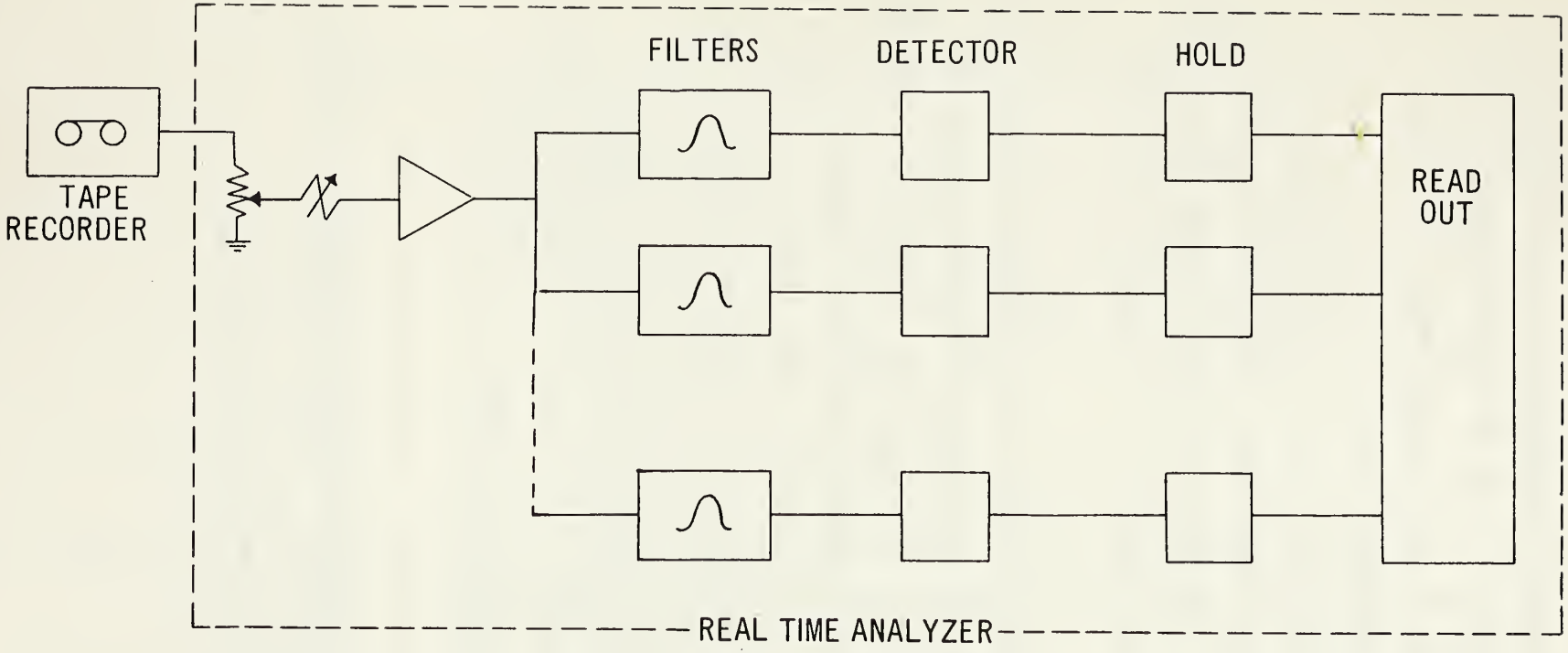


Figure 4. Block diagram of 1/3-octave band data analysis system.

5. Statement of Accuracy

The measurements are accurate to $\pm$ 3.9 dB worst case and $\pm$ 2.3 dB r.m.s. Calibration is traceable to the National Bureau of Standards.

6. Presentation of Data

British and American researchers differ in their way of presenting data. In this report the British convention is used in which L_{90} and L_{10} are defined at the A-weighted sound levels which are exceeded 90% and 10%, respectively, of the time. All sound levels are referenced to 20 $\mu N/m^2$ (2×10^{-4} microbar).

The percentile tables which are used to determine L_{90} and L_{10} in this report give the percentage of time at which the A-weighted sound levels exceed the particular 2.5 dB nest. Thus L_{90} and L_{10} are given in multiples of 2.5 dB and are specified at the decibel level which separates the nests bounding the 90 or 10 percentile figures. For instance, for the data of Table 1, location 1, the L_{90} and L_{10} values are 57.5 and 67.5 dBA, respectively.

Tables 1 through 8 give the percentage of time during which the A-weighted sound level exceeded each 2.5 dB nest. These tables also give L_{90}, L_{10}, and the average A-weighted sound level.

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[1] W. E. Scholes, "Traffic Noise Criteria", Applied Acoustics, Vol. 3, No. 1, January 1970.

[2] R. Donley, "Community Noise Regulation", Sound and Vibration, Feb. 1969.

Location	1	2	3	4	5	6	7
dBA	%	%	%	%	%	%	%
45.0-47.5	-	-	-	100	100	100	-
47.5-50.0	100	100	100	100^-	100^-	100^-	100^-
50.0-52.5	100^-	99	99	88	91	97	100^-
52.5-55.0	99	82	86	55	54	83	86
55.0-57.5	91	47	62	23	22	48	58
57.5-60.0	71	19	39	8	8	21	32
60.0-62.5	45	7	23	2	3	8	16
62.5-65.0	26	3	12	1	1	3	8
65.0-67.5	13	1	6	0^+	0^+	1	4
67.5-70.0	7	0^+	3	0^+	0^+	0^+	2
70.0-72.5	3	0^+	1	0^+	0^+	0^+	1
72.5-75.0	1	0^+	1	0	0	0^+	0^+
75.0-77.5	0^+	0	0^+	-	-	0	0^+
77.5-80.0	0^+	-	0^+	-	-	-	0^+
L90(dBA)	57.5	52.5	52.5	50.0	52.5	52.5	52.5
L10(dBA)	67.5	60.0	65.0	57.5	57.5	60.0	62.5
Time Averaged Sound Level (dBA)	64	58	61	56	56	58	60

Table 1. Percentile table (the entries in the table indicate the percentage of time the A-weighted sound level exceeded the corresponding 2.5 dB nest), L_{90}, L_{10}, and A-weighted sound level time-averaged for the seven locations analyzed for all daytime data (0700-2200 hours, September 24 through September 26, 1970).

Location	1	2	3	4	5	6	7
dBA	%	%	%	%	%	%	%
42.5-45.0	-	-	100	100	100	100	100
45.0-47.5	100	100	99	100^-	100^-	99	99
47.5-50.0	100^-	100^-	91	80	83	87	93
50.0-52.5	83	81	68	47	39	53	64
52.5-55.0	64	50	48	22	12	21	37
55.0-57.5	46	21	32	10	4	8	22
57.5-60.0	25	7	16	3	2	4	12
60.0-62.5	13	2	7	1	1	2	5
62.5-65.0	5	1	3	0^+	0^+	1	2
65.0-67.5	2	0^+	1	0^+	0^+	1	1
67.5-70.0	1	0^+	1	0	0	0^+	1
70.0-72.5	1	0	0^+	-	-	0^+	0^+
72.5-75.0	0^+	-	0^+	-	-	0	0^+
75.0-77.5	0^+	-	0	-	-	-	0
77.5-80.0	0	-	-	-	-	-	-
L90(dBA)	50.0	50.0	47.5	47.5	47.5	47.5	50.0
L10(dBA)	62.5	57.5	60.0	57.5	55.0	55.0	60.0
Time Averaged Sound Level (dBA)	59	56	57	54	53	54	56

Table 2. Percentile table (the entries in the table indicate the percentage of time the A-weighted sound level exceeded the corresponding 2.5 dB nest), L_{90}, L_{10}, and A-weighted sound level time-averaged for the seven locations analyzed for all nighttime data (2200-0700 hours, September 24 through September 27, 1970).

Location	1	2	3	4	5	6	7
dBA	%	%	%	%	%	%	%
45.0-47.5	-	-	-	-	-	-	100
47.5-50.0	-	-	100	100	100	100	100^{-}
50.0-52.5	100	100	100^{-}	99	99	100^{-}	100^{-}
52.5-55.0	100^{-}	99	88	76	69	87	92
55.0-57.5	96	62	66	35	28	49	64
57.5-60.0	82	24	44	13	9	16	31
60.0-62.5	54	9	28	5	4	4	13
62.5-65.0	32	4	17	2	1	2	7
65.0-67.5	17	3	8	1	0^{+}	1	4
67.5-70.0	8	1	4	0^{+}	0^{+}	0^{+}	2
70.0-72.5	3	0^{+}	2	0^{+}	0^{+}	0^{+}	1
72.5-75.0	1	0^{+}	1	0	0	0	0^{+}
75.0-77.5	0^{+}	0	0^{+}	-	-	-	0^{+}
77.5-80.0	0	-	0^{+}	-	-	-	0
L90(dBA)	57.5	55.0	52.5	52.5	52.5	52.5	55.0
L10(dBA)	67.5	60.0	65.0	60.0	57.5	60.0	62.5
Time Averaged Sound Level (dBA)	65	59	62	57	57	58	60

Table 3. Percentile table (the entries in the table indicate the percentage of time the A-weighted sound level exceeded the corresponding 2.5 dB nest), L_{90}, L_{10}, and A-weighted sound level time-averaged for the seven locations analyzed for all daytime data (1120-2200 hours, September 24, 1970).

Location	1	2	3	4	5	6	7
dBA	%	%	%	%	%	%	%
42.5-45.0	-	-	100	100	100	100	100
45.0-47.5	100	100	98	100^-	100^-	99	100^-
47.5-50.0	99	100^-	84	73	80	81	94
50.0-52.5	68	75	53	42	30	45	57
52.5-55.0	47	40	33	24	12	20	34
55.0-57.5	32	18	22	12	5	7	22
57.5-60.0	17	7	12	4	2	4	13
60.0-62.5	8	2	6	1	1	3	5
62.5-65.0	2	0^+	2	0^+	0^+	1	2
65.0-67.5	0^+	0^+	1	0^+	0^+	1	1
67.5-70.0	0^+	0	0^+	0	0	0^+	1
70.0-72.5	0^+	-	0^+	-	-	0	0^+
72.5-75.0	0^+	-	0	-	-	-	0^+
75.0-77.5	0	-	-	-	-	-	0
L90(dBA)	50.0	50.0	47.5	47.5	47.5	47.5	47.5
L10(dBA)	60.0	57.5	60.0	57.5	55.0	55.0	60.0
Time Averaged Sound Level (dBA)	57	55	55	53	52	53	56

Table 4. Percentile table (the entries in the table indicate the percentage of time the A-weighted sound level exceeded the corresponding 2.5 dB nest), L_{90}, L_{10}, and A-weighted sound level time-averaged for the seven locations analyzed for all nighttime data (2200-0700 hours, September 24 through September 25, 1970).

Location	1	2	3	4	5	6	7
dBA	%	%	%	%	%	%	%
45.0-47.5	-	-	-	-	100	-	-
47.5-50.0	100	-	-	100	100^-	100	100
50.0-52.5	100^-	100	100	98	91	98	100^-
52.5-55.0	99	97	97	70	57	82	94
55.0-57.5	95	63	73	31	24	49	68
57.5-60.0	74	30	45	9	11	20	46
60.0-62.5	46	14	23	2	3	9	27
62.5-65.0	27	5	12	0^+	0^+	4	13
65.0-67.5	16	2	6	0	0^+	1	7
67.5-70.0	10	1	3	-	0	1	4
70.0-72.5	5	0^+	1	-	-	0^+	2
72.5-75.0	3	0^+	0^+	-	-	0^+	1
75.0-77.5	1	0	0	-	-	0	0^+
77.5-80.0	0^+	-	-	-	-	-	0^+
L90(dBA)	57.5	55.0	55.0	52.5	52.5	52.5	55.0
L10(dBA)	70.0	62.5	65.0	57.5	60.0	60.0	65.0
Time Averaged Sound Level (dBA)	65	60	61	57	56	59	62

Table 5. Percentile table (the entries in the table indicate the percentage of time the A-weighted sound level exceeded the corresponding 2.5 dB nest), L_{90}, L_{10}, and A-weighted sound level time-averaged for the seven locations analyzed for all daytime data (0700-2200 hours, September 25, 1970).

Location	1	2	3	4	5	6	7
dBA	%	%	%	%	%	%	%
42.5-45.0	-	-	-	100	100	100	100
45.0-47.5	100	100	100	100^-	100^-	100^-	98
47.5-50.0	100^-	100^-	94	83	86	94	90
50.0-52.5	94	82	77	55	53	63	67
52.5-55.0	78	56	55	22	15	24	39
55.0-57.5	59	24	35	8	4	9	22
57.5-60.0	34	8	19	2	2	4	12
60.0-62.5	18	3	9	1	1	2	5
62.5-65.0	8	1	4	0^+	0^+	1	2
65.0-67.5	3	0^+	2	0	0^+	1	0^+
67.5-70.0	1	0^+	1	-	0	1	0
70.0-72.5	0^+	0	0^+	-	-	0^+	-
72.5-75.0	0^+	-	0^+	-	-	0	-
75.0-77.5	0^+	-	0	-	-	-	-
77.5-80.0	0	-	-	-	-	-	-
L90(dBA)	52.5	50.0	50.0	47.5	47.5	50.0	50.0
L10(dBA)	62.5	57.5	60.0	55.0	55.0	55.0	60.0
Time Averaged Sound Level (dBA)	60	56	58	54	53	55	56

Table 6. Percentile table (the entries in the table indicate the percentage of time the A-weighted sound level exceeded the corresponding 2.5 dB nest), L_{90}, L_{10}, and A-weighted sound level time-averaged for the seven locations analyzed for all nighttime data (2200-0700 hours, September 25 through September 26, 1970).

Location	1	2	3	4	5	6	7
dBA	%	%	%	%	%	%	%
45.0-47.5	-	-	-	100	100	100	-
47.5-50.0	100	100	100	99	100^{-}	99	100
50.0-52.5	100^{-}	97	97	70	85	94	99
52.5-55.0	97	63	77	27	37	80	75
55.0-57.5	84	27	51	7	14	47	42
57.5-60.0	60	8	32	3	5	26	20
60.0-62.5	35	2	18	1	2	11	10
62.5-65.0	20	1	8	0^{+}	1	4	6
65.0-67.5	8	0^{+}	4	0^{+}	0^{+}	1	2
67.5-70.0	3	0^{+}	1	0	0^{+}	0^{+}	1
70.0-72.5	1	0	0^{+}	-	0^{+}	0	0^{+}
72.5-75.0	1	-	0	-	0	-	0^{+}
75.0-77.5	0	-	-	-	-	-	0
L90(dBA)	55.0	52.5	52.5	50.0	50.0	52.5	52.5
L10(dBA)	65.0	57.5	62.5	55.0	57.5	62.5	62.5
Time Averaged Sound Level (dBA)	63	57	60	54	55	58	58

Table 7. Percentile table (the entries in the table indicate the percentage of time the A-weighted sound level exceeded the corresponding 2.5 dB nest), L_{90}, L_{10}, and A-weighted sound level time-averaged for the seven locations analyzed for all daytime data (0700-2200 hours, September 26, 1970).

Location	1	2	3	4	5	6	7
dBA	%	%	%	%	%	%	%
45.0-47.5	-	-	100	100	100	100	-
47.5-50.0	100	100	100^{-}	96	90	100^{-}	100
50.0-52.5	100^{-}	100^{-}	85	45	27	58	92
52.5-55.0	87	72	68	18	6	19	50
55.0-57.5	59	25	50	8	2	7	27
57.5-60.0	27	6	21	1	1	2	8
60.0-62.5	13	4	6	0^{+}	1	0^{+}	1
62.5-65.0	8	2	2	0	0^{+}	0	0
65.0-67.5	5	0^{+}	1	-	0	-	-
67.5-70.0	3	0	0	-	-	-	-
70.0-72.5	2	-	-	-	-	-	-
72.5-75.0	1	-	-	-	-	-	-
75.0-77.5	0	-	-	-	-	-	-
L90(dBA)	52.5	52.5	50.0	50.0	50.0	50.0	52.5
L10(dBA)	62.5	57.5	60.0	55.0	52.5	55.0	57.5
Time Averaged Sound Level (dBA)	60	57	58	53	52	54	56

Table 8. Percentile table (the entries in the table indicate the percentage of time the A-weighted sound level exceeded the corresponding 2.5 dB nest), L_{90}, L_{10}, and A-weighted sound level time-averaged for the seven locations analyzed for all nighttime data (2200-0018 hours, September 26 through September 27, 1970).

Figures 5 through 11 give L_{90} and L_{10} versus time for each location. There are gaps in the data due to equipment malfunction, unusual noise sources (i.e., steam cleaning of a church), weather, or data which were judged invalid after analysis. Peak 1/3-octave band analysis of data includes clearly identifiable noise sources of a helicopter, propeller-driven plane, and a jet plane; and a "worst" condition. The "worst" condition was determined to be caused by traffic noise at location 1 at 7:59 a.m. on September 25. Figures 12 through 14 give the results of these analyses. In Figure 14 the noise level just after the propeller-driven plane flyover is also shown. In some 1/3-octave bands, the peak level after the flyover exceeded that during the flyover of the propeller-driven plane.

7. Evaluation of Site According to HUD Circular

The criteria of a draft HUD circular[3] were used to evaluate the site using the data given in Tables 1, 2, and supplemental data concerning flight operations at Newark Airport. According to this draft circular, a site for new residential construction (single or multifamily) would be designated according to the following conditions:

(a) "Unacceptable":

(i) Sites, or any portion thereof, with an accumulation of 60 minutes of noise at or above 80 dBA at an appropriate height above the site boundary in any 24-hour period.

(ii) Sites, or any portion thereof, with an accumulation of eight hours out of any 24-hour period at 75 dBA or above at an appropriate height above the site boundary.

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[3] "Noise Abatement and Control: Departmental Policy, Implementation Responsibilities, and Standards", Draft April 13, 1970, DHUD.

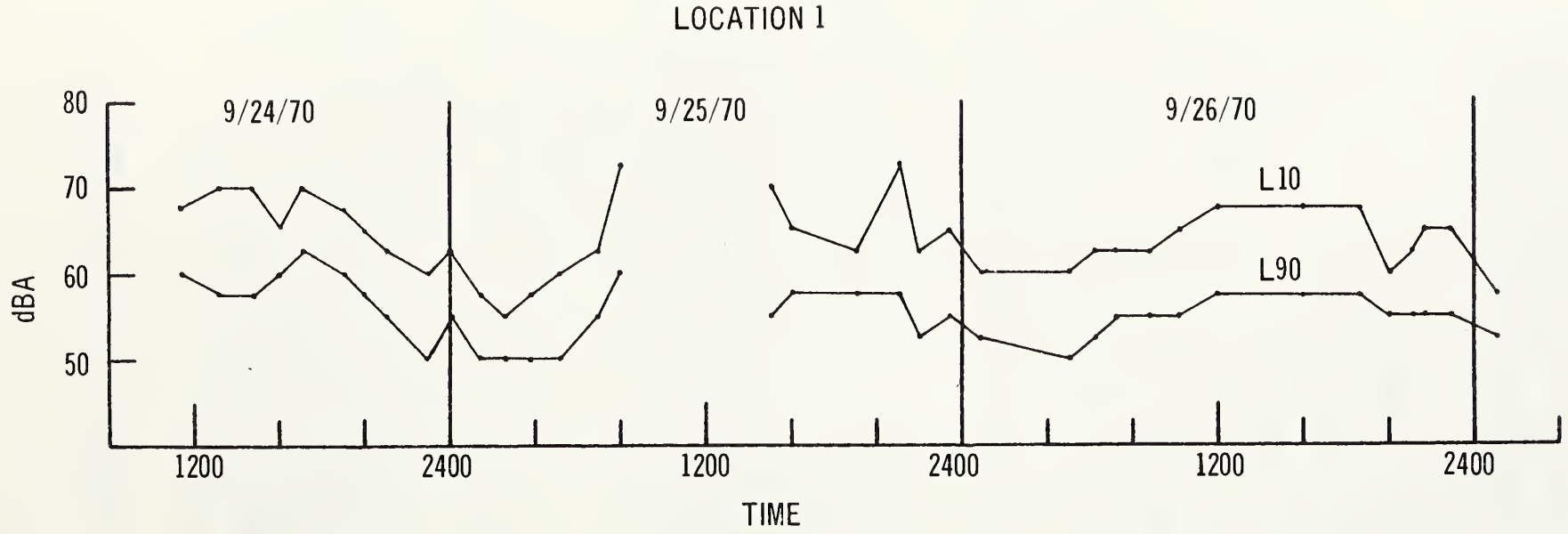

Figure 5. Noise exposure at Location 1. (Equipment malfunction and unusual noise source from 0845-1500 on September 25, 1970).

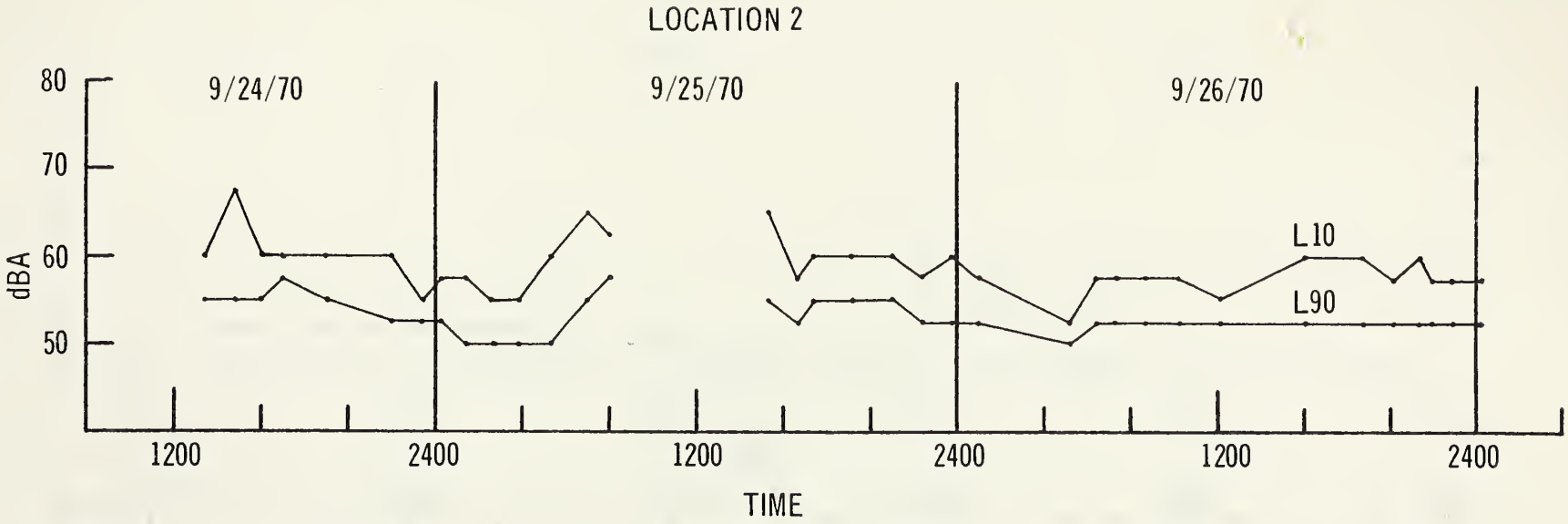

Figure 6. Noise exposure at Location 2. (Equipment malfunction and unusual noise source from 0845-1500 on September 25, 1970).

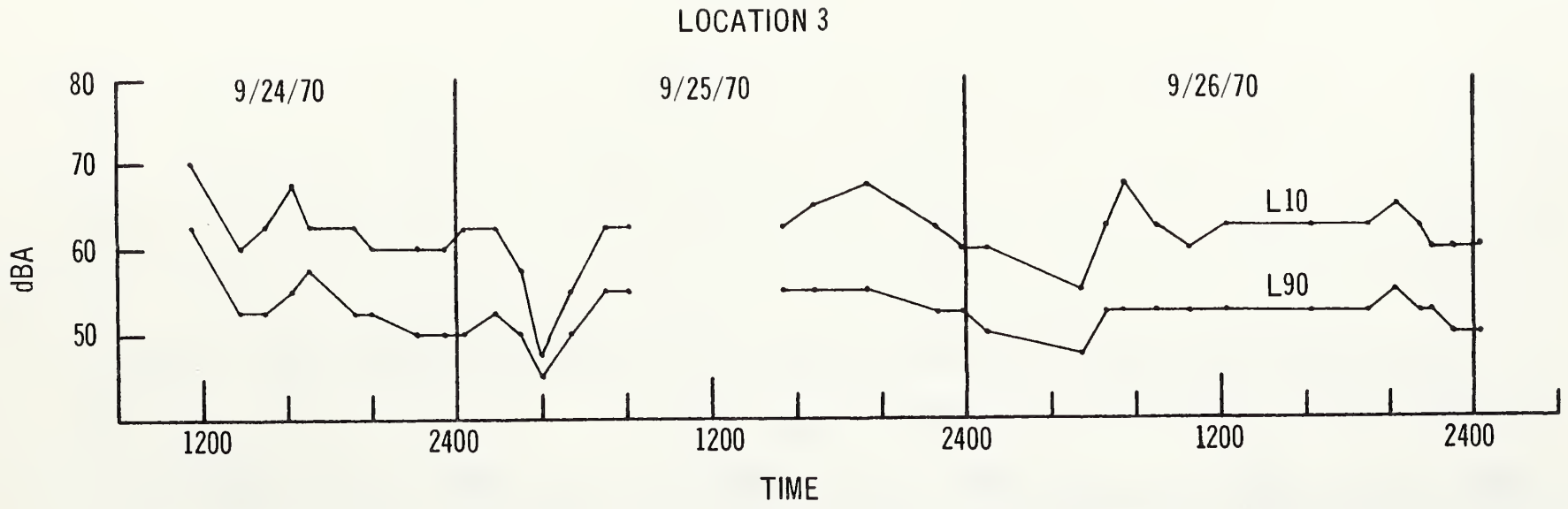

Figure 7. Noise exposure at Location 3. (Equipment malfunction and unusual noise source from 0845-1500 on September 25, 1970).

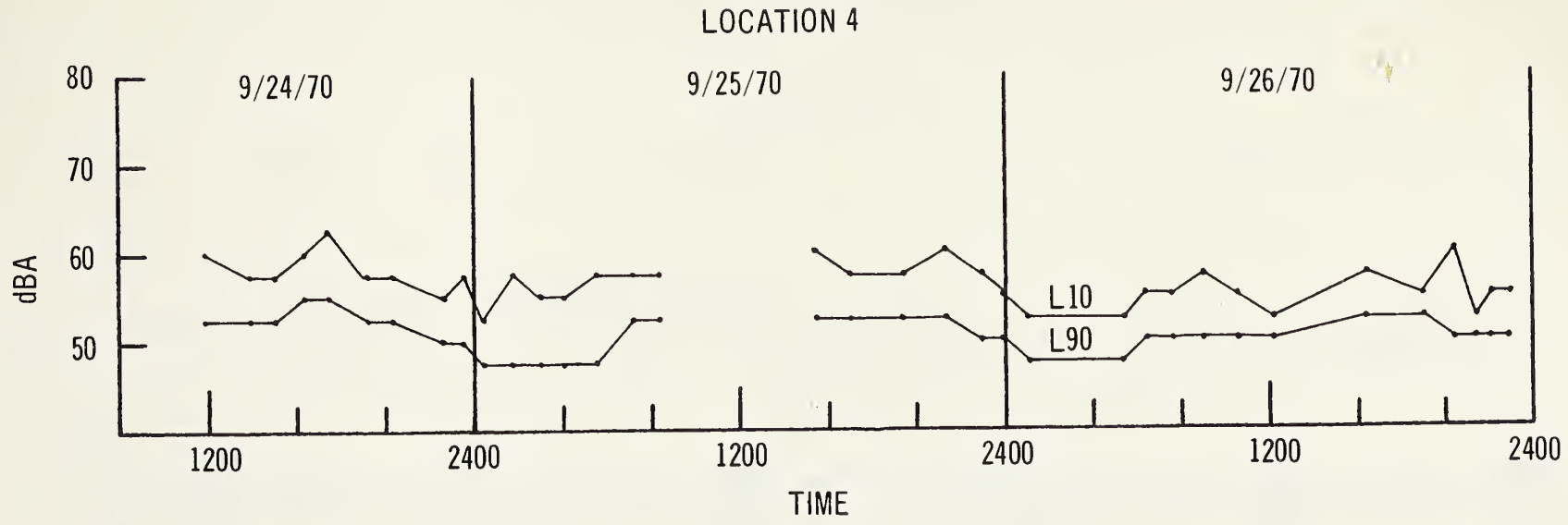

Figure 8. Noise exposure at Location 4. (Equipment malfunction and unusual noise source from 0845-1500 on September 25, 1970).

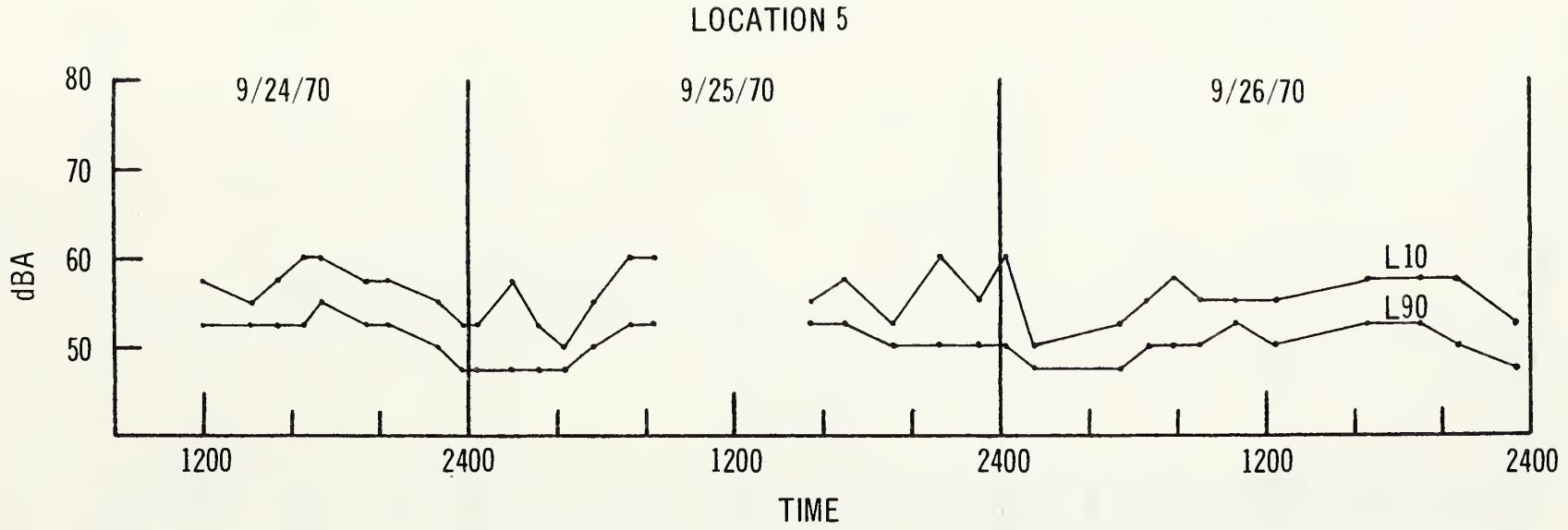

Figure 9. Noise exposure at Location 5. (Equipment malfunction and unusual noise source from 0845-1500 on September 25, 1970).

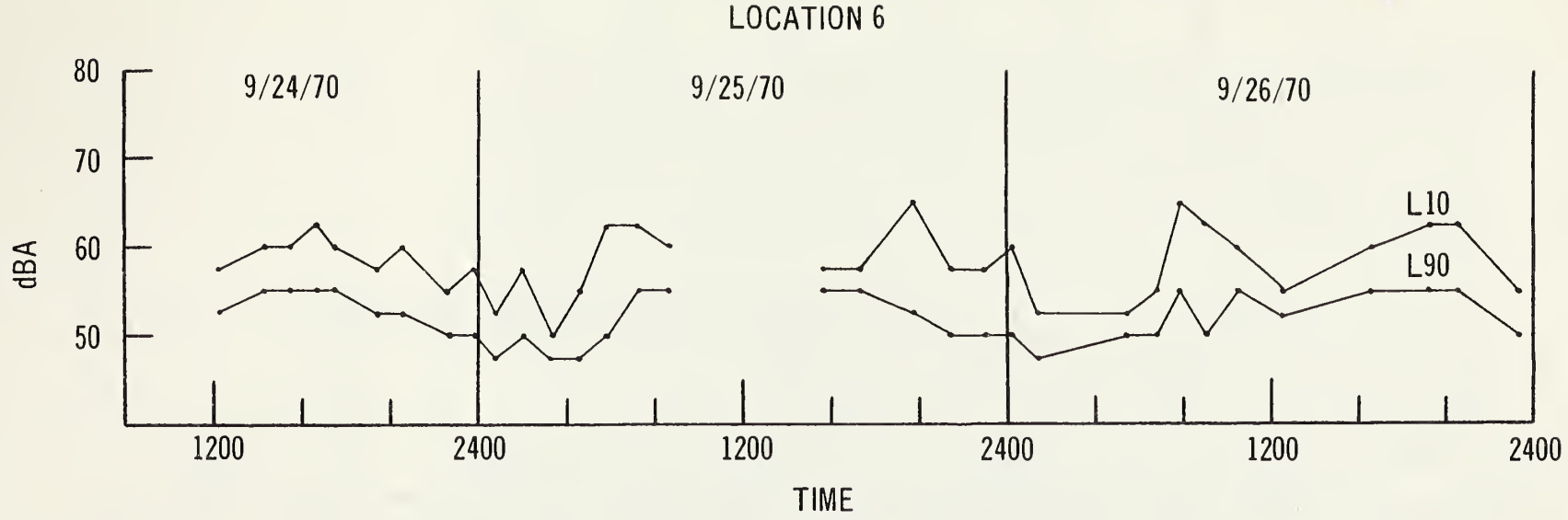

Figure 10. Noise exposure at Location 6. (Equipment malfunction and unusual noise source from 0845-1500 on September 25, 1970).

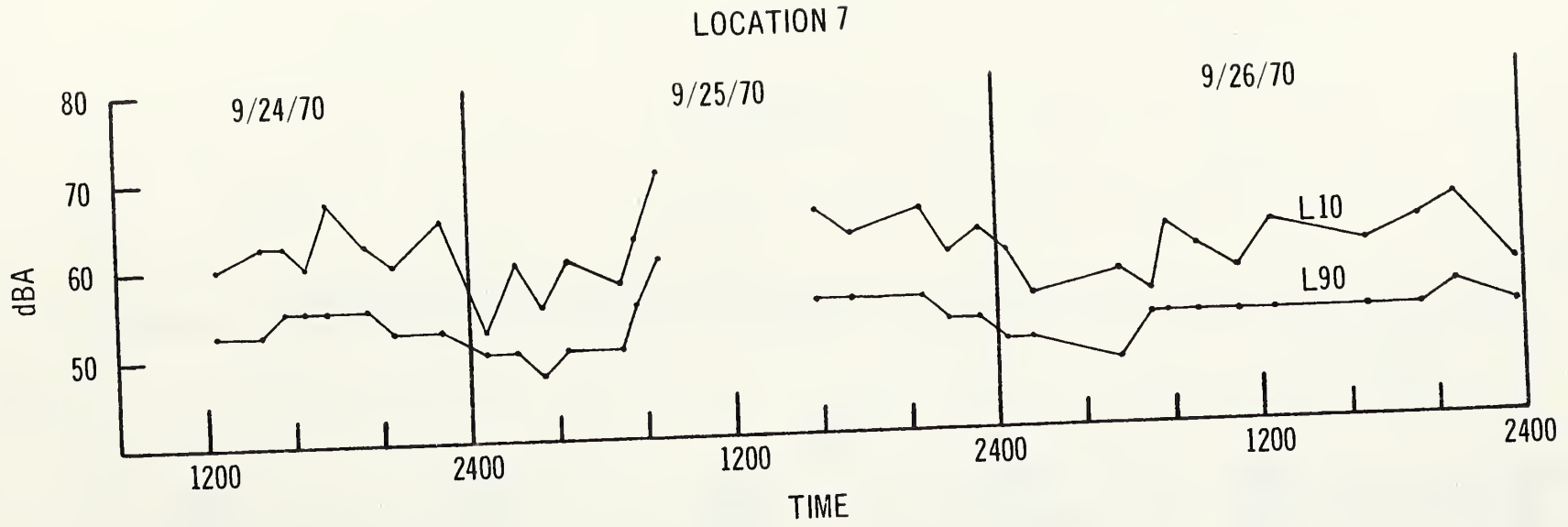

Figure 11. Noise exposure at Location 7. (Equipment malfunction and unusual noise source from 0845-1500 on September 25, 1970).

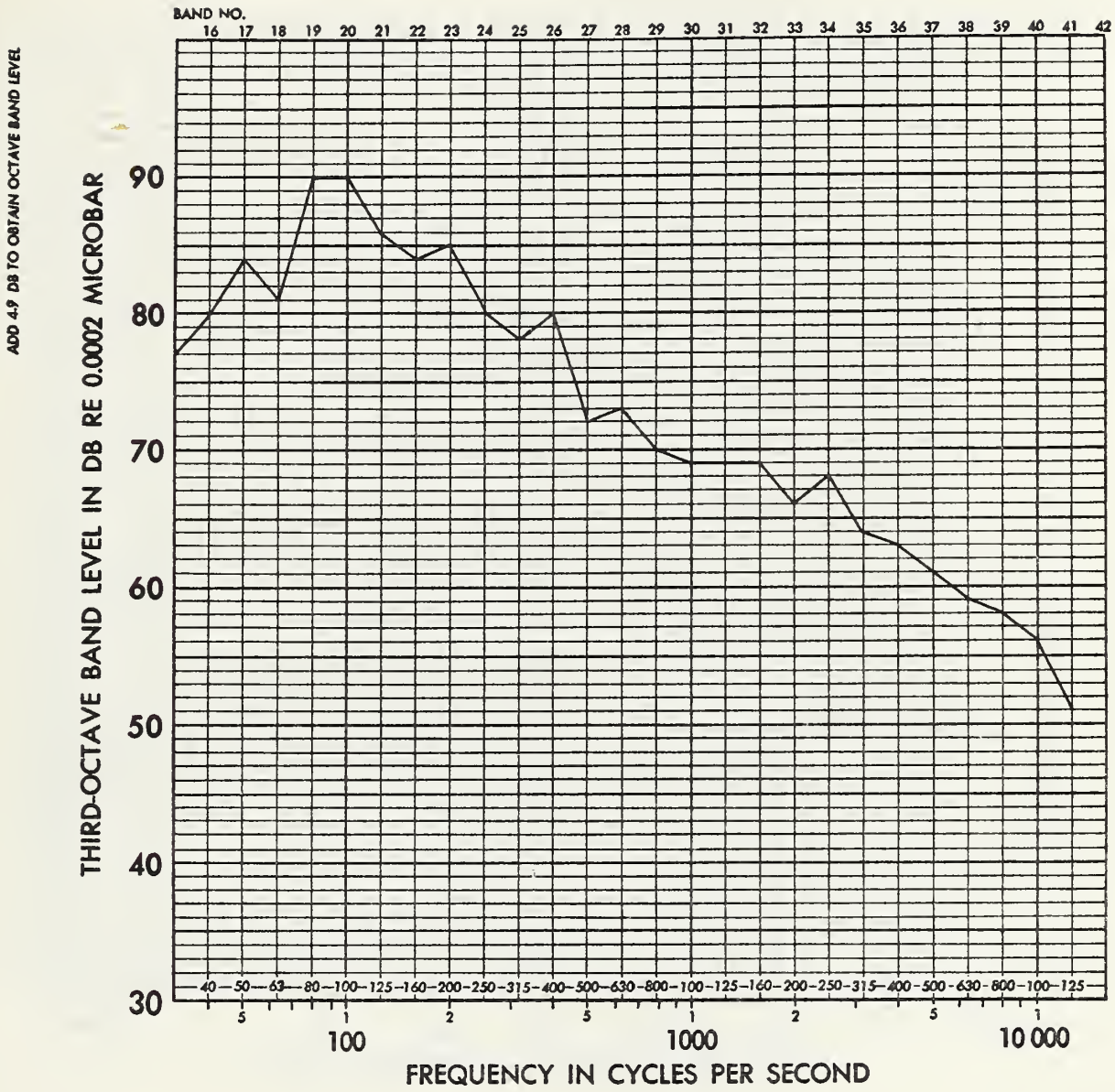

Figure 12. 1/3-octave band analysis of "worst" condition noise source (traffic) at 0759 on September 25, 1970.

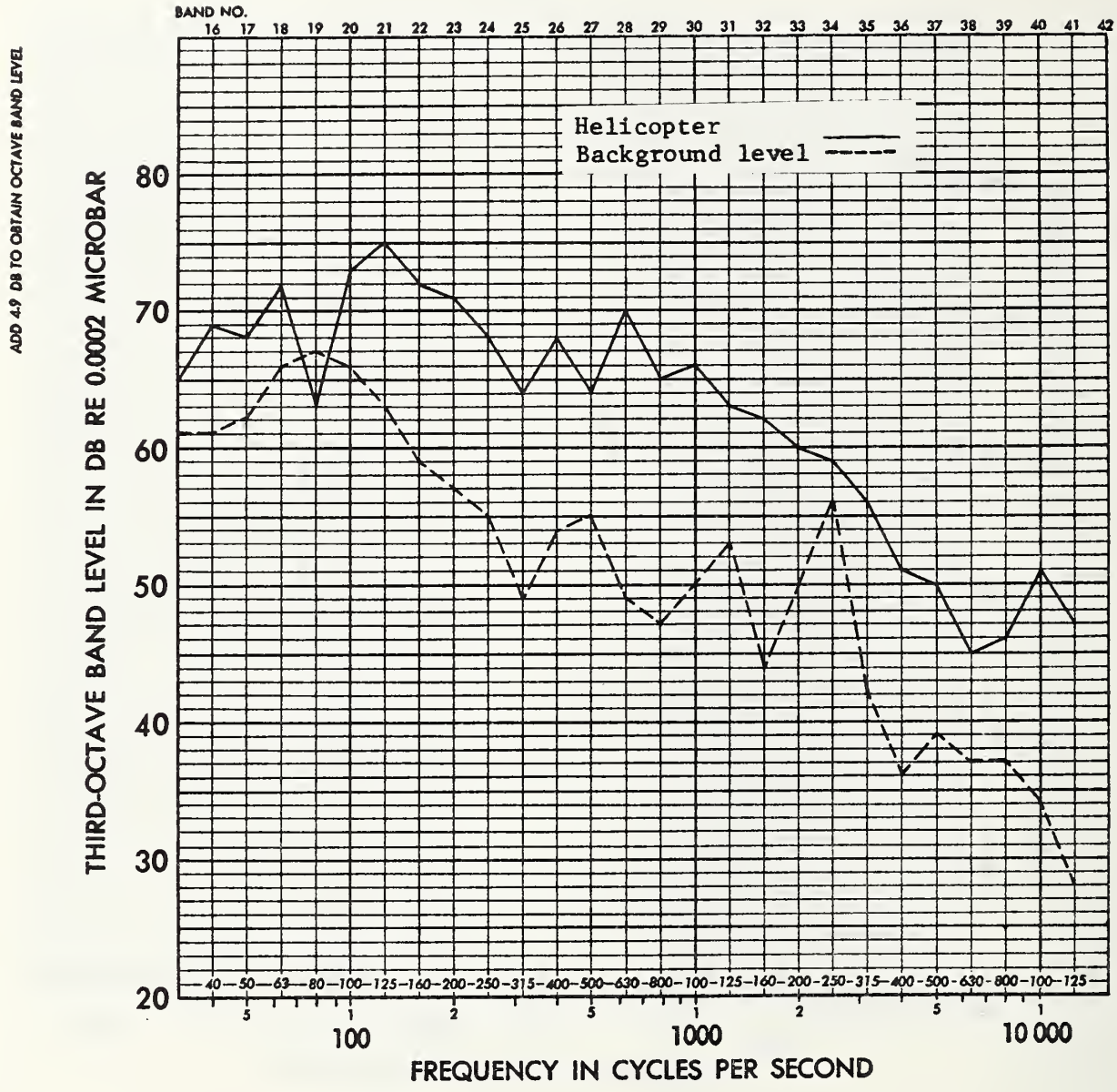

Figure 13. 1/3-octave band analysis of helicopter flyover and background level before flyover at 0906 on September 26, 1970.

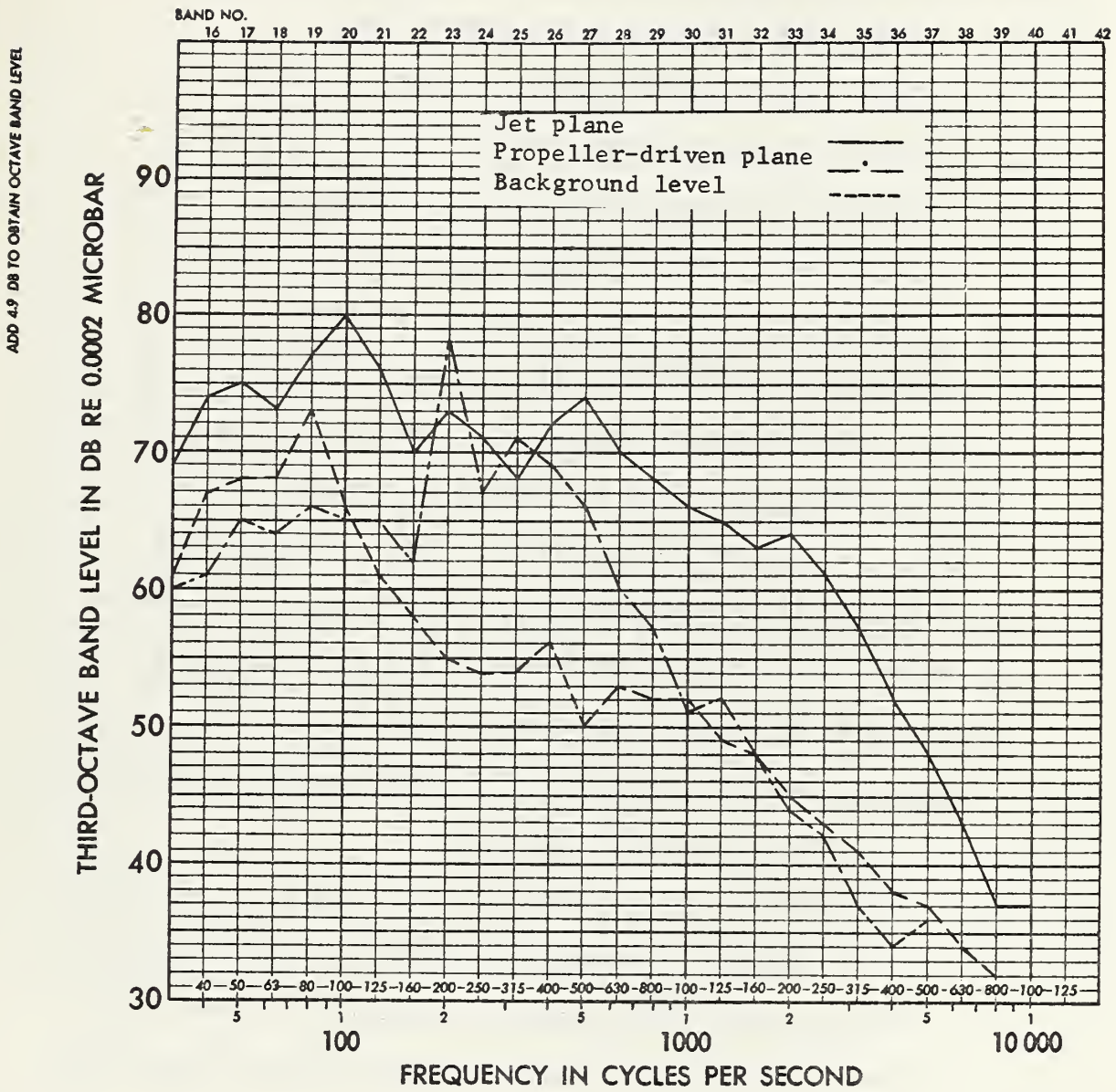

Figure 14. 1/3-octave band analysis of jet plane flyover, propeller-driven flyover and background level after flyovers at 2246 on September 24, 1970.

(iii) Sites, or any portion thereof, in the vicinity of intermittent noise such as airports with: either Noise Exposure Forecasts (NEF) in Zone C, or Composite Noise Ratings (CNR) in Zone 3. (Note: The Department of Transportation is converting from the CNR to the NEF. Field personnel should first ask for the NEF data and use these if they are available.)

(b) "Intermediate": Intermediate range sites are bounded by the criteria for unacceptability in the preceding paragraph (a) on the high side and by sites with acceptable noise described in para. (c) (i) and (ii) on the low side. A central idea is that the desirable maximum noise level for housing sites is about 65 dBA which is believed both to afford a reasonable environment for outside recreation and play and to permit noise attenuation necessary to attain reasonable interior noise levels including those for sleeping quarters.

(i) Sites, or any portion thereof, with existing or projected noise exposure at or above 65 dBA for a cumulative eight hours in any 24-hour period at appropriate heights above the boundary should be examined critically and normally be found "unacceptable."

(ii) Sites, or any portion thereof, with existing or projected noise exposures producing CNR's in Zone 2 or NEF's in Zone B should normally be found unacceptable.

(iii) Sites bounded by paragraph b(i) above and c(i) below may be found "acceptable" if interior noise exposures do not exceed standards.

According to information received from Newark Airport, the composite noise rating (CNR) with relationship to Newark Airport places the Jersey City site at less than the CNR 100 contour. The total accumulation of noise exposure measured at or greater than 45 dBA in any 24-hour period was 24 hours. The total accumulation of noise exposure measured at or greater than 80 dBA in any 24 hour period was zero. According to table 1 and 2 for the noisiest location (location 1) the average accumulation of noise exposure measured above 65 dBA in any 15-hour daytime period was 26% of the total time or 3.9 hours and in any 9 hour nighttime period was 5% of the total time or .5 hour. Thus the average accumulation of noise exposure above 65 dBA for any 24-hour period was 4.4 hours. According to this data the site would be evaluated as normally acceptable. If any consecutive daytime and nighttime period is used for this determination the accumulation of noise exposure above 65 dBA for location 1 ranges from a high of 5 hours to a low of 3.7 hours. It should be pointed out that the data for the daytime periods for September 24 and September 25 are weighted on the high side because of the particular periods of measurement and non-measurement (due to equipment difficulties).

8. Evaluation of Site by Non-Measurement Techniques

By use of the supplemental data the site was evaluated by a non-meausrement technique[4]. This report suggests using a two-step approach to evaluate the noise at a site with no acoustical measurements and using an elementary worst-case analysis of contributing noise factors. Step 1 is a screening process in which it is necessary to obtain : peak hourly automobile and truck traffic on nearby highways, nearest distance to railroads, and NEF or CNR values for closeby airports. The site's traffic acceptability is read directly from graphs for automobile and truck traffic. The effect of the railroads is taken from a distance table and the influence of aircraft can be obtained from the CNR or NEF values. While some attempt can be made to combine the site acceptabilities obtained for each of these noise sources, in general, the worst case is the safest choice.

Step 2 evaluation is simply a refinement of the step 1 evaluation and includes additional factors to account for: % road grade; mean vehicle speed; stop-and-go traffic; and shielding effects of building and submerged structures. The evaluation is as follows:

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[4]T. J. Schultz, "Guidelines for Noise Exposure Assessment of HUD Housing Sites", submitted by Bolt, Beranek and Newman to DHUD September 3, 1970.

Automobile and Truck Traffic

Pneumatic traffic counters[5] were used which recorded 1/2-hour subtotals on the south bound lane of Summit Avenue, the west bound lane of Newark Avenue, and the north bound lanes of Kennedy Boulevard. The traffic counts are given in table 9. Since only three counters were available, two way traffic volumes were estimated by doubling these one-way figures.

Manual counts of cars and trucks (including buses) on Newark Avenue and Summit Avenue indicate that up to 10% and 7%, respectively, of the daytime traffic is composed of trucks and buses. The percentage drops to around 4% on both streets at night. Trucks are not allowed on Kennedy Boulevard. Since the bus traffic seemed insignificant, no estimate of "truck type" traffic was made for the Boulevard.

The peak hourly traffic flow occurred at 0730 when the two-way hourly traffic volumes were 860, 860[6] and 2100 vehicles respectively for Summit Avenue, Newark Avenue, and Kennedy Boulevard.

Using the screening criteria graph for automobiles from the report[4] on non-measurement assessment and the value of 2100 cars/hour, the Jersey City BREAKTHROUGH site would be rated normally unacceptable up to a distance of 300 feet from Kennedy Boulevard (Figure 15).

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[5]Operated by the Jersey City Department of Public Works.

[6]The Newark Avenue counter was inoperative at a critical period when traffic seemed heaviest of all of the days of the survey. The Summit Avenue value was used to estimate the traffic flow on Newark Avenue since the total traffic flow was usually similar on these two streets.

Table 9. Traffic counts on Summit Ave., on Newark Ave., and on Kennedy Blvd.

Time	South Bound Summit Ave.	West Bound Newark Ave.	North Bound Kennedy Blvd.
(Sept. 24)			
0730		95	525
0800		140	435
0830		105	420
0900		100	325
0930		100	315
1000		115	320
1030		130	310
1100	115	125	310
1130	110	125	330
1200	125	130	345
1230	155	125	340
1300	115	140	355
1330	130	135	390
1400	115	115	350
1430	105	135	315
1500	155	130	415
1530	150	115	525
1600	170	165	525
1630	170	140	525
1700	150	175	525
1730	165	125	495
1800	115	135	470
1830	125	100	375
1900	120	125	390
1930	85	105	385
2000	75	110	400
2030	80	80	360
2100	60	*	360
2130	50	*	355
2200	50	*	325
2230	55	*	240
2300	50	*	220
2330	55	*	165
2400	30	*	185
(Sept. 25)			
0030	15	*	135
0100	15	*	135
0130	10	*	105
0200	10	*	75
0230	20	*	55
0300	5	*	55
0330	10	*	25

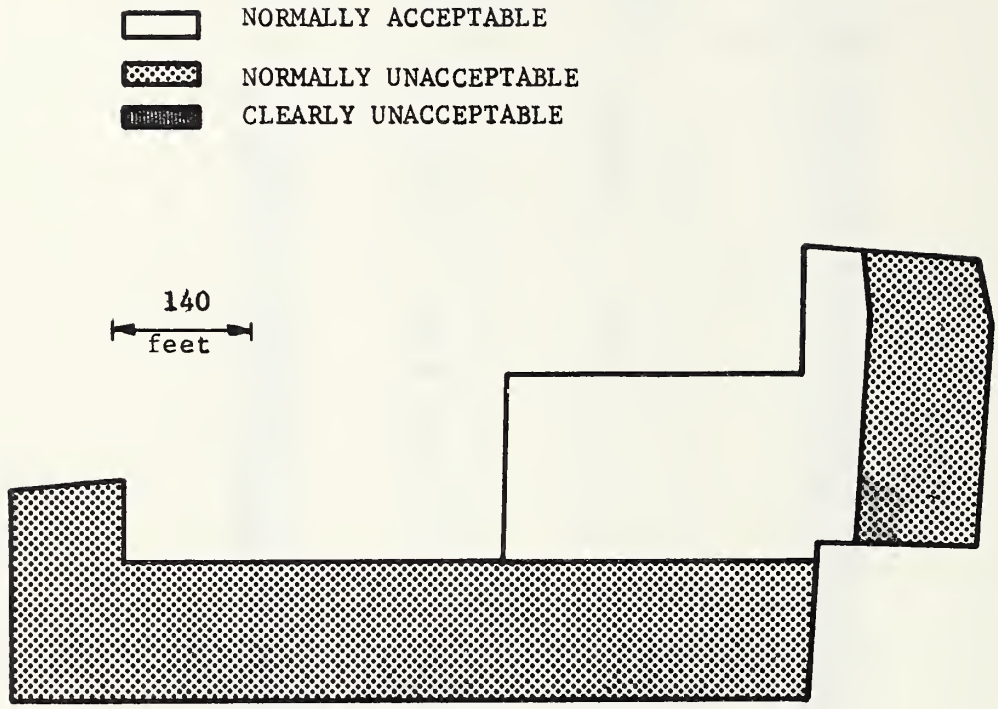
*Counter inoperative.

Time	South Bound Summit Ave.	West Bound Newark Ave.	North Bound Kennedy Blvd.
(Sept. 25)			
0400	10	*	45
0430	20	*	45
0500	25	*	55
0530	50	*	85
0600	100	*	185
0630	180	*	265
0700	205	*	450
0730	215	*	525
0800	175	*	450
0830	135	*	430
0900	135	*	355
0930	135	*	255
1000	150	*	310
1030	100	*	315
1100	125	*	335
1130	120	*	355
1200	135	*	325
1230	125	*	330
1300	130	*	390
1330	145	*	375
1400	130	*	375
1430	150	90	465
1500	160	135	485
1530	170	125	525
1600	185	135	525
1630	170	180	525
1700	150	115	525
1730	125	130	525
1800	130	145	490
1830	120	135	380
1900	100	100	385
1930	135	150	370
2000	85	130	350
2030	55	130	370
2100	75	125	380
2130	75	110	285
2200	75	105	310
2230	55	100	310
2300	55	85	365
2330	45	80	280
2400	35	75	305

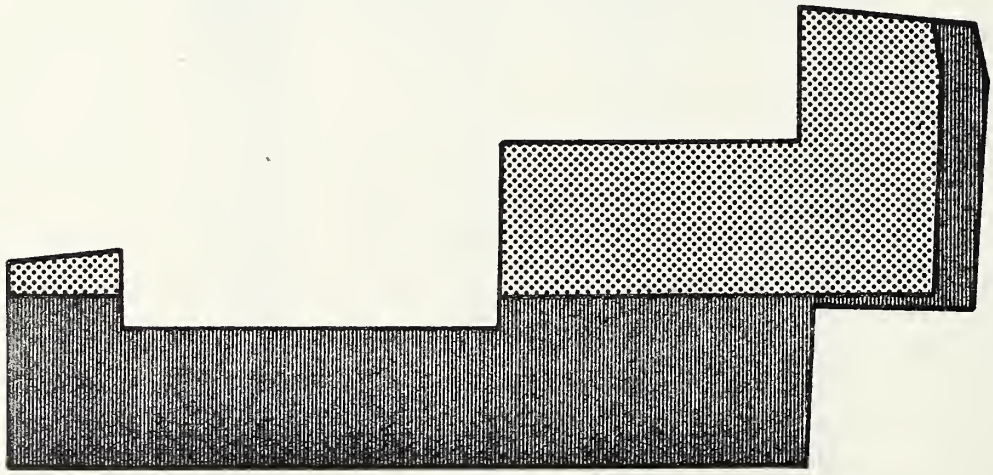
*Counter inoperative.

Time	South Bound Summit Ave.	West Bound Newark Ave.	North Bound Kennedy Blvd.
(Sept. 26)			
0030	25	100	225
0100	30	85	200
0130	30	70	155
0200	20	40	165
0230	25	35	115
0300	15	15	110
0330	20	15	70
0400	10	15	75
0430	10	5	55
0500	20	15	50
0530	25	20	65
0600	50	40	100
0630	65	60	135
0700	60	70	155
0730	70	70	210
0800	80	65	170
0830	100	75	200
0900	105	85	245
0930	110	110	250
1000	120	105	305
1030	100	115	300
1100	115	115	325
1130	95	110	365
1200	135	250	370
1230	125	125	370
1300	130	130	380
1330	125	130	405
1400	110	120	380
1430	115	160	385
1500	125	150	370
1530	110	125	385
1600	105	125	390
1630	95	115	370
1700	95	110	345
1730	80	130	335
1800	80	105	365
1830	120	110	345
1900	85	95	350
1930	85	80	405
2000	65	100	385
2030	60	100	315
2100	50	105	310
2130	60	70	265

	Time	South Bound Summit Ave.	West Bound Newark Ave.	North Bound Kennedy Blvd.
	(Sept. 26)			
	2200	65	65	290
	2230	70	70	275
	2300	55	65	280
	2330	35	65	245
	2400	50	90	350
	(Sept. 27)			
	0030	40	60	250
	0100	30	40	240
	0130	15	60	180
	0200	20	30	160
	0230	30	30	135
	0300	15	20	95
	0330	15	15	95
	0400	10	15	60
	0430	5	10	60
	0500	15	5	50
	0530	15	5	40
	0600	25	15	55
	0630	30	25	50
	0700	30	30	65
	0730	45	30	80
	0800	30	40	95
	0830	100	60	105
	0900	15	50	120
	0930		50	
SUM		11,675	10,795	42,265



STEP 1: SCREENING
(Auto traffic is worst case)



STEP 2: REFINEMENT
(Truck traffic is worst case)

SITE ACCEPTABILITY USING HUD NONACOUSTICAL MEASUREMENTS

Figure 15

The site also would be rated normally unacceptable up to 150 feet from Newark Avenue and up to 150 feet from Summit Avenue due to automobile traffic.

Estimating the peak hourly truck traffic to be 90 vehicles/hour on Newark and 55 vehicles/hour on Summit the site would be rated normally unacceptable up to 70 feet from Newark Avenue and 45 feet from Summit Avenue.

Aircraft Assessment

According to information obtained from Newark Airport the Jersey City Site is near the edge of the CNR 100 contour[7]. This would place the site on the border line between the noramlly acceptable region and the normally unacceptable region.

Railroad Assessment

The BREAKTHROUGH site is between two parallel railroad systems running nearly north-south. The Pennsylvania Railroad 1000 feet to the west of the site is shielded by two or more blocks of buildings and therefore would be rated clearly acceptable. The Erie Railroad which passes within 100 feet of the site is submerged and partially covered with streets and overpasses. The portion of the submerged railway which is open to the air vertically is at least 100 feet from the northern edge of the site. Here the site would be rated normally acceptable insofar as the railroad is concerned.

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[7]NEF curves are not available.

Noise Assessment -- Step Two: Refinement of Initial Screening Automobile and Truck Traffic

Because of the stop and go aspect of the traffic on Summit Avenue, on Newark Avenue, and on Kennedy Boulevard; adjustments were made to automobile and truck traffic volumes. The effective automobile traffic was adjusted to 10% of its volume and the effective truck traffic was adjusted to 10 times its volume. The Normally Acceptable boundary for cars would be moved to within 30 feet of Kennedy Boulevard. The site would then be rated as Normally Acceptable (auto traffic) to the sidewalks of Summit and Newark Avenues. The clearly Unacceptable region for trucks would be extended to about 200 feet north of Newark Avenue. Summit avenue truck traffic would extend this same region to at least 60 feet west of the avenue (Figure 15).

9. Summary and Conclusions

Application of the criteria of the DHUD draft circular[3] to the data of this survey results in the site being rated as normally acceptable. The step-one screening of the non-measurement technique for assessment of the site results in most of the site being rated as normally unacceptable. The second-step screening, a refinement of the initial screening for automobile and truck traffic results in a majority of the site being rated as clearly unacceptable. Since the non-measurement guidelines make no mention of sound levels, it is not known if that rating system is based on the same human response criteria as the DHUD draft circular. In addition, there are inconsistencies between the two rating systems with regard to aircraft noise. The composite noise rating (CNR) with relationship to Newark Airport

places the Jersey City site beyond (i.e., less noisy) than the CNR 100 contour. According to the DHUD draft circular, this indicates that the site is in zone 1 which is in the acceptable category. According to the non-measurement technique, the site is categorized as somewhere between the region of normally unacceptable and normally acceptable.


DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS