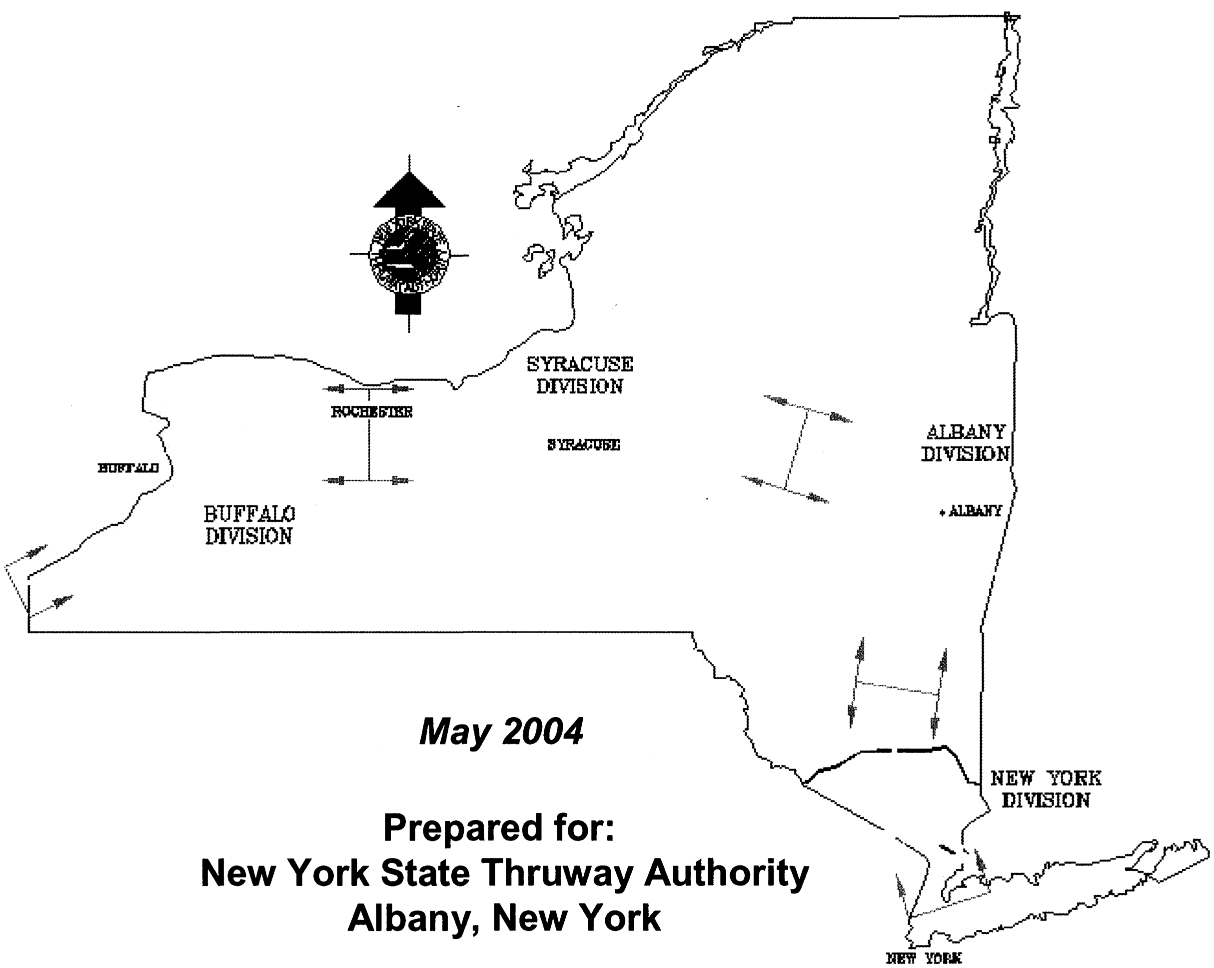
New York State Thruway Authority: Thruway-wide Noise Barrier Prioritization Study

VOLUME 1

Executive Summary and Report

Appendix A - Fundamentals of Traffic Noise
Appendix B - Final Noise Policy and Initial Screening Data
Appendix C - Noise Barrier Assessment Area Maps



May 2004

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EXECUTIVE SUMMARY

This report describes the methodology and presents the findings of a Thruway-wide noise barrier prioritization study conducted for the New York State Thruway Authority (NYSTA). In January 1998, NYSTA adopted a Noise Abatement Program with goals of: (1) providing relief to affected communities on a prioritized basis, relying on existing detailed data documenting noise impacts; and (2) undertaking a comprehensive review of locations where noise impacts may be severe but remain unquantified. This is a Type II, or retrofit noise barrier program, conducted at the option of the NYSTA.

As part of its Noise Abatement Program, the NYSTA commissioned the Thruway-wide Noise Barrier Prioritization Study. The prioritization study consists of two linked parts:

- Initial screening of the Thruway, to identify noise barrier assessment areas meeting the Authority's qualifying criteria, and
- Measurement, computation and prioritization of the qualifying candidate assessment areas.

This report provides the methodology and findings of the two linked parts. This study also reassesses all previously studied locations where noise barriers have been evaluated but that have not yet been designed and constructed. Prioritization of these previously studied barriers is superceded by the current study.

Tables 1 and 2, below, provide the priority rankings of all qualifying candidate assessment areas along the Thruway resulting from this study. The remainder of the report describes the methodology and reports the findings in greater detail.

Table 1 Noise Barrier Priority Rankings: Tier 1 (1)

Priority Ranking	Div.	Site ID	Approx. Mile Post Limits	Recommended Noise Barrier				Priority Index
				Ground - Mounted Length (ft)	Structure - Mounted Length (ft)	Height (ft)	Estimated Cost	
1	NY	NE/Exit 16/SB/3 (2)	5.10 - 5.75	813	1457	14	$1,577,000	106
2	NY	NE/Exit 12/SB/1	1.20 - 1.75	3220	0	12	$1,753,000	52
3	BUF	N/Exit N5/SB/1	3.67 - 4.06	1600	840	20	$2,111,000	29
4	BUF	ML/Exit 56/EB/1	430.51- 431.22	3629	161	18	$2,801,000	27
5	NY	NE/Exit 16/SB/2	5.70 – 6.00	3454	86	20	$2,792,000	26
6	NY	ML/Exit 4/SB/1	1.40 - 1.95	1298	1312	12	$1,580,000	25
7	BUF	N/Exit N1/NB/2	0.71 - 0.85	710	0	16	$469,000	24
8	BUF	ML/Exit 50A/WB/1	420.69- 421.39	3740	0	14	$2,262,000	23
9	SYR	ML/Exit 43/EB/3	336.10- 337.20	4970	0	14	$3,008,000	23
10	NY	NE/Exit 22/SB/1	14.3 – 14.8	3157	583	18	$2,816,000	23
11	NY	ML/Exit 3/SB/1	0.90 - 1.40	0	2882	12	$1,917,000	22
12	NY	NE/Exit 16/NB/1	6.75 - 7.15	2260	0	22	$1,912,000	22

Priority Ranking	Div.	Site ID	Approx. Mile Post Limits	Recommended Noise Barrier				Priority Index
				Ground - Mounted Length (ft)	Structure - Mounted Length (ft)	Height (ft)	Estimated Cost	
13	SYR	ML/Exit 43/EB/1	339.36- 339.77	2160	0	18	$1,563,000	22
14	BUF	ML/Exit 52A/EB/1	424.30- 424.90	3250	0	16	$2,158,000	20
15	BUF	ML/Exit 51/EB/1	420.71- 421.49	4570	0	14	$2,763,000	20
16	SYR	ML/Exit 38/EB/2	284.25- 284.77	2650	70	16	$1,829,000	20
17	BUF	ML/Exit 51/WB/1	421.74- 422.50	3800	0	16	$2,526,000	20
18	SYR	ML/Exit 35/WB/1	280.95- 281.90	4650	0	16	$3,093,000	17
19	BUF	ML/Exit 55/EB/2	428.00- 428.35	2000	0	16	$1,329,000	17
20	ALB	ML/Exit 19/SB/1	90.18 - 90.66	2470	90	16	$1,726,000	17
21	BUF	ML/Exit 50A/EB/1	420.30- 420.67	1750	0	16	$1,166,000	17
22	BUF	N/Exit N3/NB/1	2.28 - 2.90	2895	345	12	$1,807,000	17
23	BUF	N/Exit N5/SB/2	3.09 - 3.50	2137	483	14	$1,674,000	16
24	NY	ML/Exit 1/SB/1	0.00 - 0.57	0	3049	12	$2,028,000	15
25	NY	ML/Exit 10/SB/1	16.05 - 16.69	3340	270	16	$2,444,000	15
26	SYR	ML/Exit 31/EB/2	225.47- 225.91	1850	70	14	$1,161,000	15
27	NY	ML/Exit 6A/NB/1	7.30 - 8.08	4240	0	20	$3,324,000	14
28	NY	ML/Exit 16/SB/1	34.05 - 34.87	3820	0	12	$2,081,000	14
29	NY	ML/Exit 0/NB/1	0.00 - 0.30	0	1950	10	$1,141,000	13
30	ALB	ML/Exit 28/WB/1	182.32- 182.95	3210	110	14	$2,028,000	13
31	NY	ML/Exit 14A/NB/1	24.65 - 25.40	3805	145	14	$2,407,000	13
32	NY	ML/Exit 15A/NB/1	35.69 - 36.35	3430	50	13	$2,019,000	12
33	NY	ML/Exit 13/SB/1	19.49 - 20.40	4583	127	12	$2,585,000	11
34	BUF	ML/Exit 52/EB/1	421.74- 422.66	4830	0	16	$3,211,000	11
35	BUF	N/Exit N8/NB/1	5.93 - 6.17	2420	0	12	$1,318,000	11
36	BUF	ML/Exit 56/WB/2	432.86- 433.48	3210	0	16	$2,133,000	11
37	SYR	ML/Exit 45/EB/1	347.00- 347.30	2530	0	16	$1,680,000	11
38	BUF	N/Exit N3/SB/1	1.38 - 1.63	1770	0	14	$1,077,000	10
39	SYR	ML/Exit 30/WB/3	232.57- 232.80	1720	0	12	$938,000	9
40	NY	NE/Exit 17/NB/1	7.80 - 8.40	2720	260	20	$2,388,000	9
41	NY	ML/Exit 12/SB/1	18.00 - 18.70	4290	0	16	$2,852,000	9
42	NY	ML/Exit 1/SB/2	0.35 - 0.85	0	3448	12	$2,293,000	8
43	BUF	N/Exit N3/NB/2	2.92 - 3.22	1063	807	14	$1,159,000	8
44	NY	ML/Exit 15/SB/1	29.36 – 29.96	2627	363	20	$2,422,000	7

Notes *(1)* Tier 1 assessment areas have a minimum of 25 residential units constructed prior to 1976.

(2) This noise barrier was excluded from a previous noise study because a portion of it is located on a viaduct. Further investigation, as part of a detailed noise study and preliminary design, is needed to confirm the feasibility of constructing a noise barrier on this existing viaduct.

Table 2 Noise Barrier Priority Rankings: Tier 2 (1)

Priority Ranking	Div.	Site ID	Approx. Mile Post Limits	Barrier				Priority Index
				Ground – Mounted Length (ft)	Structure – Mounted Length (ft)	Height (ft)	Estimated Cost	
1	ALB	ML/Exit 23/NB/1	142.00- 142.50	2710	0	18	$1,968,000	16
2	SYR	ML/Exit 38/EB/1	284.73- 285.47	3750	150	14	$2,379,000	15
3	ALB	ML/Exit 23/NB/2	142.50- 143.20	3640	0	18	$2,639,000	14
4	NY	ML/Exit 16/SB/2	33.57 - 34.25	3570	220	12	$1,972,000	13
5	BUF	ML/Exit 46/WB/1	364.70- 365.60	4950	0	18	$3,587,000	12

Notes *(1)* Tier 2 assessment area have a minimum of 25 residential units constructed between 1976 and 1998, and an insufficient (<25) number of residential units constructed prior to 1976.

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LIST OF TABLES

NOTE: Appendix D – G (Vol. 2) and Appendix H – K (Vol. 3) are bound separately.

1 INTRODUCTION AND PROJECT DESCRIPTION

This report describes the methodology and presents the findings of a Thruway-wide noise barrier prioritization study conducted for the New York State Thruway Authority (NYSTA) by Bergmann Associates and its subconsultants Harris Miller Miller & Hanson Inc. and Fisher Associates under NYSTA Contract D213057. In January 1998, NYSTA adopted a six-year capital improvement plan that included $15M for Thruway-wide noise mitigation. This dramatic change in policy marked the first time in NYSTA's history where funds were specifically set aside for noise mitigation. In establishing its Noise Abatement Program, NYSTA recognized that traffic, and consequently traffic noise, has increased along the many sections of the Thruway since its initial construction. The Noise Abatement Program is outlined in the Final Noise Policy *New York State Thruway Authority Noise Abatement Program*[1] (see Appendix B).

The goals of the Noise Abatement Program are to: (1) provide relief to affected communities on a prioritized basis, relying on existing detailed data documenting noise impacts; and (2) undertake a comprehensive review of locations where noise impacts may be severe but remain unquantified.

As part of its Noise Abatement Program, the NYSTA commissioned its Thruway-wide Noise Barrier Prioritization Study. This prioritization study consists of two linked parts:

- **Initial screening of the Thruway, to identify noise barrier assessment areas meeting the Authority's qualifying criteria**
- **Measurement, computation and prioritization of the qualifying assessment areas.**

This study also reassesses all previously studied locations where noise barriers have been evaluated but that have not yet been designed and constructed. Prioritization of these previously studied barriers is superseded by the current study.

It is the intention of the NYSTA to implement this prioritization study by designing and constructing noise barriers in their priority order, as funding is made available. The resulting prioritization is listed in Section 7 of this report.

Federal regulations refer to noise barriers constructed along existing roadways as "Type II" noise barriers. Unlike "Type I" barriers, which are included in Federal-aid highway projects involving either construction of a highway on a new location or the physical alteration of an existing highway which significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes, consideration of Type II noise barriers is not mandated by federal or New York State regulations. Instead, Type II noise barriers are built solely at the option of individual states.

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[1] *New York State Thruway Authority Noise Abatement Program – Final Noise Policy (As Adopted by the Board in December 1997 and Revised Pursuant to the January 1998 Board Resolution)*

The NYSTA Noise Abatement Program is a voluntary Type II noise barrier program conducted at the option of the NYSTA. It is intended to provide noise abatement for qualifying existing residential development along eligible portions of its existing interstate highways where earth berms, structural noise barriers or constructed visual screens do not already exist. Although this is not a federal aid project, elements of the noise analysis follow the guidelines established by the FHWA in 23CFR772[2].

In locations where NYSTA is considering a lane-widening project, the Type I project provisions of 23CFR772 are applied. Some qualifying assessment areas in the current study may in the future become part of a Type I study, if they are in a location where a lane-widening project is developed. Similarly, assessment areas studied in the initial screening that did not meet the qualifying criteria for the Noise Abatement Program could some day be included as part of a Type I study, if they are in a location where a lane widening project is developed.

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[2] Federal Highway Administration. 23 CFR Part 772: *Procedures for Abatement of Highway Noise and Construction Noise*. Federal Register, Vol. 47, No. 131, 8 July 1982.

2 OVERVIEW OF METHOD AND TRAFFIC NOISE FUNDAMENTALS

This section of the report provides a brief overview of the methodology followed throughout the study including: the initial screening, the noise measurement program, traffic noise predictions, noise barrier design, and noise barrier prioritization. Further detail on each of these steps is provided in Section 3 through Section 6 of the report.

- An **initial screening** was conducted to identify assessment areas that potentially were eligible to be considered for noise barriers. To be eligible for consideration in this study, candidate assessment areas had to meet these criteria:
  - Located along portions of the Thruway where NYSTA has maintenance, operation, and capital improvement responsibilities, and where noise impacts are directly related to Thruway traffic.
  - Sufficient number of residences close to the Thruway.
  - Residences constructed prior to 1999.
- A **noise measurement program**, consisting of both long-term measurements (24-hour) and short-term measurements (up to approximately 20 minutes) was conducted within those areas meeting the eligibility criteria. In general, one long-term measurement was conducted in each eligible noise barrier assessment area. The purpose of the long-term measurements was to:
  - Identify the loudest-hour of the day due to Thruway traffic, and
  - Provide a basis to adjust loudest-hour computations to the 24-hour metric required to set barrier priorities.

  Short-term noise measurements were conducted at two to three measurement sites within each eligible noise barrier assessment area. The purpose of the short-term measurements was to:
  - Document existing sound levels at noise-sensitive locations,
  - Provide measured sound levels to validate the traffic-noise modeling within each assessment area, and
  - Collect concurrent traffic data for input during model validation and computation of loudest-hour sound levels.
- **Traffic noise predictions** were made using the Federal Highway Administration (FHWA) Traffic Noise Model Version 2.0 (TNM). This study included two sets of noise computations:
  - Computations to validate the TNM modeling by comparison to measurements, and
  - Computations of sound levels, both without barriers and with barriers of various heights, to compute noise barrier priorities.
- All **noise barrier design** was conducted using TNM.
  - In general, an evaluated barrier design was positioned where it would be most effective, typically either near the edge of shoulder or near the Right-of-Way (ROW) line.

  - Barriers typically were evaluated with heights ranging from 12 to 24 feet in 2-foot intervals.
  - Because NYSTA's Noise Policy does not provide specific noise barrier design goals, this evaluation was conducted in accordance with general guidelines established by FHWA and specific criteria provided by the New York State Department of Transportation's (NYSDOT) Noise Analysis Policy.
- **Noise barrier prioritization** for all candidate assessment areas was accomplished by:
  - Computation of a Priority Index for each barrier, based upon four Priority Factors (number of people, impacts factor, benefit factor, and cost), and then
  - Grouping of all barriers depending upon construction dates of the land uses they benefit.

The final product of the study, a list of all qualifying assessment areas throughout the entire Thruway ranked by Priority Index, is presented in Section 7.

For readers unfamiliar with highway traffic noise analysis, Appendix A provides a discussion of the fundamentals of highway traffic noise. Some of the main points are summarized here:

Loudness is a subjective quantity that enables a listener to order the magnitude of different sounds on a scale from soft to loud. Although the perceived loudness of a sound is based somewhat on its frequency and duration, chiefly it depends upon the sound pressure level. Sound pressure level is a measure of the sound pressure at a point relative to a standard reference value; sound pressure level is always expressed in decibels (dB), a logarithmic quantity. To the human ear, changes in sound levels of three decibels or less generally are difficult to perceive and changes of 10 decibels may be perceived as approximately doubling or halving of loudness. Figure 1 shows some common indoor and outdoor sound levels.

Another important characteristic of sound is its frequency, or "pitch." This is the rate of repetition of sound pressure oscillations as they reach our ears. Frequency is expressed in units known as Hertz (abbreviated "Hz") that are equivalent to one cycle per second. Sounds heard in the environment usually consist of a range of frequencies. The distribution of sound energy as a function of frequency is termed the "frequency spectrum." The human ear does not respond equally to identical sound levels at different frequencies. Although the normal frequency range of hearing for most people extends from a low of about 20 Hz to a high of 10,000 to 20,000 Hz, people are most sensitive to sounds in the voice range, between about 500 Hz and 2,000 Hz. Therefore, to correlate the amplitude of a sound with its level as perceived by people, the sound energy spectrum often is adjusted, or "weighted."

The weighting system most commonly used to correlate with people's response to noise is "A-weighting" (or the "A-filter") and the resultant sound level is called the "A-weighted sound level" (dBA). A-weighting significantly de-emphasize those parts of the frequency spectrum from a noise source that occur both at lower frequencies (those below about 500 Hz) and at very high frequencies (above 10,000 Hz) where we do not hear as well. The filter has very little effect, or is nearly "flat," in the middle range of frequencies between about 500 and 10,000 Hz. Because this filter generally matches our ears' sensitivity, A-weighted sound levels normally are used to evaluate environmental noise sources.

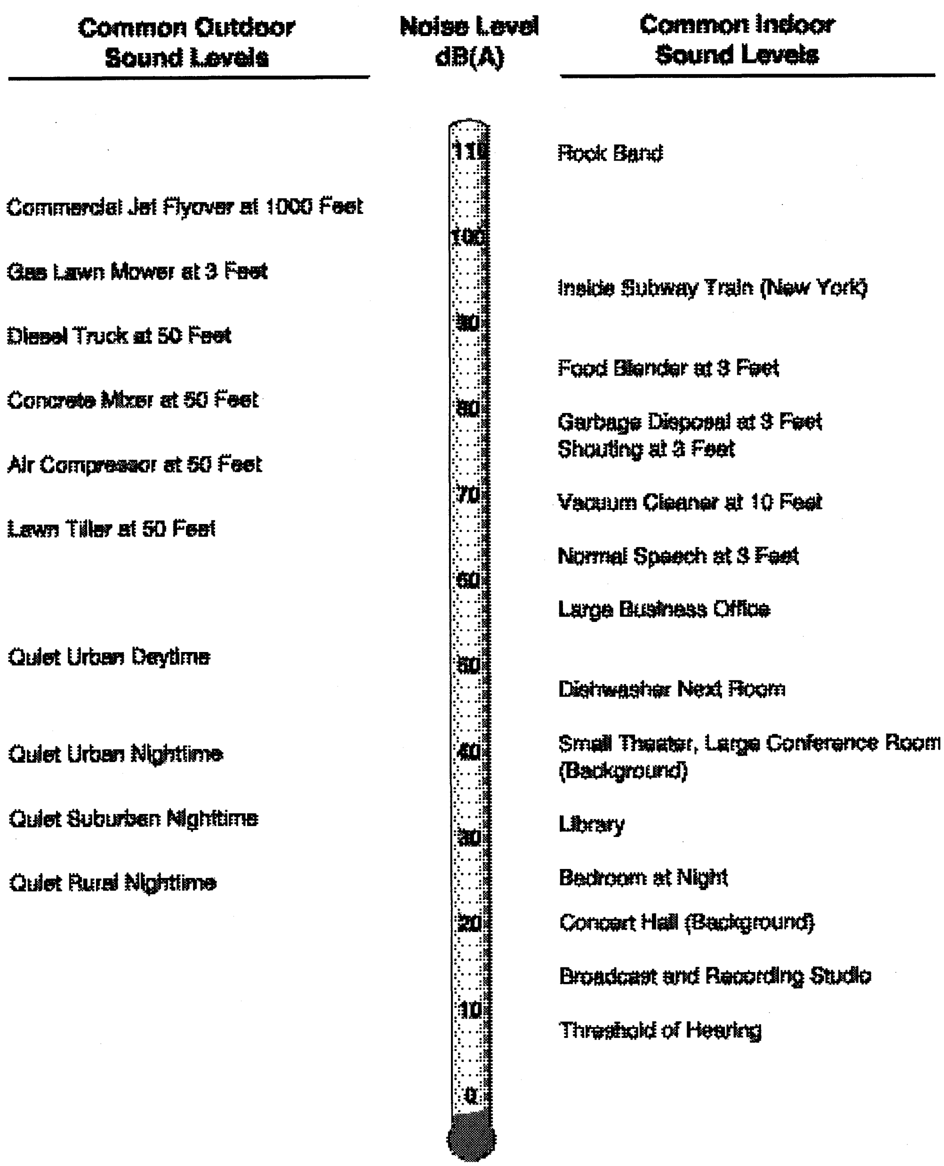

Figure 1 Common Outdoor and Indoor Sound Levels

The Equivalent Sound Level, abbreviated L_{eq}, is a measure of the exposure resulting from the accumulation of A-weighted sound levels over a particular period of interest -- for example, an hour, an 8-hour school day, nighttime, or a full 24-hour day. However, because the length of the period can vary depending on the application, the duration should always be identified or clearly understood when discussing the metric. Such durations are often identified through a subscript, for example $L_{eq(24)}$. For traffic noise analysis, L_{eq} typically is evaluated over a one-hour period.

Conceptually, L_{eq} may be thought of as a constant sound level over the period of interest that contains as much sound energy as the actual time-varying sound level with its normal peaks and valleys. It is important to recognize, however, that the two signals (the constant one and the time-varying one) would sound very different from each other if compared in real life. Also, the "average" sound level suggested by L_{eq} is not an arithmetic value, but a logarithmic, or "energy-averaged" sound level. Thus, loud events dominate any noise environment described by the metric.

The Day-Night Average Sound Level (L_{dn} or DNL) is an A-weighted equivalent level that accounts for all sound energy during a 24-hour period. L_{dn} is similar to $L_{eq(24)}$, except that L_{dn} applies a 10-dB penalty to all noise events occurring during the nighttime hours of 10 PM to 7 AM. This 10-dB penalty, which counts each nighttime noise event as equivalent to 10 similar daytime events, is intended to account for both increased human sensitivity to nighttime noise and generally lower nighttime ambient sound levels. In this study, L_{dn} was used to help determine noise barrier prioritization rankings.

3 CANDIDATE NOISE BARRIERS FOR PRIORITIZATION

Three Thruway noise barrier activities led into the finalized noise barrier prioritization:

- **Previous Thruway noise barrier studies.** Several previous studies identified and prioritized potential noise barriers along selected portions of the Thruway. Those barriers not yet built were subsequently folded into the current study.
- **Initial Noise Barrier Screening.** The first part of this current study, potential noise barrier areas along eligible portions of the full Thruway system were initially screened, to eliminate those areas not qualifying for noise barriers.
- **Final list of candidate noise barriers.** Field visits and review of aerial photographs further eliminated several areas that passed initial screening, and added other areas—resulting in the final list of candidate noise barriers for prioritization.

This section summarizes those three previous activities and includes the list of final barrier candidates for prioritization.

3.1 Previous Thruway Noise Barrier Studies

Several previous studies identified and prioritized potential noise barriers along selected portions of the Thruway—specifically in Westchester and Rockland Counties, plus Orange County south of Mile Post 50.02.[3,4,5]

Noise barriers have already been constructed along several of these Thruway sections. Locations where noise barriers are presently being constructed or have already been constructed are not reassessed here, because they no longer need prioritization.

Locations where noise barriers have been designed and approved for construction (but not yet constructed) are not reassessed here, because they also no longer need prioritization. These include noise barriers along the southbound side of I-87 between MP 30.85 and MP 30.45 in the Village of

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[3] *Noise Barrier Study, New England Division Westchester County, Interstate Route 95 Pelham/New Rochelle Border to Connecticut State Line*, Prepared for: New York State Thruway Authority, Prepared by: Berger, Lehman Associates, P.C., September 1987, revised September 1990.

[4] *Noise Study Technical Report, Interstate Route 87 from the Hudson River to the Orange County line and the Garden State Parkway Connection*, Prepared for: New York State Thruway Authority, Prepared by: Rust Environment & Infrastructure, Inc., May 1996.

[5] *"Noise Mitigation Prioritization Study, I-87, Westchester, Rockland and Orange Counties, Final Technical Report,"* Acentech Report No. 251, Prepared by Acentech Incorporated, Prepared for Edwards & Kelcey Engineers, July 2000.

Hillburn, and along the southbound side of I-87 between MP 22.05 and MP 21.60 in the Town of Clarkstown.

In contrast, locations that have been prioritized for noise barriers, but noise barriers have not been designed and approved for construction, have been folded into the current study, so that these qualifying residential areas will be assessed consistently with all others throughout the Thruway system.

3.2 Initial Noise Barrier Screening

This section summarizes the initial noise barrier screening. The initial screening follows the criteria and process as outlined in the Final Noise Policy.

3.2.1 Eligibility criteria

To be eligible for noise barriers, potential noise barrier assessment areas had to meet the following eligibility criteria as presented in the Final Noise Policy (see Appendix B for details):

- **General location.** Potential noise barrier assessment areas must lie along portions of the Thruway where NYSTA has maintenance, operation, and capital improvement responsibilities, and where noise impacts are directly related to Thruway traffic. The Thruway does not have capital improvement responsibilities for the Cross-Westchester Expressway or Interstate 84. For this reason, potential noise barrier areas along that portion of the Thruway are not eligible.
- In total, the following Thruway portions meet this general-location criterion:
    - The Thruway Main Line (Mile Post 0.00 to Mile Post 496.00)
    - New England Section (Mile Post NE 0.00 to Mile Post NE 15.01)
    - Garden State Parkway Connection (Mile Post GSP 0.00 to GSP Mile Post 2.40)
    - Berkshire Section (Mile Post B 0.00 to Mile Post B 24.28)
    - Niagara Section (Mile Post N 0.00 to Mile Post N 21.10)
- **Number of residences and their distance from the Thruway.** Potential noise barrier assessment areas must include 25 or more residential structures within 200 feet of the nearest Thruway edge of travel lane (either mainline or ramp).
- **Residence construction dates.** In counting residential structures within 200 feet, residences are grouped into three tiers:
    - Tier 1: Residences constructed prior to 1976, which will be given first priority.
    - Tier 2: Residences constructed between 1976 and 1998, which will be considered subsequent to those of Tier 1.
    - Tier 3: Residences constructed in 1999 or later, which are not eligible.

  The date of construction for a residential structure is the date a building permit was issued. As part of the initial screening, the tier for every residential structure within 200 feet was determined from the best available information. This included: the New York State – Statewide Digital Orthoimagery Program, which includes aerial photography captured between 1994 and 1999; the 2001 NYS Office of Real Property Service (ORPS) data files; historic aerial photography and historic USGS quadrangle maps, and local municipal assessors. Only assessment areas with 25 or more residences in Tiers 1 and 2 are eligible. For that reason, to determine eligibility of a potential assessment area, Tier 3 residences are excluded from the count. The criteria used for prioritization of assessment areas in Tiers 1 and 2 are addressed in a later section of the report.

3.2.2 Initial-screening process

Initial screening for these Thruway portions consisted of the following tasks:

- An office-based review of databases and aerial photography, to identify all areas along the Thruway that are eligible for noise barriers, per the criteria in the previous section.
- A field review of these candidate noise barrier assessment areas, including a meeting with Thruway division personnel.
- Construction of a comprehensive database of both office-based and field-based information to use in identifying candidate locations. This database will also be used to keep records and logs of noise related information related to the Thruway. See Appendix B for examples of database and the summary tables separated by Thruway Divisions. The Microsoft® Access database CD will be maintained by the Authority and linked to GIS. A copy of the Access database CD is attached in a pocket sleeve in Appendix B.
- Recommendation of Thruway noise barrier prioritization candidate locations. These were provided in a summary table separated by Thruway Division (see Appendix B) during the initial screening process.

3.3 Final Assessment Areas for Noise Barrier Prioritization

Field visits and review of aerial photographs further eliminated four assessment areas that passed initial screening, and added seven other areas. This section contains assessment area tables (Table 3 through Table 6), location maps (Figures 1-A through 1-J), and a narrative description of these final assessment areas for noise barrier candidates.

In total, the following numbers of assessment areas along the Thruway, by Division, were eligible for noise barriers and therefore are included in the remainder of this study:

- New York Division: 21 assessment areas (out of 85 potential areas screened)
- Albany Division: 4 assessment areas (out of 28 potential areas screened)
- Syracuse Division: 9 assessment areas (out of 27 potential areas screened)
- Buffalo Division: 20 assessment areas (out of 58 potential areas screened)

3.3.1 Tables

Table 3 through Table 6 list the final assessment areas, and in these tables:

- Column 1 provides the assessment area, for cross -reference to other tables and maps. See detailed description on the following page.

Thruway Exit Direction

Assessment Area: (__ / ______ / __ / __) {Example: (ML / Exit 19 / SB / 1) }

Section of Thruway

Study Area Number between Exits (numbered consecutively)

Section of Thruway:
ML= Mainline (I-90 west of exit 24 and I-87 between NYC line and exit 24)
NE= New England section (I-95, north of NYC line)
N= Niagara section (I-190)

Thruway Exit:
Exit number of the preceding interchange based on direction of traffic flow (ex. Exit 19)

Direction:
The direction of traffic flow and specifically:
I-90 (EB or WB)
I-87 (NB or SB)
I-95 (NB or SB)
I-190 (NB or SB)

Study Area Number:
A sequential number, beginning with 1, indicating the position of the assessment area with respect to the preceding exit number.

- Column 2 provides the town, village or city, and the county within which the assessment area is located.
- Column 3 locates the area by approximate milepost position.
- Column 4 provides the number of residential units (single family homes or individual units within multi-family buildings) located within 200 feet of the Thruway in each assessment area. The table provides the total number of Tier 1 residences and Tier 2 residences (in parentheses), as defined in Section 3.2.1.

Table 3 New York Division Assessment Areas by Mile Post & Interchange

Assessment Area	City/Town, County	Approx. Thruway Mileposts	Total Residences within 200 feet Tier 1 & (Tier 2)
ML / EXIT 1 / SB / 1	City of Yonkers, Westchester County	0.0 to 0.3	25 (0)
ML / EXIT 0 / NB / 1	City of Yonkers, Westchester County	0.0 to 0.3	25 (0)
ML / EXIT 2 / SB / 1	City of Yonkers, Westchester County	0.5 to 0.8	25 (0)
ML / EXIT 3 / SB / 1	City of Yonkers, Westchester County	0.9 to 1.4	25 (0)
ML / EXIT 4 / SB / 1	City of Yonkers, Westchester County	1.4 to 1.85	25 (0)
ML / EXIT 6A / NB / 1	Village of Ardsley, Westchester County	7.45 to 8.0	28 (0)

Assessment Area	City/Town, County	Approx. Thruway Mileposts	Total Residences within 200 feet Tier 1 & (Tier 2)
ML / EXIT 10 / SB / 1	Villages of Grandview on Hudson & Nyack, Rockland County	16.15 to 16.6	37 (0)
ML / EXIT 12 / SB / 1	Town of Clarkstown, Rockland County	18.0 to 18.7	28 (0)
ML / EXIT 13 / SB / 1	Town of Clarkstown, Rockland County	19.65 to 20.4	25 (0)
ML / EXIT 14A / NB / 1	Town of Ramapo, Rockland County	24.4 to 25.9	26 (0)
ML / EXIT 15 / SB / 1	Village of Suffern, Rockland County	29.5 to 30.0	26 (0)
ML / EXIT 16 / SB / 2	Village of Sloatsburg, Rockland County	33.6 to 34.1	20 (6)
ML / EXIT 16 / SB / 1	Village of Sloatsburg, Rockland County	34.1 to 34.8	26 (4)
ML / EXIT 15A / NB / 1	Town of Tuxedo, Orange County	35.8 to 36.3	25 (0)
NE / EXIT 12 / SB / 1	New York City, Bronx County	1.1 to 1.6	26 (0)
NE / EXIT 16 / SB / 3	City of New Rochelle, Westchester County	5.2 to 5.5	28 (0)
NE / EXIT 16 / SB / 2	City of New Rochelle, Westchester County	5.6 to 5.9	30 (0)
NE / EXIT 16 / SB / 1	City of New Rochelle, Westchester County	6.0 to Exit Ramp	25 (0)
NE / EXIT 16 / NB / 1	City of New Rochelle, Westchester County	6.6 to 7.5	25 (0)
NE / EXIT 17 / NB / 1	Town of Mamaroneck, Westchester County	7.7 to 8.2	25 (0)
NE / Conn. Line / SB / 1	City of Rye & Village of Port Chester, Westchester County	14.3 to 14.8	25 (0)

Table 4 Albany Division Assessment Areas by Mile Post & Interchange

Assessment Area	City/Town, County	Approx. Thruway Mileposts	Total Residences within 200 feet Tier 1 & (Tier 2)
ML / EXIT 19 / SB / 1	City of Kingston, Ulster County	90.25 to 90.5	38 (0)
ML / EXIT 23 / NB / 1	City of Albany, Albany County	142.0 to 142.5	16 (12)
ML / EXIT 23 / NB / 2	City of Albany, Albany County	142.5 to 144.2	14 (12)
ML / EXIT 28 / WB / 1	Village of Fultonville, Montgomery County	182.4 to 182.95	30 (0)

Table 5 Syracuse Division Assessment Areas by Mile Post & Interchange

Assessment Area	City/Town, County	Approx. Thruway Mileposts	Total Residences within 200 feet Tier 1 & (Tier 2)
ML / EXIT 31/ EB / 2	Town of Schuyler, Herkimer County	225.5 to 225.9	32 (0)
ML / EXIT 30 / WB / 3	City of Utica, Oneida County	232.6 to 232.9	48 (0)
ML / EXIT 35 / WB/ 1	Town of Salina, Onondaga County	281.1 to 281.9	46 (5)
ML / EXIT 38 / EB / 2	Town of Salina, Onondaga County	284.3 to 284.7	15 (10)
ML / EXIT 38 / EB / 1	Village of Liverpool, Onondaga County	284.8 to 285.5	20 (6)
ML / EXIT 39 / EB / 1	Town of Salina, Onondaga County	285.7 to 286.7	25 (5)
ML / EXIT 43 / EB / 3	Town of Manchester, Ontario County	336.3 to 337.0	52 (0)
ML / EXIT 43/ EB / 1	Village of Manchester, Ontario County	339.5 to 339.8	25 (0)
ML / EXIT 45/ EB / 1	Town of Farmington, Ontario County	347.3 to Exit 44 Ramp	25 (0)

Table 6 Buffalo Division Assessment Areas by Mile Post & Interchange

Assessment Area	City/Town, County	Approx. Thruway Mileposts	Total Residences within 200 feet Tier 1 & (Tier 2)
ML / EXIT 46/ WB / 2	Town of Henrietta, Monroe County	364.7 to 365.6	(25)
ML / EXIT 50A/ EB / 1	Town of Amherst, Erie County	419.9 to 419.3	32 (0)
ML / EXIT 50A/ WB / 1	Town of Cheektowaga, Erie County	420.4 to 421.3	38 (0)
ML / EXIT 51/ EB / 1	Town of Cheektowaga, Erie County	420.3 to 421.6	38 (0)
ML / EXIT 51/ WB / 1	Town of Cheektowaga, Erie County	421.6 to 422.35	47 (0)
ML / EXIT 52/ EB / 1	Town of Cheektowaga, Erie County	422.6 to 421.8	31 (0)
ML / EXIT 52A/ EB / 1	Town of Cheektowaga, Erie County	424.25 to 424.85	37 (0)
ML / EXIT 55/ EB / 3	Town of West Seneca, Erie County	428.0 to OK	27 (0)
ML / EXIT 55/ EB / 2	Town of West Seneca, Erie County	428.0 to 428.35	27 (0)
ML / EXIT 56/ EB / 1	City of Lackawanna, Erie County	430.4 to 431.2	27 (0)
ML / EXIT 56/ WB / 2	Town of Hamburg, Erie County	432.8 to 433.4	28 (3)

Assessment Area	City/Town, County	Approx. Thruway Mileposts	Total Residences within 200 feet Tier 1 & (Tier 2)
N / EXIT N1 / NB /2	City of Buffalo, Erie County	0.75 to 0.90	25 (0)
N / EXIT N2/ SB / 1	City of Buffalo, Erie County	1.4 to 1.6	31 (0)
N / EXIT N3/ SB / 1	City of Buffalo, Erie County	2.2 to 2.9	34 (0)
N / EXIT N3/ NB / 1	City of Buffalo, Erie County	2.2 to 2.9	47 (0)
N / EXIT N3/ NB / 2	City of Buffalo, Erie County	3.0 to 3.2	33 (0)
N / EXIT N5/ SB / 2	City of Buffalo, Erie County	3.1 to 3.5	40 (0)
N / EXIT N5/ SB / 1	City of Buffalo, Erie County	3.65 to 4.1	57 (0)
N / EXIT N7/ NB / 1	City of Buffalo, Erie County	5.8 to Exit Ramp	30 (0)
N / EXIT N8/ NB / 1	City of Buffalo, Erie County	Entrance Ramp to 5.9	52 (0)

3.3.2 Location Plans

Figures 1-A through 1-J are the location plans for the final assessment areas. These maps provide the following information:

- Location with respect to interchanges (Exit Number), County, and Assessment Area designation.

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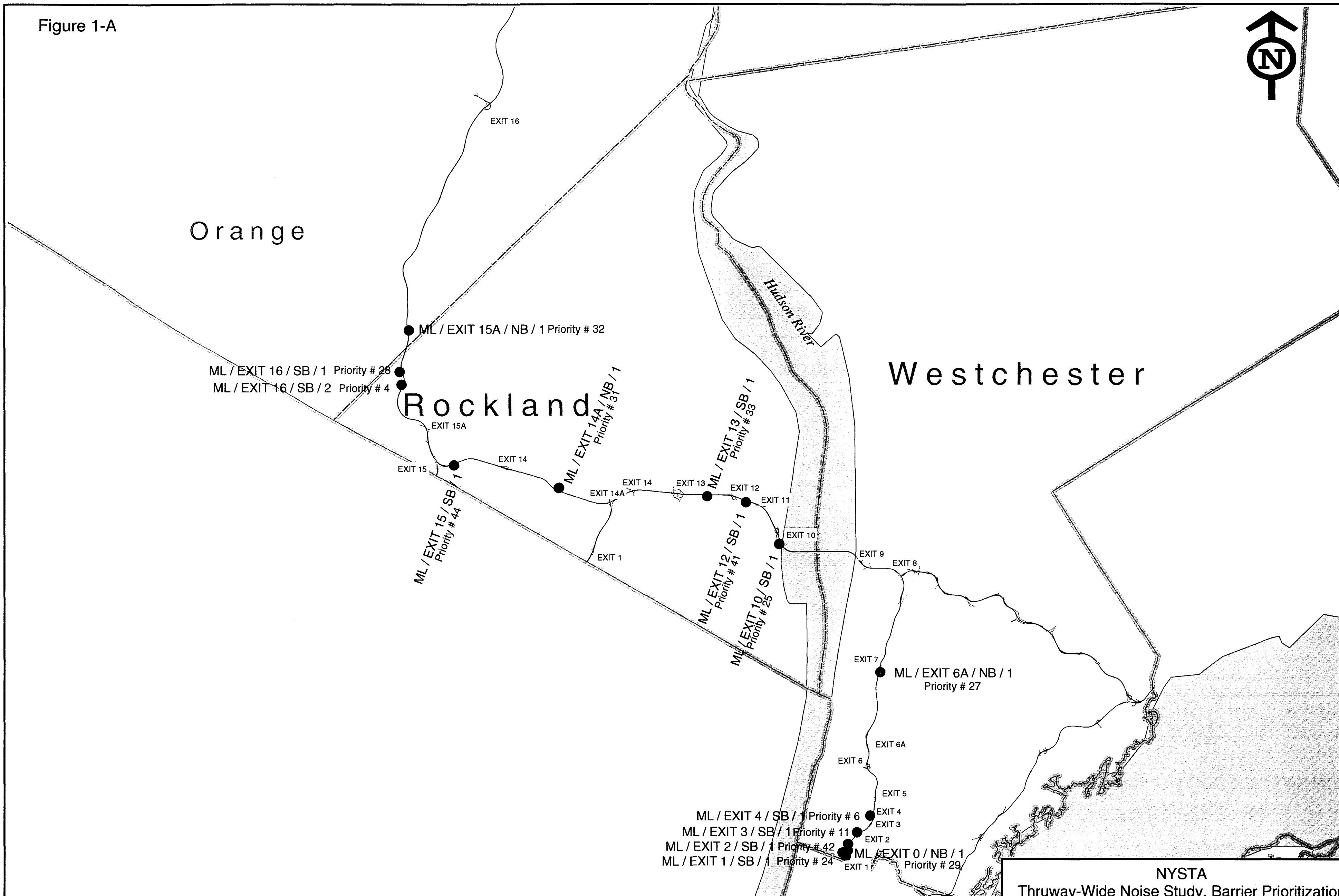
Figure 1-A



NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

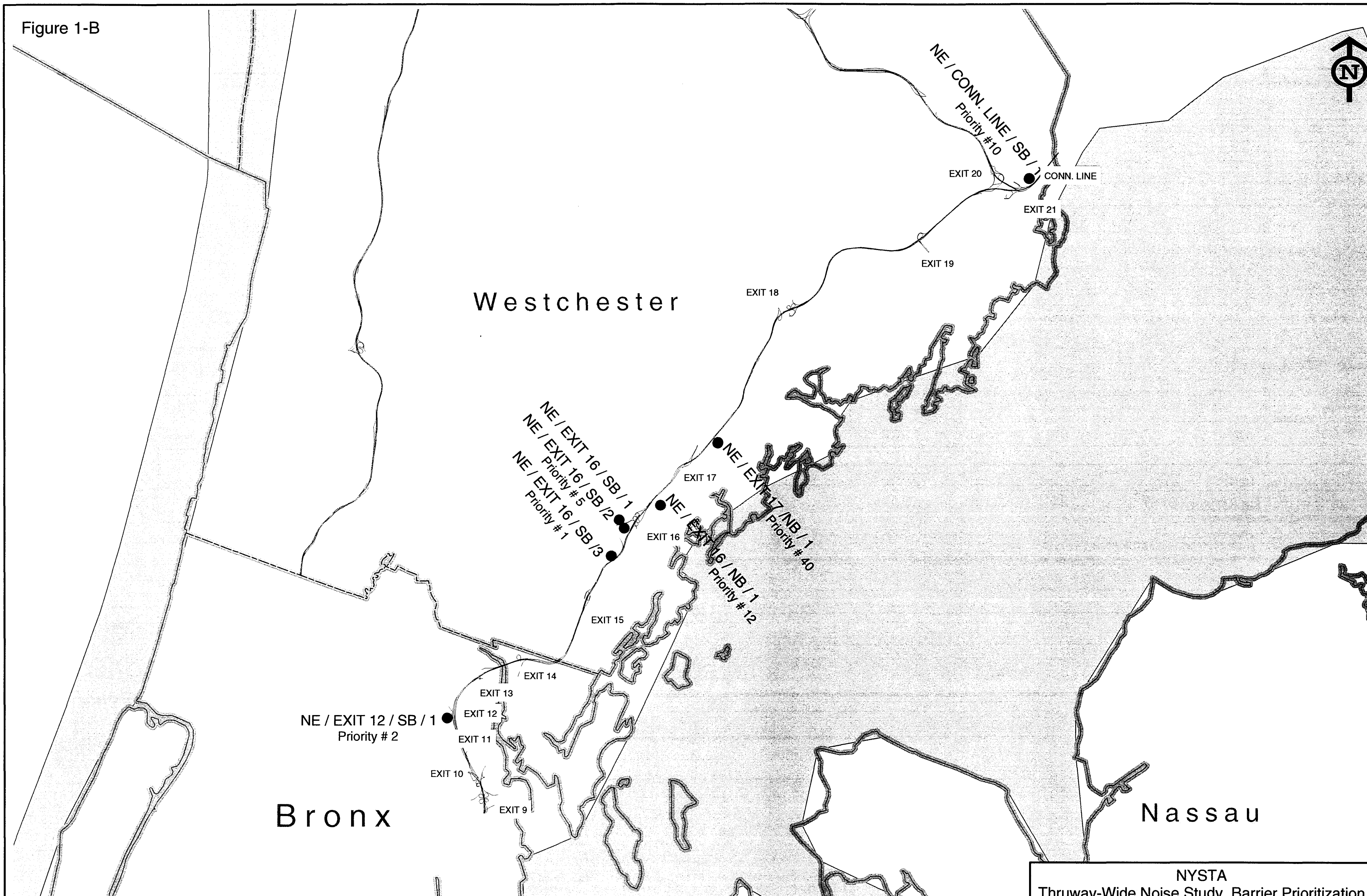
Noise Assessment Area Location Plan:
New York Division
Westchester County
Rockland County
Orange County

SCALE:	DATE:	FIGURE:
1" = 5 mi.	6/2004	1-A

Legend

- ● Assessment Area Location (Tier 1)
- ● Assessment Area Location (Tier 2)
- ML / EXIT 52 / NB / 1 Assessment Area ID
- Exit 26 Exit Number

Figure 1-B



NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Legend

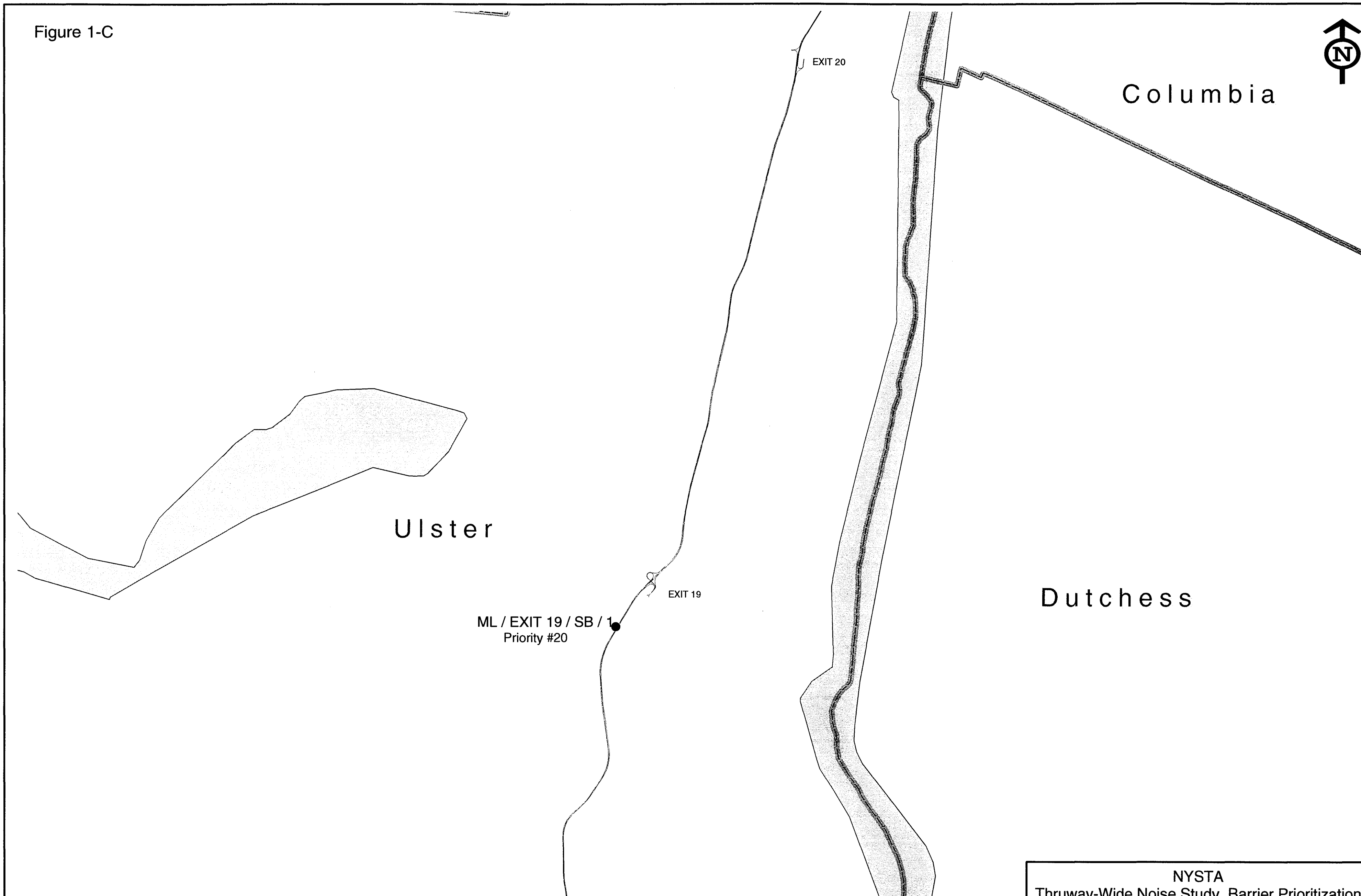
- ● Assessment Area Location (Tier 1)
- ● Assessment Area Location (Tier 2)
- ML / EXIT 52 / NB / 1 Assessment Area ID
- Exit 26 Exit Number

Noise Assessment Area Location Plan:
New York Division

Bronx County
Westchester County

SCALE:	DATE:	FIGURE:
1" = 2 mi.	6/2004	1-B

Figure 1-C



Legend	
●	Assessment Area Location (Tier 1)
●	Assessment Area Location (Tier 2)
ML / EXIT 52 / NB / 1	Assessment Area ID
Exit 26	Exit Number

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Assessment Area Location Plan:
Albany Division
Ulster County

SCALE:	DATE:	FIGURE:
1" = 2 mi.	6/2004	1-C

Figure 1-D

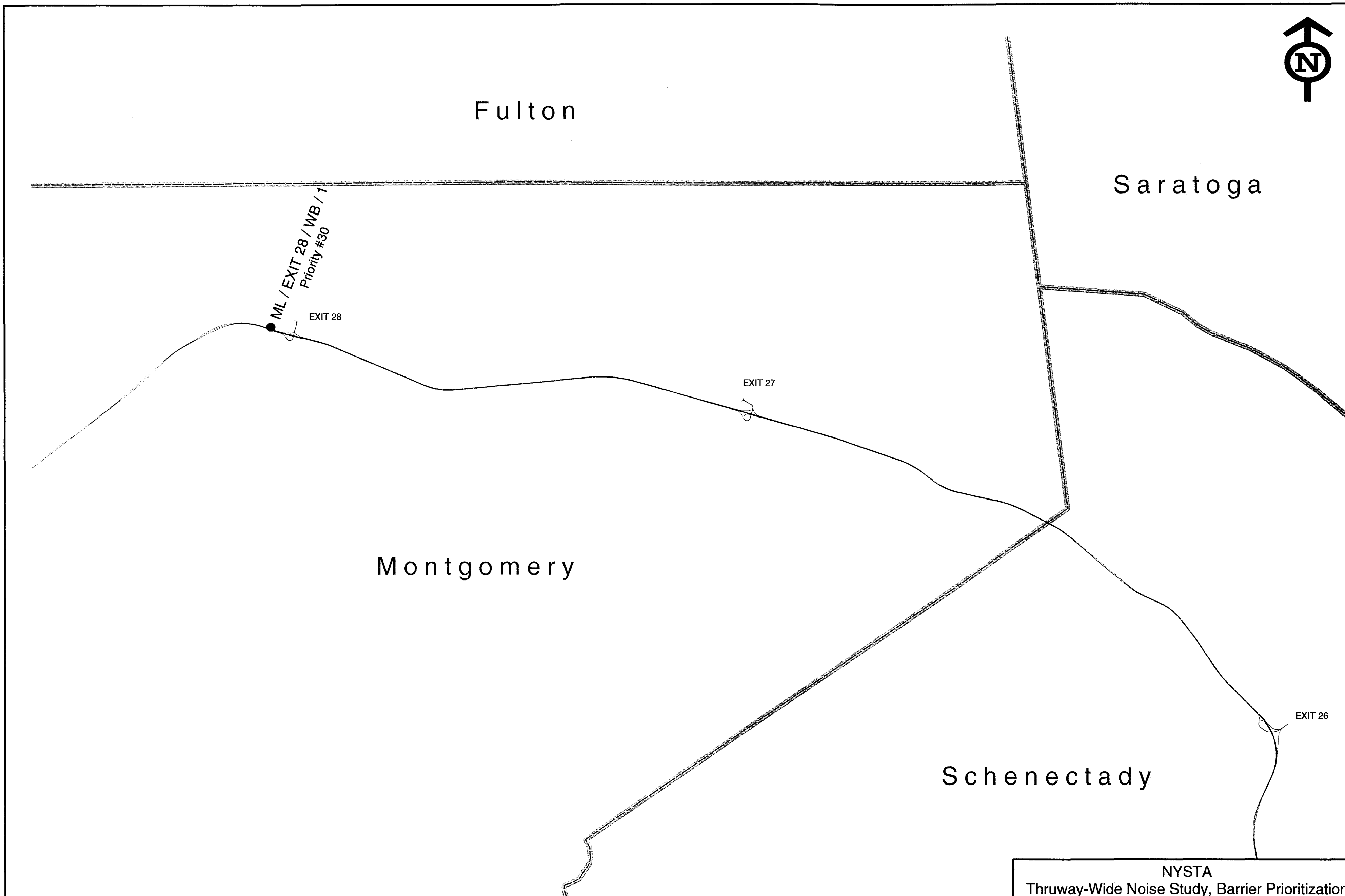
NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Assessment Area Location Plan:
Albany Division
Albany County

SCALE:	DATE:	FIGURE:
1" = 2 mi.	6/2004	1-D

Legend

- ● Assessment Area Location (Tier 1)
- ● Assessment Area Location (Tier 2)
- ML / EXIT 52 / NB / 1 Assessment Area ID
- Exit 26 Exit Number



NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Assessment Area Location Plan:
Albany Division
Montgomery County

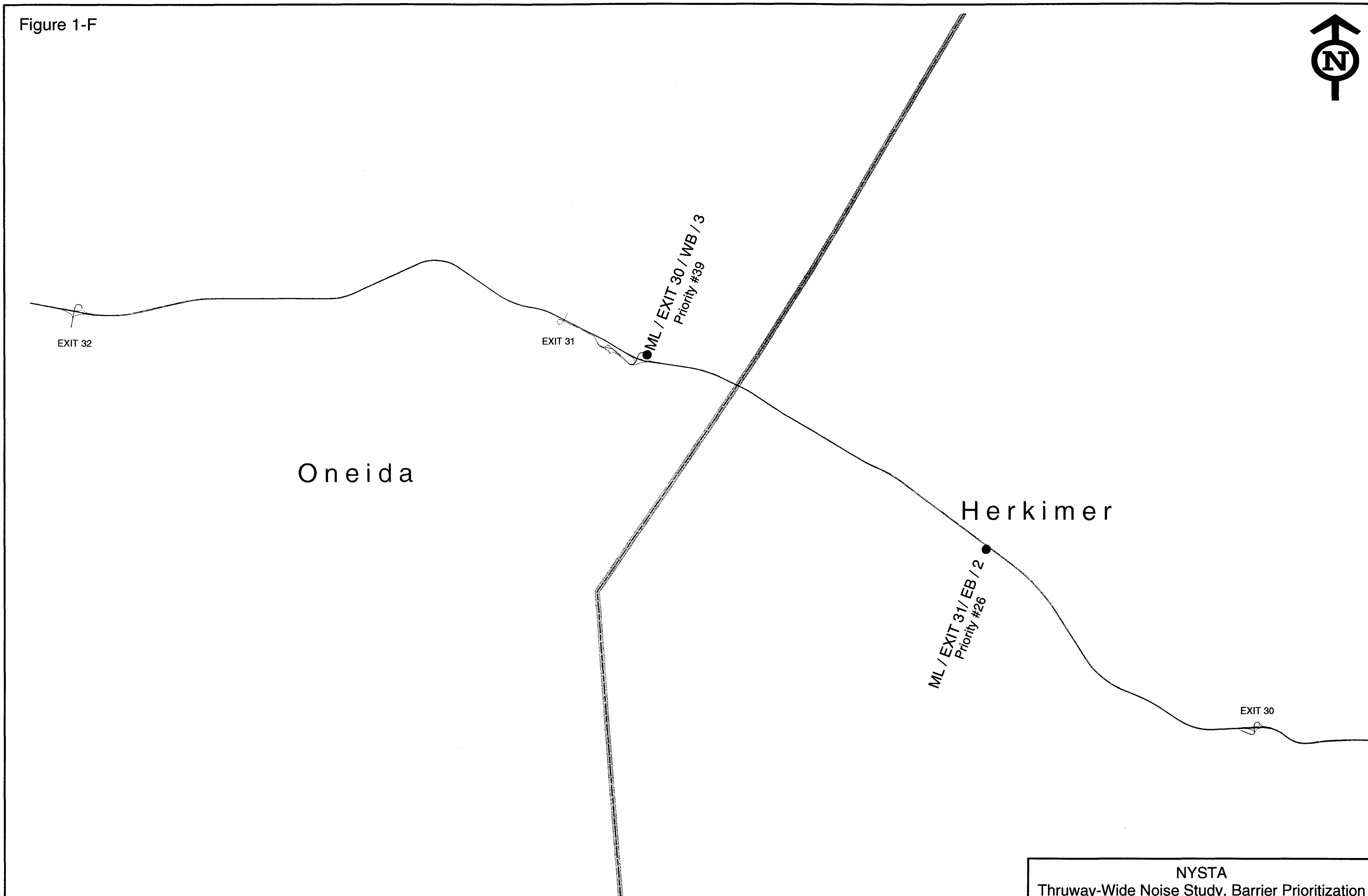
SCALE:	DATE:	FIGURE:
1" = 2 mi.	6/2004	1-E

Legend

- ● Assessment Area Location (Tier 1)
- ● Assessment Area Location (Tier 2)

ML / EXIT 52 / NB / 1 — Assessment Area ID
Exit 26 — Exit Number

Figure 1-F



Legend	
●	Assessment Area Location (Tier 1)
●	Assessment Area Location (Tier 2)
ML / EXIT 52 / NB / 1	Assessment Area ID
Exit 26	Exit Number

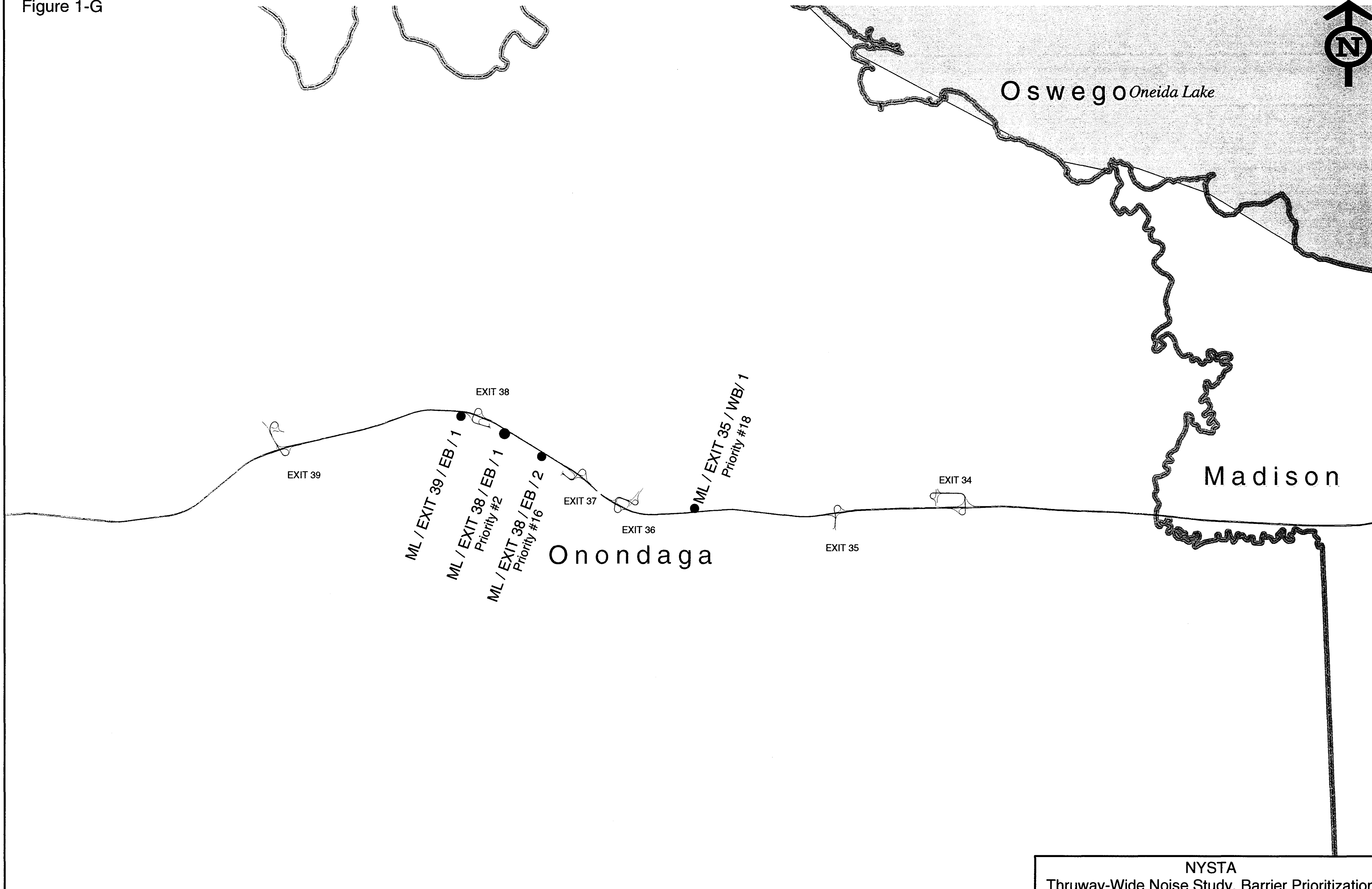
NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Assessment Area Location Plan:
Syracuse Division

Herkimer County
Oneida County

SCALE:	DATE:	FIGURE:
1" = 2 mi.	6/2004	1-F

Figure 1-G



Legend

- ● Assessment Area Location (Tier 1)
- ● Assessment Area Location (Tier 2)
- ML / EXIT 52 / NB / 1 — Assessment Area ID
- Exit 26 — Exit Number

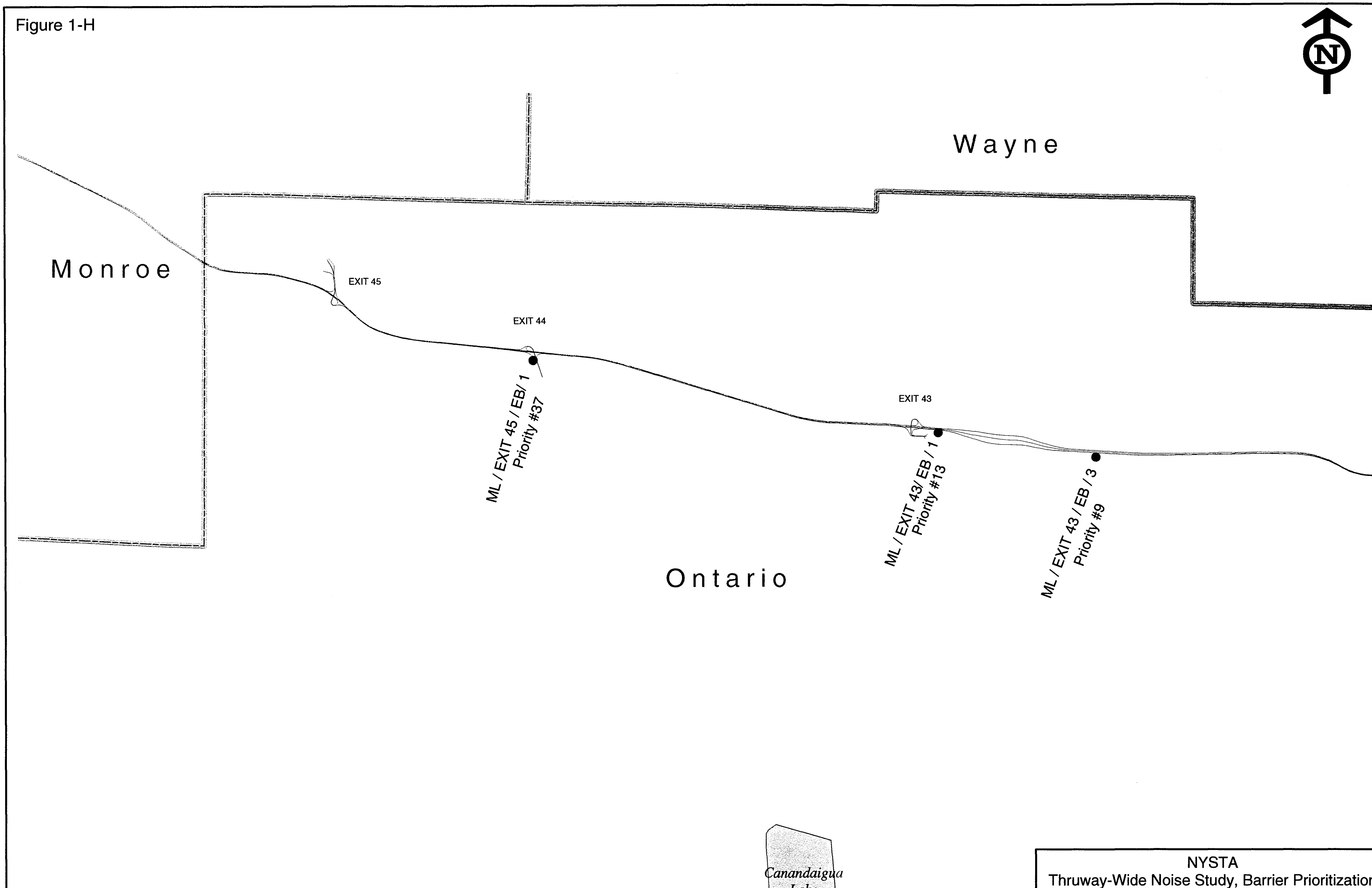
NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Assessment Area Location Plan:
Syracuse Division

Onondaga County

SCALE:	DATE:	FIGURE:
1" = 2 mi.	6/2004	1-G

Figure 1-H



Legend

- ● Assessment Area Location (Tier 1)
- ● Assessment Area Location (Tier 2)
- ML / EXIT 52 / NB / 1 Assessment Area ID
- Exit 26 Exit Number

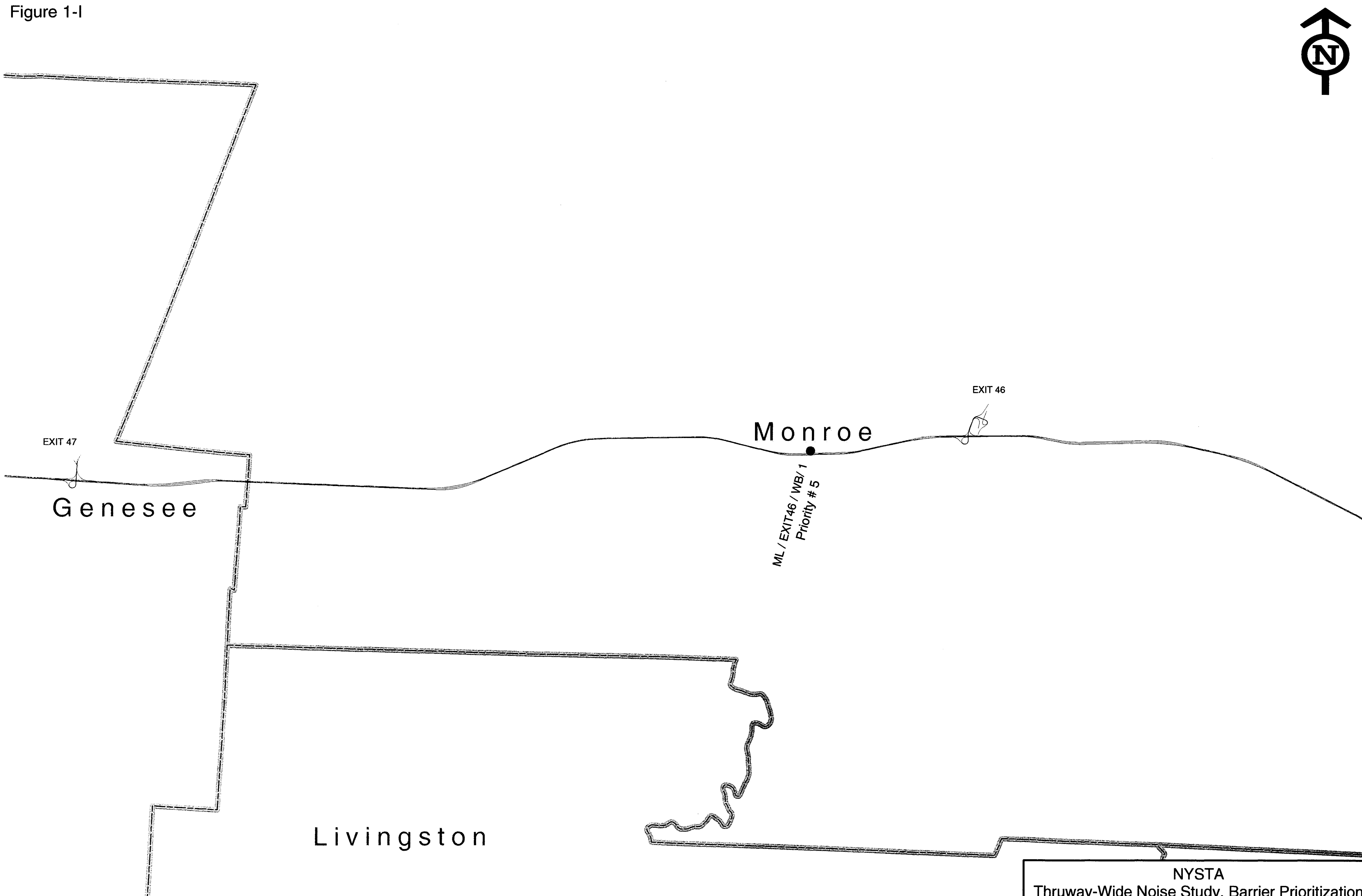
NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Assessment Area Location Plan:
Syracuse Division

Ontario County

SCALE:	DATE:	FIGURE:
1" = 2 mi.	6/2004	1-H

Figure 1-I

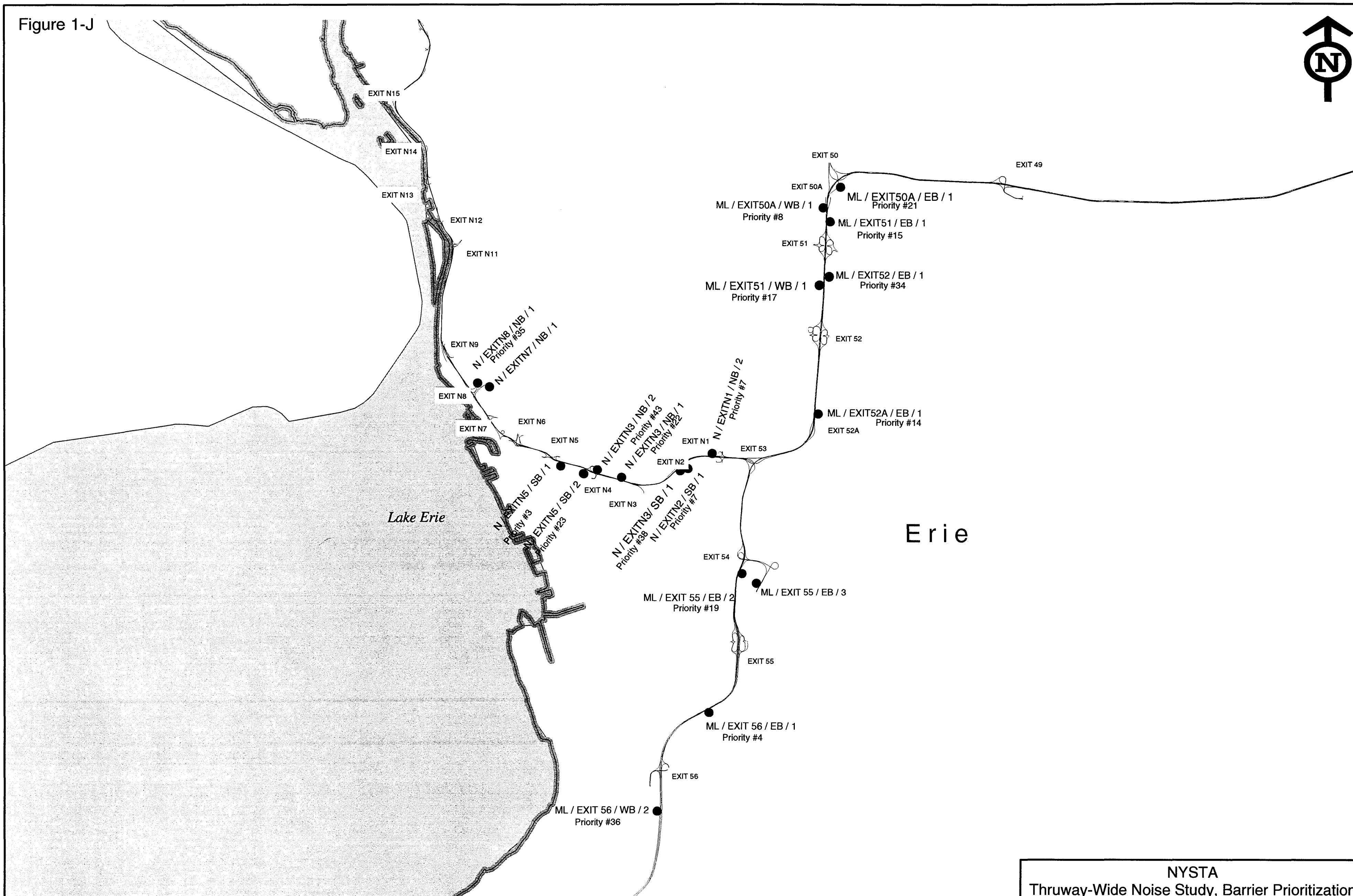


NYSTA Thruway-Wide Noise Study, Barrier Prioritization		
Noise Assessment Area Location Plan: Buffalo Division Monroe County		
SCALE: 1" = 2 mi.	DATE: 6/2004	FIGURE: 1-I

Legend

- ● Assessment Area Location (Tier 1)
- ● Assessment Area Location (Tier 2)
- ML / EXIT 52 / NB / 1 — Assessment Area ID
- Exit 26 — Exit Number

Figure 1-J



NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Assessment Area Location Plan:
Buffalo Division

Erie County

SCALE:	DATE:	FIGURE:
1 inch equals 2 miles	6/2004	1-J

Legend

- ● Assessment Area Location (Tier 1)
- ● Assessment Area Location (Tier 2)
- ML / EXIT 52 / NB / 1 — Assessment Area ID
- Exit 26 — Exit Number

3.3.3 Narrative descriptions

New York Division: ML/Exit 0/NB/1. Thirty-nine single-family homes, one two-family residence, and 58 units in three apartment buildings along Longmeadow Road, Parkway North, West Delano Road and McLean Avenue, at the south end of I-87 near Exit 1 (I-87 milepost 0.0 to 0.3). Central Park Avenue North is located between the homes and the Thruway. Two of the apartment buildings share an outdoor recreational space between the buildings, while the other apartment building has balconies at the corners of the first and subsequent floors. Impact and benefit were assessed at the shared recreational space and at first-floor balconies with exposure to the Thruway. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 1/SB/1. 127 single-family homes, 27 two- and three-unit multi-family homes, 86 units in three apartment buildings, Connor Park, Saint Paul's School, Saint Paul's Church, Saint Paul's Convent, and a public school along Highview Terrace, Devoe Avenue, South Devoe Avenue, Lee Avenue, McLean Avenue, Forest Avenue and Central Park Avenue South at the south end of I-87 near Exit 1 (I-87 milepost 0.0 to 0.3). Central Park Avenue South is located between the homes and the Thruway. Impact and benefit for the single-family and multi-family homes were assessed at outdoor use areas associated with each home. For each of the three apartment buildings and St. Paul's School and Church, impact and benefit were assessed at interior locations. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 3/SB/1. 121 single-family homes, 21 two- and three-unit multi-family homes, 2 multi-unit residence homes, 20 units in four townhouse buildings along Boone Street, Clark Street, Belmont Avenue, Chamberlain Avenue, Loring Avenue, Crotty Avenue, Borcher Avenue, Orient Street, Holly Street, Inwood Street, Midland Terrace and Central Park Avenue South, along I-87 near Exit 2 (I-87 milepost 0.9 to 1.4). Central Park Avenue South is located between the homes and the Thruway. Impact and benefit for the single-family and multi-family homes were assessed at outdoor use areas associated with each home. The townhouse units share an outdoor recreational yard around the buildings. Impact and benefit were assessed for all units in areas of the yard closest to their particular building. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 2/SB/1. 77 single-family homes, one multi-family residence, 130 units in eight apartment buildings, an Elementary School, Nursery School, Library, and Temple/Recreation Center along Bajart Place, St. John's Avenue, Wendover Road, Sunlight Hill, Midland Terrace and Central Park Avenue South, along I-87 near Exit 2 (I-87 milepost 0.5 to 0.8). Central Park Avenue South is located between the homes and the Thruway. All of the apartment buildings on Midland Terrace share a large outdoor recreational yard around the buildings. Impact and benefit were assessed for all units in areas of the yard closest to their particular building. The Nursery School and Library have small outdoor areas on the side of the Thruway – impact and benefit were assessed at these locations. The Elementary School has an outdoor recreation area on the side opposite the Thruway – impact and benefit were assessed at this location. For the Temple/Recreation Center, impact and benefit were assessed at an interior location. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 4/SB/1. 127 single-family homes and 15 two- and four-unit multi-family homes on Central Park Avenue South, Murray Avenue, Mile Square Road, Staunton Street, Onondaga Street, Westerly Street, Otsego Street, Tioga Avenue, Hayward Street, Emerson Street, Robley Street, Cowles Avenue, along I-87 near Exit 3 (I-87 milepost 1.4 to 1.85). Central Park Avenue South is located between the homes and the Thruway. Impact and benefit for the single-family and multi-family homes were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 6A/NB/1. 105 single-family homes and fourteen homes in duplexes along Carrier Avenue, Bonaventure Avenue, Felix Avenue, Almena Avenue, Ridge Road, and Winding Road east of I-87 near Exit 7 (I-87 milepost 7.45 to 8.0). Impact and benefit were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 10/SB/1. 82 single-family homes and nine multi-family homes along River Road, South Broadway, and Shadyside Avenue, south of I-87 at Exit 10 (I-87 milepost 16.15 to 16.6). A chapel is located on the east side of River Road next to the Hudson River. Impact and benefit were assessed at outdoor use areas associated with each home as well as the property adjacent to the chapel. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 12/SB/1. 86 single-family homes along Greenbush Road, Stony Hill Lane, Sunset View Drive, Delaware Drive, Ingalls Street and Central Avenue, southeast of I-87 at Exit 12 (I-87 milepost 18.0 to 18.7). Impact and benefit were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 13/SB/1. 102 single-family homes along Dutch Court, Holland Drive, Deer Meadow Drive, Hunter Place, Louise Drive, and Adele Road east of I-87 at Exit 13 (I-87 milepost 19.65 to 20.4). A church is located at the corner of Strawtown Road and Hunter Place. Impact and benefit were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 14A/NB/1. 67 single-family homes and 60 multi-family homes along Hungry Hollow Road, Dykstra's Way, Old Nyack Turnpike, Saddle River Road, Miele Road, Fred Eller Road, and Summit Road northwest of I-87 at Exit 14A (I-87 milepost 24.4 to 25.9). Beth Rochel Elementary School is on the east side of Saddle River Road. Old Nyack Turnpike is located between the Thruway and the school as well as several of the multi-family homes. Impact and benefit were assessed at outdoor use areas associated with the single- and multi-family residences, as well as the School playground located on the south side of the school property facing the Thruway. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 15/SB/1. 22 single-family homes and 87 multi-family homes along Washington Avenue, Pleasant Avenue, Cross Street, Wayne Avenue, and Chestnut Street, southeast of I-87 at Exit 15 (I-87 milepost 29.5 to 30.0). Most of the homes have yards and patios that face the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home and at those associated with multi-family homes. At locations where no outdoor use areas were associated with the multi-family homes, impact was assessed in interior locations assuming open windows. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 15A/NB/1. 58 single-family homes along Barone Court, East Village Road, and Grove Drive, east of I-87 at Exit 15A (I-87 milepost 35.7 to 36.4). Most of the homes have yards and patios that face the Thruway, although East Village Road is between the first row of homes and the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 16/SB/1. 110 single-family homes along Washington Avenue, Sheridan Street, Grant Street, and Grove Drive, west of I-87 at Exit 16 (I-87 milepost 34.2 to 34.9). A number of homes have yards and patios that face the Thruway, and the remaining homes are in a village type setting. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

New York Division: ML/Exit 16/SB/2. 61 single-family homes along Washington Avenue, Seven Lakes Road, and Waldon Terrace, west of I-87 at Exit 16 (I-87 milepost 33.6 to 34.3). A number of homes have yards and patios that face the Thruway, and the remaining homes are in a village type setting. Impact and benefit were assessed at outdoor use areas associated with each single-family home. A local school has an outdoor use area at the rear of the facility, facing the Thruway. The homes in this area are classified as Tier 2.

New York Division: NE/Exit 12/SB/1. 102 single-family homes and townhouses, 139 two- and three-unit multi-family homes, the Regeis Care Center, and one Church along Edson Avenue, Grace Avenue, Baychester Avenue, Palmer Avenue and vicinity, along I-95 near Exit 12 (I-95 milepost 1.1 to 1.6). Palmer Avenue, Hammersley Avenue and Edson Avenue are located between the homes and the Thruway. Impact and benefit for the single-family and multi-family homes were assessed at outdoor use areas associated with each home. The Regeis Care Center has an outdoor use area at the rear of the facility, facing the Thruway. The homes in this area are classified as Tier 1.

New York Division: NE/Exit 16/NB/1. Eleven single-family homes along Palmer Avenue, 192 units in thirteen apartment buildings including Palmer Avenue co-operatives, an apartment building north of the Palmer Avenue co-operatives, Dorchester Gardens, and Palmer Avenue apartments, along I-95 near Exit 16 (I-95 milepost 6.6 to 7.5). Railroad tracks carrying commuter trains, regional passenger trains, and freight trains are located east of the Thruway between noise-sensitive land use and the highway. The two buildings in the Palmer Avenue co-operatives have balconies at the corners of the first and subsequent floors, and share a common playground area – impact and benefit were assessed at both interior and exterior locations. Impact and benefit were assessed at interior locations at the apartment building north of the co-operatives. The two buildings in Dorchester Gardens have ground-floor patios and share a swimming pool – impact and benefit for 120 units were assessed at these exterior locations. At the Palmer Avenue apartments, impact and benefit were assessed at the shared playground area, at park benches outside the north building, and at interior locations on the first-floor with exposure to the Thruway. The homes in this area are classified as Tier 1.

New York Division: NE/Exit 16/SB/1. Nine single-family homes, 15 multifamily homes, 40 townhouses, and five units in one apartment building along Manhattan Boulevard, The Circle, The Boulevard, Rochelle Place, and Morris Street, along I-95 near Exit 16 (I-95 milepost 6.0 to exit ramp). Impact and benefit were assessed at exterior areas associated with each residence, as well as at a daycare facility and an open-space park area both of which are located on The Circle. The homes in this area are classified as Tier 1.

New York Division: NE/Exit 16/SB/2. Eleven single-family homes, 29 multifamily homes, 15 townhouses, and 39 units in five apartment buildings on Sickles Avenue, Park Place, Lawn Avenue, Burling Lane, and Grand Street, along I-95 near Exit 16 (I-95 milepost 5.6 to 5.9). Where applicable, impact and benefit were assessed at exterior areas associated with each residence. At several multi-family buildings, impact and benefit were assessed at interior locations on the first-floor with exposure to the Thruway. The homes in this area are classified as Tier 1.

New York Division: NE/Exit 16/SB/3. 45 single-family homes, 79 multi-family homes, 226 units in three buildings, two churches, and a school on North Avenue, Union Avenue, Odell Place, Walnut Street, Crescent Avenue, Charles Street, Webster Avenue, Grove Avenue, and 1st Street, along I-95 near Exit 16 (I-95 milepost 5.2 to 5.5). Where applicable, impact and benefit were assessed at exterior areas associated with each residence. At several multi-family buildings, impact and benefit were assessed at interior locations on the first-floor with exposure to the Thruway. Impact and benefit were assessed at a common outdoor area for 219 units associated with a large apartment building on Union Avenue. Impact and benefit were assessed at interior locations associated with the church and the school. The residences in this area are classified as Tier 1.

New York Division: NE/Exit 17/NB/1. 102 single-family homes and 5 two- and three-unit multi-family homes along Palmer Avenue, Woodland Avenue, Nancy Lane, Garit Lane and Blossom Terrace, along I-95 near Exit 17 (I-95 milepost 7.7 to 8.4). 179 units in two apartment complexes including Patricia Gardens and Larchmont Palmer co-operatives. Railroad tracks carrying commuter trains, regional passenger trains, and freight trains are located east of the Thruway between noise-sensitive land use and the highway. The Larchmont Palmer co-operatives have balconies on the first and subsequent floors – impact and benefit were assessed at these first-floor exterior locations. At Patricia Gardens, impact and benefit were assessed for 24 units at the shared yard area exposed to the Thruway. The homes in this area are classified as Tier 1.

New York Division: NE/Conn. Line/SB/1. 50 single-family homes, 73 two- to five-unit multi-family homes and a baseball field along Cottage Street, Edgar Street, Cesard Street, Grey Rock, Alto Avenue and Fox Island Road, along I-95 near Exit 22 (I-95 milepost 14.3 to 14.8). Impact and benefit were assessed at outdoor use areas associated with each home or multi-family residence. The homes in this area are classified as Tier 1.

Albany Division: ML/Exit 19/SB/1. 7 single-family homes and 16 garden apartment buildings along Hurley Avenue west of I-87 located south of Exit 19 (I-87 milepost 90.2 to 90.7). The single-family homes have yards that face the Thruway, and at the garden apartments, impact and benefit were assessed for 96 units at the identified shared yard areas exposed to the Thruway. The homes in this area are classified as Tier 1.

Albany Division: ML/Exit 23/NB/1. 161 single-family homes along Mountain Street, Leighton Street, Southern Boulevard, and Kenosha, north of I-87 at Exit 23 (I-87 milepost 142.0 to 142.50). Most of the homes have yards that face the Thruway, although East Village Road is between the first row of homes and the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 2.

Albany Division: ML/Exit 23/NB/2. 129 single-family homes along the Merelene Avenue, Rose Court, Edgecomb Court, Holmes Court, Swartson Court, Marlette Court, and Kefton Court, north of I-87 located just west of Exit 23 (I-87 milepost 142.5 to 143.20). Most of the homes have yards and patios that face the Thruway, although East Village Road is between the first row of homes and the

Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 2.

Albany Division: ML/Exit 28/WB/1. 70 single-family homes, and 5 multifamily homes in a village type setting on Washington Street, Montgomery Street, York Street, Franklin Street, and Broad Street, north of I-90 located just west of Exit 28 (I-90 milepost 182.3 to 183.0). The first row of homes have yards and patios that face the Thruway, and the remaining row of homes are orientated parallel to the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

Syracuse Division: ML/Exit 30/WB/3. 8 single-family homes located along Route 5 and seven garden apartment buildings between Route 5 and the Thruway north of I-90 located at the exit 31 on/off ramp (I-90 milepost 232.6 to 232.8). The single-family homes have back yards that face the Thruway, and at the garden apartments, impact and benefit were assessed for 104 units at the identified shared yard areas exposed to the Thruway. The homes in this area are classified as Tier 1.

Syracuse Division: ML/Exit 31/EB/2. 93 single-family mobile homes on Joseph Street , Bono Blvd., Country Meadow Drive, and Millers Grove Road, south of I-90 located east of exit 31 (I-90 milepost 225.5 to 225.9). The single-family homes have yards that face the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

Syracuse Division: ML/Exit 35/WB/1. 178 single-family homes in the Young Avenue and Mohawk Drive neighborhood, north of I-90 located west of Exit 35 (I-90 milepost 281.0 to 281.9). The homes have yards and patios that face the Thruway, and the remaining row of homes are orientated both parallel and perpendicular to the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

Syracuse Division: ML/Exit 38/EB/1. 96 single-family homes bound within 7th Street and Vine Street, and 10 multi-unit condominiums on Sprigmoor Drive, south of I-90 located east of Exit 38 (I-90 milepost 284.7 to 285.5). The homes have yards and patios that face the Thruway, and the remaining row of homes are orientated both parallel and perpendicular to the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home and condominium. The homes in this area are classified as Tier 2.

Syracuse Division: ML/Exit 38/EB/2. 128 single-family homes and on Sunflower Drive, Ontario Place, Midwood Drive, Grandy Drive, Cranberry Drive, and Brookview Lane, south of I-90 located east of Exit 38 (I-90 milepost 284.3 to 284.8). The homes have yards and patios that face the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

Syracuse Division: ML/Exit 39/EB/1. 87 single-family homes within the Tyler Terrace/ Harding Avenue neighborhood, and along Garfield Avenue, Footprint Circle, and Cleveland Avenue, south of I-90 located just west of Exit 38 (I-90 milepost 285.9 to 286.7). The homes have yards and patios that face the Thruway, and the exit 38 on/off ramp. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

Syracuse Division: ML/Exit 43/EB/1. 124 single-family mobile homes bound within Routes 21 and 96 and the Canandaigua Outlet, south of I-90 located just east of exit 43 (I-90 milepost 339.4 to 339.8). The single-family homes have yards that face the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

Syracuse Division: ML/Exit 43/EB/3. 254 single-family mobile homes on Prestige Drive, White Spruce Lane, Spring Run, and Fall Brook Circle, south of I-90 located just east of the Port Byron Thruway rest area (I-90 milepost 336.1 to 337.2). The single-family homes have yards that face the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

Syracuse Division: ML/Exit 45/EB/1. 93 single-family homes that are primarily mobile type homes on Kelly Drive, Brookwood Drive, Terri Drive, Craig Drive, Dale Drive, Hunts Park Road , and Corey Drive, south of I-90 located just west of exit 44 and along the on/off ramp (I-90 milepost 347.0 to 347.3). The single-family homes have yards that face the Thruway and the on/off ramp. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 46/WB/1. 131 single-family homes in the Grangerford and Cave Hollow neighborhoods, north of I-90 located east of Exit 46 (I-90 milepost 364.7 to 365.6). The homes have yards and patios that face the Thruway. Impact and benefit were assessed at outdoor use areas associated with each single-family home. The homes in this area are classified as Tier 2.

Buffalo Division: ML/Exit 50A/EB/1. Fifty-eight single-family homes along Delmar, Wilshire, Charlotte, Binner, and Beach Roads, at the south east quadrant of the I-90/I-290 interchange at Exit 50 (I-90 milepost 420.3 to 420.7). The backyards of the homes on Delmar and Wilshire Roads abut the Thruway. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 50A/WB/1. 131 single-family homes along Lochland Drive, Susan Lane, and Hemenway Road, on the west side of I-90 between Exits 50A and 51 (I-90 milepost 420.7 to 421.4). Homes along Lochland Drive face the Thruway and are separated by the roadway. Homes along Susan Lane and Hemenway Road have back and side yards that abut the Thruway. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 51/EB/1. 146 single-family homes along Bixler Road, Ontario Drive, Mapleview Road, St. Paul Court, Hemenway Road, Norine Drive, and the vicinity, on the east side of I-90 between Exits 50A and 51 (I-90 milepost 420.7 to 421.4). The back and side yards of homes along Bixler Road, Ontario Drive, St. Paul Court, and Norine Drive abut the Thruway. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 51/WB/1. Eighty-three single-family homes, and ten four-unit apartment buildings along Lucid Drive, Floreis Court, and E Melcourt Drive, on the west side of I-90 south of Exit 51 (I-90 milepost 421.7 to 422.5). Homes along Lucid Drive face the Thruway and are separated by the roadway. The backyards of the homes on E Melcourt Drive abut the Thruway.

Impacts and benefits for the single-family and multi-family homes were assessed at outdoor use areas associated with each home. A total of 123 dwelling units are benefited at this assessment area. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 52/EB/1. Ninety-seven single-family homes along Fonda Drive, Laurentian Drive, Pinehurst Drive. Miami Parkway, and Nokomis Parkway, and the vicinity, on the east side of I-90 south of Exit 51 (I-90 milepost 421.7 to 422.7). The backyards of homes along Fonda Drive, Pinehurst Drive, and the west ends of Laurentian Drive, Miami Parkway, and Nokomis Parkway all abut the Thruway. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 52A/EB/1. 134 single-family homes along Ludwig Avenue, and the vicinity, on the east side of I-90 north of Exit 52A (I-90 milepost 424.25 to 424.9). Homes along Ludwig Avenue face the Thruway and are separated by the roadway. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 55/EB/3. Single-family homes along Tindle Avenue, along the Seneca Street ramp of Route 400, near Exit 54 (I-90 milepost 427.95 to exit ramp). The backyards of these homes abut the ramp. Impacts were assessed at outdoor use areas associated with each home. Field measurements revealed no noise impact in this area. In addition, subsequent information revealed that this area was outside the NYSTA limits of jurisdiction.

Buffalo Division: ML/Exit 55/EB/2. Sixty-five single-family homes along Klas and Dirkson Avenues, , on the east side of I-90 at the south east quadrant of Exit 54 (I-90 milepost 428.0 to 428.35). The backyards of the homes on Klas Avenue abut the Thruway. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 56/EB/1. 101 single-family homes, fifteen two-family residences, eight four-unit apartment buildings, one eight-unit apartment building, and three ten-unit apartment buildings, along S Fisher Road, Edison Street, Firestone Street, Smith Street, and the vicinity, along I-90 near Exit 54 (I-90 milepost 430.4 to 431.2). The backyards of the homes along S Fisher Road abut the Thruway. Impacts and benefits for the single-family and multi-family homes were assessed at outdoor use areas associated with each home. A total of 201 dwelling units are benefited at this assessment area. The homes in this area are classified as Tier 1.

Buffalo Division: ML/Exit 56/WB/2. Fifty-five single-family homes along Blair Court, Abbott Parkway, and the vicinity, on the west side of I-90 south of Exit 56 (I-90 milepost 432.8 to 433.4). The backyards of the homes on Blair Court abut the Thruway. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N1/NB/2. Ten single-family homes and eleven two-family residences, along Weaver, Willet, and S Ogden Streets, on the north side of I-190 at the east end, just west of Exit 1 (I-190 milepost 0.7 to 0.85). The yards of the homes along the North Service Road face the Thruway. Impacts and benefits for the single-family and multi-family homes were assessed at outdoor use areas associated with each home. A total of 32 dwelling units are benefited at this assessment area. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N2/SB/1. Six single-family homes and three two-family residence along Rejtan and Matejko Streets, on the south side of I-190 at the south east quadrant of Exit N2 (I-190 milepost 1.1 to 1.35). The backyards of these homes are separated from the Thruway by a wooded area. Impacts and benefits were assessed at outdoor use areas associated with each home. A total of twelve dwelling units are benefited at this assessment area. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N3/SB/1. Thirty-two single-family homes and three two-family residences, along Glenn Street, Roberts Avenue, and Kelburn Street, on the south side of I-190 at the south west quadrant of Exit N2 (I-190 milepost 1.35 to 1.7). Homes on Roberts Avenue face I-190 and are separated by the roadway and a warehouse. Impacts and benefits for the single-family and multi-family homes were assessed at outdoor use areas associated with each home. A total of 38 dwelling units are benefited at this assessment area. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N3/NB/1. Ninety-four single-family homes along Peabody, Walter, Maurice, Orlando, Babcock, Imson, Oakdale, Milton, and Harrison Streets, on the north side of I-190 west of Exit N3 (I-190 milepost 2.2 to 2.9). All streets in this area are perpendicular to I-190. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N3/NB/2. Thirty-three single-family homes and a playground, along Clifford Street, on the north side of I-190 at the north east quadrant of Exit N4 (I-190 milepost 2.9 to 3.2). Backyards of homes on the south side of Clifford Street are separated from I-190 by the playground. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N5/SB/2. 107 single-family homes along Perry, Fulton, and Smith Streets, on the south side of I-190 at the south west quadrant of Exit N4 (I-190 milepost 3.1 to 3.5). At the west end of the area, the backyards of homes along Perry Street abut the Thruway. At the east end of the area, homes along Perry Street face the Thruway and are separated by the roadway. Impacts and benefits were assessed at outdoor use areas associated with each home. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N5/SB/1. Thirty-five single-family homes, eleven twenty-unit apartments, and three forty-unit apartments, along Perry Street, Otto Street, and the vicinity, on the south side of I-190 at the south east quadrant of Exit N5 (I-190 milepost 3.65 to 4.1). Along Perry Street at the east end of the area, the backyards of the single family homes abut I-190. Impacts and benefits for the single family homes were assessed at outdoor use areas associated with each home. The apartment buildings have no individual outdoor space or balconies, and share the outdoor recreational space between the buildings. Impacts and benefits for the multi-family units were assessed at the shared recreational space for all first floor units, and half of each subsequent floor. A total of 218 dwelling units are benefited at this assessment area. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N7/NB/1. One two-unit apartment, four three-unit apartment, and two four-unit apartments are clustered along Carolina Street, on the northbound side of I-190 at the north east quadrant of Exit N8 (I-190 milepost 5.7 to exit ramp). Each of the apartments has a concrete patio. Impacts and benefits for these multi-family residences were assessed at outdoor use areas associated with each unit. A total of 22 dwelling units are benefited at this assessment area. The homes in this area are classified as Tier 1.

Buffalo Division: N/Exit N8/NB/1. Two two-family homes, four four-unit apartments, two six-unit apartments, one 32-unit apartment, and one 64-unit apartment, south of Efner Street, on the northbound side of I-190 at the north west quadrant of Exit N8 (I-190 milepost entrance ramp to 6.2). Impacts and benefits for the 2, 4, and 6-family homes were assessed at outdoor use areas associated with each home. The 32-unit apartment building has four units per floor with balconies for each. The 64-unit apartment building has eight units per floor with balconies for each. Impacts and benefits for these 32 and 64-unit buildings were assessed at the first floor patios. A total of 41 dwelling units are benefited at this assessment area. The homes in this area are classified as Tier 1.

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4 NOISE MEASUREMENTS

Study team members conducted an extensive Thruway-wide noise measurement program during October, November, and December 2002. At least one long-term (24-hour) noise measurement and several short-term (approximately 15 to 20-minute duration) measurements were conducted in each assessment area that had been found to be eligible for further analysis during the initial screening.

Long-term measurements were conducted at 58 locations Thruway-wide. The objectives of the long-term measurements were to:

- Identify the loudest-hour of the day at a representative location within each assessment area where the noise level is dominated by Thruway traffic. The loudest hour was used for traffic noise impact modeling and noise barrier design for the entire assessment area.
- Provide a basis for adjusting computed hourly L_{eq} noise levels to the 24-hour Day-Night Sound Level (L_{dn}) metric required for the priority evaluation.

Short-term measurements were conducted during two different periods at each of approximately 140 locations Thruway-wide. The objectives of the short-term noise measurements were to:

- Document existing sound levels at noise-sensitive locations within each assessment area.
- Obtain measurement data that was used to 'validate' the traffic-noise prediction modeling for each assessment area, thereby increasing confidence in computed noise levels at additional prediction sites.
- Obtain counted traffic data that was used as input to the Traffic Noise Model (FHWA TNM2.0) to validate the noise modeling for each assessment area and for loudest-hour modeling within each assessment area.

This section provides further information on the purpose, site-selection criteria, procedures, and resulting noise levels for both the long-term and the short-term measurements. Additional details appear in Appendix D through Appendix G (separately bound in Volume 2).

4.1 Long-Term Measurements

4.1.1 Purpose

One long-term (24-hour) measurement was conducted in each eligible noise barrier assessment area. Within each assessment area, this long-term measurement:

- Identified the loudest-hour of the day due to Thruway traffic.
- Provided a basis to adjust loudest-hour computations to the 24-hour metric L_{dn} (day-night noise level) that is required to set barrier priorities.

4.1.2 Site-selection criteria

In general, long-term measurement sites (generally one per assessment area) were chosen to:

- Be secure against vandalism—generally within fenced yards, on porches, behind shrubs, or on school roofs.
- Be dominated by Thruway noise—typically on the unshielded sides of first-row buildings
- Be representative of noise-sensitive land uses within the assessment area, wherever possible.

4.1.3 Procedures

Detailed procedures were adopted for these measurements, to ensure their uniformity among measurement crews. These procedures:

- Required ANSI (American National Standards Institute) "precision" noise monitors, with calibrations traceable to NIST (the National Institute of Standards and Technology).
- Required measurement of hourly statistical descriptors (L_n)—plus hourly equivalent sound levels (L_{eq}) from which the 24-hour L_{dn} can be computed.
- Required field calibration before and after each 24-hour measurement.
- Required start times at the beginning of an hour, rather than mid hour.
- Required measurement between Monday noon and Friday noon—that is, excluding weekends, Monday morning and Friday afternoon.
- Required download to computer, using a specific computer program.
- Required the following documentation: a specific site log, site photographs for several distinct purposes, and 24-hour weather data (if available).
- Required data transfer to spreadsheet, for later tabulation and graphing in a fixed format.

4.1.4 Measured noise levels

Table 7 through Table 10 summarizes the resulting long-term noise measurements. In these tables:

- Column 1 provides the assessment area, for cross-reference to other tables and maps.
- Columns 2 and 3 locate the long-term measurement site. More detailed measurement locations appear on the measurement field sheets in Appendix E (separately bound).
- Columns 4 through 6 provide the measurement results. In particular:
  - Column 4 identifies the loudest hour of the day at this long-term site. At some long-term sites, the same "loudest-hour" sound level was measured during more than one hour. In those cases, the tables list all of the hours associated with that measured sound level.
  - Column 5 provides the measured loudest-hour L_{eq} sound level.
  - Column 6 provides that assessment area's adjustment, from loudest-hour L_{eq} to the 24-hour metric, L_{dn}. This adjustment is the difference of the loudest-hour L_{eq} subtracted from the measured L_{dn}.

Table 7 Summary of New York Division Measured Noise Levels: Long-term

Assessment area	Site name	Measurement location	Measurement results		
			Loudest hour	Loudest-hour L_{eq} (dBA)	Adjustment to obtain measured L_{dn} (dB)
ML/Exit 1/SB/1	NY-LT1	11 Central Park Avenue South	0700 & 0800	76.7	+3.1
ML/Exit 0/NB/1	NY-LT2	13 Longmeadow Road	0600 & 0700	72.0	+3.3
ML/Exit 2/SB/1	NY-LT3	329 Central Park Ave. S. / Lincoln Park Library	0800	74.1	+2.7
ML/Exit 3/SB/1	NY-LT4	417 Central Park Avenue South	0800	72.1	+2.5
ML/Exit 4/SB/1	NY-LT5	22 Onondaga Street	0600	71.4	+2.7
ML/Exit 6A/NB/1	NY-LT6	19 Colony Road	0800	74.6	+1.5
ML/Exit 10/SB/1	NY-LT7	10 Ferris Lane	0600	71.5	+3.4
ML/Exit 12/SB/1	NY-LT8	24 Stony Hill Lane	1000 & 1200	70.5	+3.0
ML/Exit 13/SB/1	NY-LT9	14 Deer Meadow Drive	0800	74.4	+2.7
ML/Exit 14A/NB/1	NY-LT10	1 Summit Avenue	0800	75.8	+2.6
ML/Exit 15/SB/1	NY-LT11	46 Wayne Avenue	0600 & 0800	65.4	+3.2
ML/Exit 16/SB/2	NY-LT12	27 Waldron Terr.	0800	71.4	+3.4
ML/Exit 16/SB/1	NY-LT13	72 Lincoln St.	1600	63.6	+3.3
ML/Exit 15A/NB/1	NY-LT14	145 Barone Ct.	1600	73.1	+2.9
NE/Exit 12/SB/1	NE-LT1	3031 Edson Road	0600	72.9	+3.1
NE/Exit 16/SB/3	NE-LT2	16 Walnut Street	1300	76.4	+3.6
NE/Exit 16/SB/2	NE-LT3	15 Lawn Avenue	1300	77.3	+4.3
NE/Exit 16/SB/1	NE-LT4	5 The Manhattan Boulevard	0700	67.4	+0.2
NE/Exit 16/NB/1	NE-LT5	8 East Avenue	1600	72.8	+3.6
NE/Exit 17/NB/1	NE-LT6	8 Woodland Avenue	0700	72.6	+3.6
NE/Conn Line/SB/1	NE-LT7	1 Laurel Drive	1300	78.6	+4.6

Table 8 Summary of Albany Division Measured Noise Levels: Long-term

Assessment area	Site name	Measurement location	Measurement results		
			Loudest hour	Loudest-hour L_{eq} (dBA)	Adjustment to obtain measured L_{dn} (dB)
ML/Exit 19/SB/1	A-LT1	Bldg. #13 Country Village Court	1400	66.2	+2.6
ML/Exit 23/NB/1	A-LT2	406 Mountain	1600	76.9	+1.7
ML/Exit 23/NB/2	A-LT3	Swartson Court	1600	70.1	+3.2
ML/Exit 28/WB/1	A-LT4	24 Washington Street	1600	68.9	+2.5

Table 9 Summary of Syracuse Division Measured Noise Levels: Long-term

Assessment area	Site name	Measurement location	Measurement results		
			Loudest hour	Loudest-hour L_{eq} (dBA)	Adjustment to obtain measured L_{dn} (dB)
ML/Exit 30/WB/3	S-LT1	Candlewyck Apartments	1700	69.9	+3.6
ML/Exit 31/EB/2	S-LT2	263 Joseph Street	1700	69.6	+4.0
ML/Exit 35/WB/1	S-LT3	206 Mohawk Drive	1600	72.5	+3.4
ML/Exit 38/EB/2	S-LT4	201 Ontario Place	0900	71.0	+2.4
ML/Exit 38/EB/1	S-LT5	206 Springmoor	0800	72.4	+2.4
ML/Exit 39/EB/1	S-LT6	105 Footprint Circle	1600	70.8	+3.3
ML/Exit 43/EB/3	S-LT7	White Spruce	0700	68.0	+2.9
ML/Exit 43/EB/1	S-LT8	204 Saratoga	0700	71.5	+2.9
ML/Exit 45/EB/1	S-LT9	459 Terri Drive	1700	70.1	+3.8

Table 10 Summary of Buffalo Division Measured Noise Levels: Long-term

Assessment area	Site name	Measurement location	Measurement results		
			Loudest hour	Loudest-hour L_{eq} (dBA)	Adjustment to obtain measured L_{dn} (dB)
ML/Exit 46/WB/1	B-LT1	139 Grangerford	1100	63.6	+3.9
ML/Exit 46/WB/1	B-LT2	99 Cave Hollow	0900	68.7	+4.1
ML/Exit 50A/EB/1	B-LT4	28 Delmar Rd.	0800	77.5	+0.2
ML/Exit 50A/WB/1	B-LT5	161 Lochland Dr.	0900	70.5	+2.3
ML/Exit 51/EB/1	B-LT6	16 Ontario Dr.	1400	76.8	+2.9
ML/Exit 51/WB/1	B-LT7	173 Melcourt Dr. East	0700	77.5	+1.4
ML/Exit 52/EB/1	B-LT8	60 Pinehurst Ave.	0700	78.4	+2.0
ML/Exit 52A/EB/1	B-LT9	75 Ludwig Ave.	0800	72.3	+2.5
ML/Exit 52A/EB/1	B-LT10	207 Ludwig Ave.	1500	71.6	+2.2
ML/Exit 55/EB/3	B-LT11	127 Tindle Ave.	0800	65.1	-1.0
ML/Exit 55/EB/2	B-LT12	86 Klas Ave.	0800	71.8	+2.6
ML/Exit 56/EB/1	B-LT13	50 Fisher Park	1500	70.3	+2.7
ML/Exit 56/EB/1	B-LT14	62 Firestone St.	1500	73.7	+2.2
ML/Exit 56/WB/2	B-LT15	3687 Blair Ct.	1800	70.6	+2.9
N/Exit N1/NB/2	N-LT1	538 Willet St.	0700	71.9	+1.3
N/Exit N2/SB/1	N-LT2	4 Reitan St.	1600	66.4	+1.5
N/Exit N3/SB/1	N-LT3	31 Glenn St.	1600	69.4	+0.4
N/Exit N3/NB/1	N-LT4	189 Orlando	0700	73.7	-0.1
N/Exit N3/NB/2	N-LT5	37 Clifford St.	0800	67.5	+1.4
N/Exit N5/SB/2	N-LT6	837 Perry St	1600	75.0	-2.0
N/Exit N5/SB/1	N-LT7	546 Perry St	1600	67.3	+1.5
N/Exit N5/SB/1	N-LT8	North of 356 Alabama	1500	65.8	+2.2
N/Exit N7/NB/1	N-LT9	Northwest of 22A Carolina	0700	70.1	+0.2
N/Exit N8/NB/1	N-LT10	54 Maryner Homes	0800	77.1	+2.1

4.2 Short-term Measurements

4.2.1 Purpose

Short-term noise measurements (up to approximately 20-minutes duration) were conducted at two to three measurement sites within each eligible noise barrier assessment area. An attempt was made to perform one measurement at or near peak-traffic conditions and one measurement during off-peak conditions. These short-term measurements were conducted during an ongoing 24-hour measurement in the same assessment area.

Within each assessment area, these short-term measurements:

- Documented existing sound levels at noise-sensitive locations.
- Provided measured sound levels to validate the traffic-noise computation model (the FHWA Traffic Noise Model, TNM) within each assessment area.
- Collected concurrent traffic data, for input during model validation and computation of loudest-hour sound levels.

4.2.2 Site-selection criteria

In general, short-term measurement sites were chosen to:

- Represent most noise-sensitive land uses within the assessment area, based upon:
  - Distance to the Thruway
  - Absence or presence of shielding
  - Roadway/receiver geometry
  - Influence of other noise sources, such as local streets.
- Represent locations of frequent human use—either in such locations or acoustically equivalent to such locations.
- Primarily represent first-row receivers—though also represent second-row or third-rows receivers wherever Thruway noise levels also dominate.

4.2.3 Procedures

Detailed procedures were adopted for these measurements, to ensure their uniformity among measurement crews. These procedures:

- Required ANSI Type-I or Type-II instrumentation, with calibrations traceable to NIST.
- Required field calibration before and after each short-term measurement.
- Required measurements for a minimum of 15 minutes, extended in 5-minute trial periods until a trial period changes the cumulative L_{eq} less than 1 decibel.
- Required the following documentation: a specific short-term site data sheet, specific weather data, simultaneous traffic data and datasheet for all roadways that contribute significant noise.

- Required measurement between Monday noon and Friday noon—that is, excluding weekends, Monday morning and Friday afternoon.
- Precluded measurements during stop-and-go traffic, or whenever the average speed varies significantly during the measurement period.
- Precluded measurements when the mainline Thruway pavement is wet.
- Precluded measurements when wind speeds exceed 10 miles per hour.
- Required photographs to show microphone location, adjacent land use, and shielding features.

4.2.4 Measured noise levels

All short-term measured sound levels appear in Appendix H (separately bound). These measurement results document existing sound levels at noise-sensitive locations in each assessment area. In addition, Section 5.1 documents the use of these measured sound levels and their concurrent traffic for model validation.

Table 11 through Table 14 summarizes all short-term noise measurements. In these tables:

- Column 1 provides the assessment area, for cross-reference to other tables and maps. Short-term site locations appear on the maps in Appendix C and on the measurement field sheets in Appendix F (separately bound). Short-term measurements were conducted from one to four different measurement sites within each assessment area. For areas with multiple sites, the tables include one row for each measurement site.
- Columns 2 and 3 provide the measurement results of all short-term measurements obtained in a particular assessment area. In particular:
  - Column 2 documents the distance in feet between the Thruway median and each short-term measurement sites in each assessment area.
  - Column 3 documents the corresponding loudest-hour L_{eq} at each short-term measurement site. In each case, the measured short-term L_{eq} has been adjusted to loudest-hour conditions based upon data from the assessment area's long-term noise measurement. In cases where two slightly different loudest-hour sound levels were computed for a particular site based on different sets of measurement data, the tables report the highest adjusted sound level.

In addition to distance from the Thruway, some factors not included in the tables also may have affected sound levels at the measurement sites. Some of these factors include shielding provided by buildings, terrain, or retaining walls, pavement conditions near a particular measurement site, vehicle mix (i.e., percentage of trucks and automobiles), and wind direction at the time of the measurement. For these reasons, the highest sound levels were not always recorded at the closest measurement sites to the Thruway.

Table 11 Summary of New York Division Measured Noise Levels: Adjusted Short-term Results

Assessment area	Measurement Results	
	Distance to Thruway Median (ft.)	Measured L_{eq}, Adjusted to Loudest-hour (dBA)
ML/Exit 1/SB/1	115	76
	260	66
	365	63
ML/Exit 0/NB/1	155	70
	210	68
	235	66
ML/Exit 2/SB/1	165	68
	185	67
	320	58
ML/Exit 3/SB/1	145	71
	255	62
	270	63
ML/Exit 4/SB/1	125	69
	240	72
	260	65
ML/Exit 6A/NB/1	235	66
	270	68
	445	62
ML/Exit 10/SB/1	115	78
	155	66
	490	65
ML/Exit 12/SB/1	155	65
	245	60
	415	60
ML/Exit 13/SB/1	185	71
	305	65
	325	66
ML/Exit 14A/NB/1	170	70
	375	64
	400	66
ML/Exit 15/SB/1	165	75
	225	72
	405	64
ML/Exit 16/SB/2	130	76
	135	76
ML/Exit 16/SB/1	180	71
	210	63
ML/Exit 15A/NB/1	130	76
	250	69
NE/Exit 12/SB/1	140	79
	180	76
	225	75
NE/Exit 16/SB/3	110	75
	140	76
	390	63
NE/Exit 16/SB/2	75	75
	90	62
	135	73
NE/Exit 16/SB/1	155	60
	420	63
NE/Exit 16/NB/1	400	72
	480	69
	500	69

NE/Exit 17/NB/1	260	69
	350	68
	380	65
NE/Conn. Line/SB/1	160	74
	275	69
	340	70

Table 12 Summary of Albany Division Measured Noise Levels: Adjusted Short-term Results

Assessment Area	Measurement Results	
	Distance to Thruway Median (ft.)	Measured L_{eq}, Adjusted to Loudest-hour (dBA)
ML/Exit 19/SB/1	100	72
	165	71
ML/Exit 23/NB/1	105	75
	110	75
ML/Exit 23/NB/2	120	76
ML/Exit 28/WB/1	120	70
	150	68

Table 13 Summary of Syracuse Division Measured Noise Levels: Adjusted Short-term Results

Assessment Area	Measurement Results	
	Distance to Thruway Median (ft.)	Measured L_{eq}, Adjusted to Loudest-hour (dBA)
ML/Exit 31/EB/2	160	69
	210	66
ML/Exit 30/WB/3	200	70
	730	70
ML/Exit 35/WB/1	125	76
	175	72
ML/Exit 38/EB/2	180	71
	220	67
ML/Exit 38/EB/1	175	67
	210	72
	270	66
ML/Exit 39/EB/1	170	73
	200	72
	800	64
ML/Exit 43/EB/3	250	70
	260	68
ML/Exit 43/EB/1	180	69
	185	69
ML/Exit 45/EB/1	300	70
	800	70

Table 14 Summary of Buffalo Division Measured Noise Levels: Adjusted Short-term Results

Assessment Area	Measurement Results	
	Distance to Thruway Median (ft.)	Measured L_{eq}, Adjusted to Loudest-hour (dBA)
ML/Exit 46/WB/2	180	66
	190	68
	250	66
ML/Exit 50A/EB/1	485	75
	590	67
ML/Exit 50A/WB/1	230	70
	240	74
	275	72
	290	67
ML/Exit 51/EB/1	185	74
	190	77
	255	71
	310	69
ML/Exit 51/WB/1	150	82
	160	76
	160	76
	205	78
ML/Exit 52/EB/1	180	75
	190	68
	195	75
	225	73
ML/Exit 52A/EB/1	230	69
	245	75
	275	72
ML/Exit 55/EB/3	130	60
	130	60
ML/Exit 55/EB/2	170	68
	205	72
ML/Exit 56/EB/1	180	75
	185	73
	225	70
ML/Exit 56/WB/2	210	73
	225	72
N/Exit N1/NB/2	135	73
	165	71
N/Exit N2/SB/1	360	65
	400	72
N/Exit N3/SB/1	155	71
	475	71
N/Exit N3/NB/1	115	75
	135	71
	150	78
N/Exit N3/NB/2	225	68
	230	68
N/Exit N5/SB/2	145	74
	185	75
N/Exit N5/SB/1	160	70
	185	69
	355	70
N/Exit N7/NB/1	280	70
	780	62
N/Exit N8/NB/1	100	77
	1440	75

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5 NOISE COMPUTATIONS AND BARRIER DESIGN

This study involves two sets of noise computations:

- Computations to validate the modeling conducted with the FHWA Traffic Noise Model Version 2.0(TNM), which was used throughout the study.
- Computations of sound levels, both without barriers and with barriers of various heights, to compute noise barrier priorities.

This section discusses methods used for both these sets of computations.

5.1 Computations to Validate FHWA TNM Modeling

5.1.1 Past TNM validation

All traffic noise computations were made with TNM, FHWA's current computer model for traffic-noise computation and noise barrier design. This model computes highway-traffic noise at selected receiver locations, based upon traffic input and three-dimensioned geometrical input for the roadway and intervening terrain.

Validation of TNM, just like validation of any computer model, compares computed values with their corresponding measured values. TNM was partially validated during its development in the 1990s. That validation showed very good agreement between two sets of field data and model computations with essentially zero average difference. TNM is currently being validated against many additional sets of field data, throughout the country. Those comparisons show that TNM over-calculates sound levels by an average of two-to-three decibels, under essentially all roadway geometries and receiver distances.[6] Therefore, over-predictions of this magnitude are to be expected and do not necessarily indicate either poor modeling techniques or corrupted measurement data. In addition, TNM computations might differ from measurements due to site-specific factors including differences in vehicle noise emission levels, pavement types and condition, and weather conditions present during the measurements. In some cases, these factors may cause the computed sound levels to be either below or more than three decibels above the measured values.

[6] Rochat, Judith L. and Gregg G. Fleming, *Validation of FHWA's Traffic Noise Model (TNM): Phase 1*, FHWA Report No. FHWA-EP-02-031, August 2002, p. 39.

5.1.2 Validation in this current study

This current study validates TNM for the specific sites within each assessment area. In that sense, it specializes TNM validation to the Thruway system. To validate TNM, short-term noise measurements in each assessment area are compared to TNM computations under similar circumstances. In that sense, the short-term noise measurements (Section 4.2) serve as the validation standard. Validation is best when agreement is good between TNM computations and corresponding measurements.

This section summarizes the methods used for that validation, plus the validation results. In particular, this section includes:

- Summary of the computation process, including input.
- Comparisons of measured and computed sound levels, plus their implications.

5.1.3 Summary of the computation process, including input

TNM validation along the Thruway consisted of the following steps:

- **Choice of measurement site/time.** In each assessment area, validations were conducted at one to three short-term measurement sites. In areas where one validation was conducted, the short-term measurement site where the loudest sound level was measured typically was chosen for validation (unless anomalous field conditions at that site suggested using a different measurement site). In some assessment areas, particularly where complex geometry complicated the modeling, validations were conducted at up to three short-term measurement sites. In addition to validating the modeling for each assessment area, this process also helped to fine-tune modeling assumptions.
- **Geometry input.** Three-dimensional roadway geometry was obtained from a number of sources. These include: county, city or town-wide paper or electronic based mapping; NYSTA record drawings for recent construction projects; and the New York State – Statewide Digital Orthoimagery Program for recent aerial photography. Where no other suitable topographic mapping could be obtained, USGS Quadrangle mapping was used to obtain ground elevations of roadways, receivers and intervening terrain.
- **Traffic input.** Traffic input was determined from traffic volume and classification counts conducted simultaneously with the short-term noise measurements, which were the baseline for the validation comparisons. As required by TNM, partial-hour traffic counts were scaled-up to a full hour before use.
- **Computation with TNM.** With this input, hourly L_{eq} was computed by TNM.
- **Comparison with measurements.** Then each computed value was compared to its corresponding measured value.

5.1.4 Comparisons of measured and computed sound levels

Although TNM has been shown to be quite accurate for most situations, it is useful to "validate" the model for a specific project area by comparison of computed results with measured noise data. To help accomplish this, simultaneous traffic counts were conducted during all short-term noise measurements. Following the measurements, the traffic counts were normalized to hourly volumes and used as input to the noise prediction model to perform a validation of the noise modeling for each assessment area.

Based on a comparison of computed and measured sound levels, input to the TNM was fine-tuned in some cases to provide better agreement between computed and measured values. Fine-tuning considered both site-specific factors (such as a contaminated measurement or modeling assumptions regarding shielding or reflections at a particular site) and systematic factors (such as traffic speeds, pavement conditions, or prevailing winds). Similar assumptions were then used in modeling loudest-hour sound levels at all prediction sites within each assessment area.

Examples of fine-tuning include:

- Reconsideration of terrain lines or ground zones.
- Reconsideration of shielding features such as building rows, large buildings, or retaining walls.
- Consideration of reflections caused by buildings, noise barriers, or retaining walls.
- Assumptions regarding accelerating and decelerating vehicles near toll plazas or intersections.
- Re-checking modeled roadway geometries.

Separately by assessment area, Tables 15 through 18 provide a comparison of all measured and computed sound levels after fine-tuning. In these tables:

- Column 1 provides the assessment area, for cross-reference to other tables and maps. Validation sites appear on the assessment area figures in Appendix C, and on the measurement field sheets in Appendix F (separately bound). A validation was conducted for at least one measurement site within each assessment area. In some assessment areas, particularly those requiring modeling of complex geometries, validations were performed for multiple measurement sites (up to three) to assist in fine-tuning the model. For areas with multiple validation sites, the tables include one row for each site.
- Column 2 provides the measured L_{eq} at the validation site within this assessment area.
- Column 3 provides the L_{eq} computed for this site using the traffic counts obtained during the short-term noise measurement.
- Column 4 provides the difference (comparison) between the computed and the measured values. A positive difference indicates that the model slightly overpredicted the noise level at this location. A negative difference indicates that the model slightly underpredicted the noise level.
- The last row provides an average of the "computed minus measured" column, to obtain an average validation value for the full Thruway division.

Table 15 New York Division Validation: Comparison of Measured and Computed Sound Levels

Assessment area	Measured L_{eq} (dBA)	Validation results	
		Computed L_{eq} (dBA)	Computed minus measured (dB)
ML/Exit 1/SB/1	64.7	65.8	1.1
	74.5	71.7	-2.8
	62.1	66.1	4.0
ML/Exit 1/NB/1	69.9	70.0	0.1
	66.8	69.7	2.9
	64.5	65.1	0.6
ML/Exit 2/SB/2	67.4	67.2	-0.2
	63.5	66.4	2.9
	57.3	59.2	1.9
ML/Exit 2/SB/1	62.0	64.6	2.6
	60.9	63.2	2.3
	69.9	68.3	-1.6
ML/Exit 3/SB/1	67.5	69.5	2.0
	70.2	68.9	-1.3
	62.6	65.1	2.5
ML/Exit 6A/NB/1	64.2	67.4	3.2
	66.9	69.8	2.9
	60.4	65.0	4.6
ML/Exit 10/SB/1	63.3	67.8	4.5
	77.4	80.2	2.8
	65.6	66.3	0.7
ML/Exit 12/SB/1	60.0	59.8	-0.2
	60.3	64.6	4.3
	63.9	65.2	1.3
ML/Exit 13/SB/1	63.0	63.9	0.9
	61.3	65.8	4.5
	68.6	72.4	3.8
ML/Exit 14A/NB/1	60.7	66.9	6.2
	66.6	66.5	-0.1
	62.0	66.5	4.5
ML/Exit 15/SB/1	66.8	66.9	0.1
	69.8	73.3	3.5
	59.3	63.7	4.4
ML/Exit 16/SB/2	75.8	78.0	2.2
ML/Exit 16/SB/1	62.6	64.1	1.5
ML/Exit 15A/NB/1	68.2	68.2	0.0
NE/Exit 12/SB/1	74.5	76.6	2.1
	75.7	76.8	1.1
	73.3	73.0	-0.3
NE/Exit 16/SB/3	75.1	75.8	0.7
	73.8	74.3	0.5
	61.0	64.4	3.4
NE/Exit 16/SB/2	74.2	76.1	1.9
	72.0	72.4	0.4
	61.8	61.7	-0.1
NE/Exit 16/SB/1	60.1	59.1	-1.0
	63.0	62.5	-0.5

Assessment area	Measured L_{eq} (dBA)	Validation results	
		Computed L_{eq} (dBA)	Computed minus measured (dB)
NE/Exit 16/NB/1	69.0	68.7	-0.3
	72.0	71.2	-0.8
	68.0	71.1	3.1
NE/Exit 17/NB/1	65.2	63.0	-2.2
	62.7	65.9	3.2
	68.3	71.8	3.5
NE/Exit 22/SB/2	73.5	77.2	3.7
	68.4	71.2	2.8
	69.4	70.2	0.8
Average difference (computed minus measured):			**+1.7 dB**

Table 16 Albany Division Validation: Comparison of Measured and Computed Sound Levels

Assessment area	Measured L_{eq} (dBA)	Validation results	
		Computed L_{eq} (dBA)	Computed minus measured (dB)
ML/Exit 19/SB/1	70.9	73.4	2.5
ML/Exit 23/NB/1	74.8	77.1	2.3
ML/Exit 23/NB/2	75.4	75.0	-0.4
ML/Exit 28/WB/1	68.9	71.4	2.5
Average difference (computed minus measured):			**+1.7 dB**

Table 17 Syracuse Division Validation: Comparison of Measured and Computed Sound Levels

Assessment area	Measured L_{eq} (dBA)	Validation results	
		Computed L_{eq} (dBA)	Computed minus measured (dB)
ML/Exit 31/EB/2	66.1	69.0	2.9
ML/Exit 30/WB/3	69.8	69.8	0.0
ML/Exit 35/WB/1	75.6	74.9	-0.6
ML/Exit 38/EB/2	67.1	68.7	1.6
ML/Exit 38/EB/1	64.9	65.5	0.6
ML/Exit 39/EB/1	72.3	71.8	-0.5
ML/Exit 43/EB/3	67.6	67.9	0.3
ML/Exit 43/EB/1	67.7	68.9	1.2
ML/Exit 45/EB/1	67.6	67.1	-0.5
Average difference (computed minus measured):			**+0.6 dB**

Table 18 Buffalo Division Validation: Comparison of Measured and Computed Sound Levels

Assessment area	Measured L_{eq} (dBA)	Validation results	
		Computed L_{eq} (dBA)	Computed minus measured (dB)
ML/Exit 46/WB/2	67.6	70.1	2.5
ML/Exit 50A/EB/1	72.1	70.9	-1.2
ML/Exit 50A/WB/1	66.5	68.0	1.5
ML/Exit 51/EB/1	73.4	74.5	1.1
ML/Exit 51/WB/1	75.6	77.1	1.5
ML/Exit 52/EB/1	68.3	69.1	0.8
ML/Exit 52A/EB/1	70.8	71.2	0.4
ML/Exit 55/EB/3	60.0	61.9	1.9
ML/Exit 55/EB/2	67.1	68.0	0.9
ML/Exit 56/EB/1	72.7	72.6	-0.1
ML/Exit 56/WB/2	71.9	73.1	1.2
N/Exit N1/NB/2	71.9	72.9	1.0
N/Exit N2/SB/1	71.6	73.0	1.4
N/Exit N3/SB/1	70.5	72.0	1.5
N/Exit N3/NB/1	75.4	74.5	-0.9
N/Exit N3/NB/2	68.3	68.8	0.5
N/Exit N5/SB/2	74.7	73.2	-1.5
N/Exit N5/SB/1	66.3	66.6	0.3
N/Exit N7/NB/1	62.0	61.2	-0.8
N/Exit N8/NB/1	72.7	69.3	-3.4
Average difference (computed minus measured):			**+0.4 dB**

Tables 15 through Table 18 show that at the majority of validation sites, the difference between measured and computed sound levels ranged between about –2 dB and +3 dB. In addition, the average differences for the four Thruway Divisions ranged between +0.4 dB and +1.7 dB. This slight overprediction results in appropriately-conservative computations, and is consistent with the USDOT TNM validation study described in Section 5.1.1. It should be noted that small overpredictions or underpredictions do not significantly affect the noise barrier prioritization rankings.

5.2 Computations of Sound Levels for Noise Barrier Priorities

All noise-level computations for noise barrier priorities were made with the FHWA TNM. This section summarizes the methods used, including the use of long-term measurements to convert TNM hourly-L_{eq} output to the 24-hour L_{dn} needed for prioritization. Additional details appear below in Appendix I (separately bound).

Noise-level computation for barrier prioritization consisted of the following steps:

- **Geometry input, including possible barrier locations and heights.** Three-dimensional study area geometry was obtained from the sources described in Section 5.1.3. In general, barrier locations were selected where the barriers would be most effective, typically either near the edge of shoulder or near the Right-of-Way (ROW) line. In some cases, test barriers were evaluated both at the ROW and edge of shoulder to check the comparative effectiveness in both locations.

Barriers near the edge of shoulder were located approximately 15 to 20 feet from the edge of pavement. ROW barriers were located using the existing ground elevation near the ROW line or along the highest ground between the ROW and edge of pavement. Barriers typically were evaluated with heights ranging from 12 to 24 feet in 2-foot intervals.

- **Traffic Input.** Traffic input was determined using counts conducted during the short-term noise measurements. In general, the traffic count data obtained closest to loudest-hour conditions was used for each assessment area. For some areas, a different short-term hour was chosen to better match the loudest-hour mix of vehicle types. As required by TNM, partial-hour traffic counts were scaled up to a full hour before use.
- **TNM computation of hourly L_{eq}.** With this input, hourly L_{eq} was computed by TNM. In two types of situations, reflected noise was included in these computations:
  - Where the Thruway is above grade, with a concrete retaining wall adjacent to a busy frontage road
  - Where the barrier lay between the mainline and a busy at-grade frontage road.

  In these situations, reflected noise was included either (1) with an "image" roadway in TNM input, or (2) with an appropriate TNM factor applied to the frontage roadway.

  Multiple reflections, using TNM's parallel-barrier module, were included in cross sections that have vertical retaining walls in cut. TNM's parallel-barrier module can compute the effect of multiple reflections when two vertical surfaces flank the roadway. This module was not used for on-grade barriers, however, because acoustical absorption on these barriers would eliminate multiple reflections. However, the module was used when reflections were due to vertical retaining walls, since these cannot easily be made absorptive during detailed barrier design.
- **Conversion from computed-hour L_{eq} to 24-hour L_{dn}, plus addition of background sound levels.** Each computation was first converted from the computed-hour L_{eq} to loudest-hour L_{eq}, based upon the sound-level relation between these two hours from the long-term measurement in that assessment area. Then approximate background sound levels were added to the computed Thruway levels, to obtain the total sound level. This is important because background sound can limit a barrier's noise reduction, thereby changing its benefit and its resulting barrier priority. These approximate background levels were 55 dBA and 50 dBA, in urban and suburban areas, respectively, and 45 dBA in selective rural areas. The computed loudest-hour sound levels were used to confirm that noise impact existed within each assessment area, according to the criteria described in Section 5.3. After this, then the loudest-hour-with-added-background L_{eq} was further converted to 24-hour L_{dn}—also based upon the area's long-term measurement.
- **Computation of barrier priority for each possible height.** From these L_{dn} computations and other required input, barrier priorities were computed for each possible barrier height, generally ranging from 12 feet to 24 feet. These computations are discussed in Section 6, below.
- **Selection of highest-priority barrier for each assessment area.** Based upon these computations, the barrier height was chosen that yielded the highest computed priority in each assessment area.

The prioritization method is summarized in Section 6, below, while priority comparisons among all assessment areas appear in Section 7.

5.3 Additional Criteria for Noise Barrier Design

5.3.1 Noise impact, acoustical feasibility, and reasonable cost

Because NYSTA's Noise Policy does not provide specific noise barrier design goals, this evaluation was conducted in accordance with general guidelines established by FHWA in 23 CFR Part 772 and by specific criteria provided by NYSDOT's Noise Analysis Policy (NAP)[7].

The FHWA noise abatement criterion (NAC) for outdoor areas receiving frequent use, such as residences, is 67 dBA L_{eq}. Noise impact is assessed where noise levels "approach or exceed" the NAC during the loudest hour of the day. Many state DOTs, including NYSDOT, define the word "approach" to mean where the loudest-hour L_{eq} equals one decibel less than the NAC. Therefore, noise impact occurs where noise levels equal or exceed 66 dBA L_{eq} for exterior residential land use. FHWA requires that primary consideration in abating traffic noise be given to exterior activities. This abatement is usually required where frequent human use occurs and therefore lowered noise levels would be beneficial. The interior NAC of 52 dBA L_{eq} is used only where no exterior activities occur on the premises, or such activities are removed from or shielded from the roadway noise.

In this study, noise barriers also were designed to meet the goals of FHWA and NYSDOT noise abatement policies with respect to acoustical feasibility and reasonable cost. Acoustical feasibility relates to noise reduction provided by the barrier. According to NYSDOT policy, when noise abatement measures are being considered, every reasonable effort shall be made to obtain substantial noise reductions. A substantial noise reduction should be approximately ten decibels; abatement, however, must provide a minimum reduction of at least seven decibels at the properties with the greatest reductions in each barrier area. If a noise barrier cannot be designed to provide this minimum noise reduction, the barrier is not acoustically feasible.

In addition, NYSDOT provides criteria for determining reasonable cost for noise mitigation measures. The NYSDOT NAP states that "reasonable cost shall be determined using a cost index based on total cost per dwelling unit benefited, as well as the unit cost of the noise barrier material installed . . . ." The policy further states that "all dwelling units whether owner occupied or rented; detached, duplex or mobile homes; and multi-family apartment units should be counted if they are benefited, regardless of whether or not they were identified as impacted. The threshold of noise reduction which establishes a 'benefited' property is at least five decibels determined at a point where frequent human use occurs and a lowered noise level would be of benefit."[8]

In addition to the amount of noise reduction provided and the cost of abatement, other criteria are often considered for the feasibility and reasonableness of noise abatement, including engineering feasibility, the number of homes benefited, the opinions of impacted residents, the absolute noise levels, and the predicted change in future noise levels. Of these, all except engineering feasibility

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[7] New York State Department of Transportation, Environmental Analysis Bureau, "Noise Analysis Policy, Project Environmental Guidelines," June 1998.

[8] NYSDOT NAP, p. 3.2-5.

and views of impacted residents are considered in the prioritization method described in Section 6. Engineering feasibility deals with issues of highway safety, drainage, access, constructability, and structural design. Structured design is a significant issue when noise barriers are proposed on existing bridges, viaducts and retaining walls, as the transfer of dead loads and wind load from the noise barrier to the structure must be considered. Engineering feasibility will be addressed during find acoustical and engineering design of the noise barriers. Views of impacted residents are also considered during the final acoustical and engineering design, typically through contact with local officials and/or meetings with local officials and affected residents.

All of the recommended noise barriers in Section 6 of this report provide substantial noise reductions, thus meeting the NYSDOT NAP acoustical feasibility requirements. All of the recommended noise barriers in Section 6 of this report also include a cost per residence benefited, based on a minimum five decibel benefit.

5.3.2 Reflective noise barriers

Under some circumstances, the construction of vertical retaining walls or noise barriers creates an opportunity for highway noise to reflect from the walls or barriers and increase sound levels on the opposite side of the highway. In other cases, the construction of two retaining walls or noise barriers on opposite sides of the highway from each other allows multiple reflections of sound between the surfaces to increase sound levels further and/or to reduce (degrade) the effectiveness of any noise barriers. For this study, the potential effects of these reflections was assessed only in cut sections with existing vertical retaining walls, to the extent that the reflections affected preliminary noise barrier design. Mitigation of reflection sound, however, was not included in the prioritization procedure. Consideration of such mitigation, which may include use of sound-absorbing materials, should be included at a later date, as determined during the final barrier design.

In some cases, noise barriers may be recommended opposite residential areas that either did not meet the initial screening criteria or that have a lower priority index than the area under evaluation. In these cases, single reflections of sound off of one noise barrier (as opposed to multiple reflections between parallel noise barriers) may have the potential to increase sound levels by a maximum of three decibels at the area on the opposite side of the Thruway. It is likely, however, that actual increases in sound level would be only one to two decibels. Although this increase in sound *level* is very modest (changes in environmental sound levels of less than three decibels often are considered to be unnoticeable), residents may perceive a change in the *character* of the sound and attribute it to the newly constructed noise barrier. This perception, in addition to concerns over not qualifying for a noise barrier (or not being ranked as high a priority assessment area) while residents on the opposite side of the Thruway did, may be a cause of annoyance and complaints. For these reasons, it is recommended that sound absorbing surfaces be evaluated during final design for all recommended noise barriers constructed opposite residential areas either with or without noise barriers. Based on recent noise barrier projects on the Thruway, the additional cost of sound absorptive barriers is approximately $4 to $5 per square foot.

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6 NOISE BARRIER PRIORITIZATION METHOD

Barrier priorities for all candidate assessment areas were computed by the method described in this section. In brief, the method involves (1) computation of a Priority Index for each barrier, based upon four Priority Factors, then (2) grouping of all barriers into Tier 1 and Tier 2 barriers, depending upon construction dates of the land uses they benefit. Appendix J (separately bound) provides additional details of the noise barrier prioritization method.

6.1 Summary of Prioritization Method

A Priority Index was computed for each candidate noise barrier, using the following equation:

$$\textit{Priority Index} = \frac{\textit{(Number of People)(Impact Factor)(Benefit Factor)}}{\textit{(Cost)}} \qquad (1)$$

This equation incorporates four Priority Factors (to the right of its equal sign). These Priority Factors were computed as described below.

- **Number of People:** *More people affected means higher barrier priority, all else being equal.* To determine *Number of People*, all people behind the full length of the barrier were counted—and some beyond the barrier ends, as well. During the noise measurement program, the study team collected land use data, including numbers of single-family residences, counted or estimated numbers of dwelling units within multi-family buildings, and locations of frequently-used outdoor areas where lowered noise levels would provide a benefit (such as yards, patios, and either individual or joint-use areas at apartment complexes). Consistent with the NYSDOT NAP, "all dwelling units whether owner occupied or rented; detached, duplex or mobile homes; and multi-family apartment units" were included[9]. In addition to residences, other noise-sensitive areas, such as parks and places of worship were noted. Every counted residential dwelling unit, place of worship, school, playground and park was assigned three people. All these people were counted independent of their existing noise level and their computed benefit from the barrier. Appendix J provides additional information specific to assessing multi-family housing.
- **Impact Factor:** *Higher noise level means higher barrier priority, all else being equal.* The *Impact Factor* was based upon the "Average Chance of High Annoyance" (ACHA) due to no-barrier noise levels, as obtained from Figure 2. This figure results from a large number of attitudinal surveys concerning annoyance from road noise (Meidema and Vos, 1978. "Exposure-response relationship for transportation noise." Journal of the Acoustical Society of America, volume 104(6), pp. 3432-3445). In brief, the figure translates a person's 24-hour noise level into the chances that person will be "highly annoyed" by the noise, based upon these surveys.

[9] NYSDOT NAP p. 3-2.5.

With this definition of *Impact Factor*, the following combinations are equivalent impacts. The product of *Number of People* and *Impact Factor* is approximately the same and therefore they contribute approximately the same value to the Priority Index.

- 100 people at 75 dBA, L_{dn},
- 135 people at 70 dBA, L_{dn},
- 190 people at 65 dBA, L_{dn},
- 285 people at 60 dBA, L_{dn}.

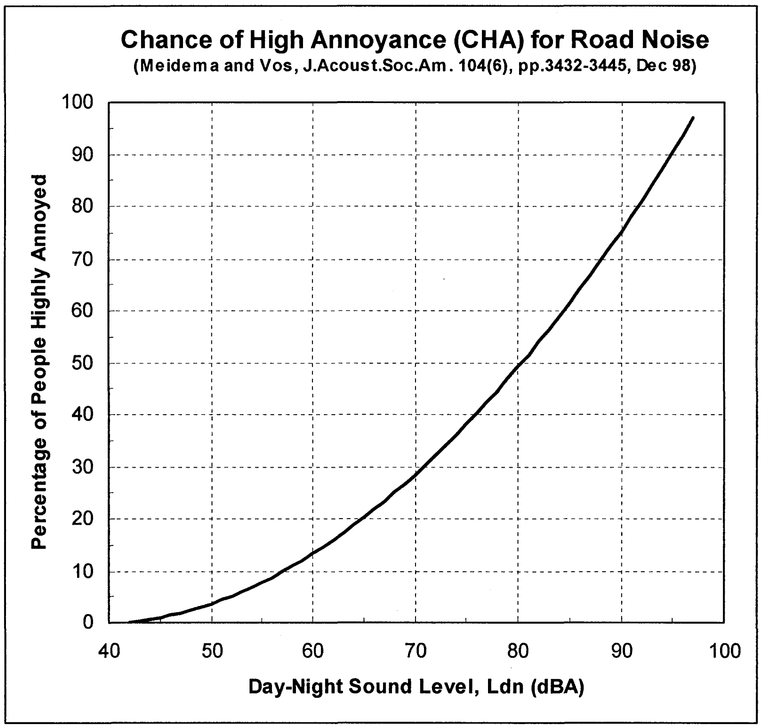

Figure 2 Community Annoyance Due to Noise

- **Benefit Factor:** *Higher noise reduction means higher barrier priority, all else being equal.* The *Benefit Factor* was based upon the ratio of the ACHA with and without the noise barrier, as obtained from Figure 2. Note that no benefit was assigned for persons receiving less than 4.5 dB of noise reduction, thus causing these persons to have no influence on the Priority Index.

  With this definition of *Benefit Factor*, the following combinations are equivalent. The product of *Number People*, *Impact Factor* and *Benefit Factor* is the same and therefore they contribute approximately the same value to the Priority Index:

  - 5 decibels of noise reduction starting at 75 dBA L_{dn},
  - 6 decibels of noise reduction starting at 70 dBA L_{dn},.
  - 7.5 decibels of noise reduction starting at 65 dBA L_{dn},
  - 10 decibels of noise reduction starting at 60 dBA L_{dn}.

- **Barrier cost:** *Lower cost means higher barrier priority, all else being equal.* For this study, the cost evaluation is different from the NYSDOT because the NYSTA has decided to use actual construction costs from recently constructed noise barrier projects. This enables NYSTA to better estimate its overall noise barrier program construction costs. The following unit costs were used to compute approximate barrier costs:
  - Concrete noise barrier on grade: $30 per square foot, plus $185 per lineal foot.
  - Structure-mounted noise barrier: $40 per square foot, plus $185 per lineal foot.

6.2 Prioritization Tiers

The Thruway Authority has established a three-tiered approach to noise barrier priorities:

- Tier 1—Residential Construction Prior to 1976. The Authority will give first priority to studying all noise-impacted areas where residential structures were constructed prior to 1976.
- Tier 2—Residential Construction Between 1976 and 1998: Subsequent to completing studies eligible under Tier1, the Authority will evaluate noise in areas where residential structures were constructed between 1976 and 1998.
- Tier 3—Residential Construction After 1998. Areas where residential structures are constructed after 1998 will not be eligible for noise studies. None of these have been included in this current study.

As a result of this three-tiered approach, candidate noise barriers were separated into the two eligible tiers: Tier 1 and Tier 2. Then they were sorted by Priority Index, high to low, separately within each tier. The two resulting priority lists appear in Section 7.

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7 RESULTING NOISE BARRIERS AND THEIR PRIORITIES

This section contains the resulting noise barriers and their priorities:

- Table 19 contains all Tier 1 barriers, as defined in the preceding section. This table's barriers will be given first priority by the NYSTA, in order of decreasing priority index.
- Table 20 contains Tier 2 barriers, as defined in the preceding section. This table's barriers will be considered by the NYSTA, in order of decreasing priority index, subsequent to those of Tier 1.
- Barrier Locations appear on noise measurement sites and Barrier Location Plan Maps in Appendix C (Volume 1).

In these tables:

- Column 1 provides Priority Ranking, which numbers the assessment areas barrier in increasing order based on decreasing Priority Index values.
- Column 2 provides the Thruway Division for this barrier.
- Column 3 provides the assessment area, for cross-reference to other tables and maps. Barrier locations appear on maps in Appendix C.
- Column 4 provides the approximate location of the assessment area based on Thruway mileposts.
- Columns 5 and 6 provide the barrier length separated by ground-mounted or structure mounted categories.
- Column 7 provides the barrier height.
- Column 8 provides the estimated cost of the barrier, based upon the unit costs given in Section 6.1.
- Columns 9 and 10 document the number of residences (1) impacted in this barrier vicinity, and (2) benefited by the barrier (at least 5 decibels of noise reduction).
- Column 11 provides the approximate cost per benefited residence, i.e., the estimated cost divided by the number of residences benefited.
- Column 12 contains the barrier's Priority Index, which results from the computations described in Section 6.

Table 19 Noise Barrier Priority Rankings: Tier 1

Priority Ranking	Div.	Site ID	Approx. Mile Post	Recommended Noise Barrier				No. of Residences		Cost per Residence Benefited	Priority Index
				Ground-Mounted Length (ft)	Structure-Mounted Length (ft)	Height ft)	Estimated Cost	Impacted	Benefited		
1	NY	NE/Exit 16/SB/3 (1)	5.10 - 5.75	813	1457	14	$1,577,000	322	441	$3,600	106
2	NY	NE/Exit 12/SB/1	1.20 - 1.75	3220	0	12	$1,753,000	307	253	$6,900	52
3	BUF	N/Exit N5/SB/1	3.67 - 4.06	1600	840	20	$2,111,000	89	218	$9,700	29
4	BUF	ML/Exit 56/EB/1	430.51- 431.22	3629	161	18	$2,801,000	175	201	$13,900	27
5	NY	NE/Exit 16/SB/2	5.70 – 6.00	3454	86	20	$2,792,000	64	114	$24,500	26
6	NY	ML/Exit 4/SB/1	1.40 - 1.95	1298	1312	12	$1,580,000	60	120	$13,200	25
7	BUF	N/Exit N1/NB/2	0.71 - 0.85	710	0	16	$469,000	26	32	$14,700	24
8	BUF	ML/Exit 50A/WB/1	420.69- 421.39	3740	0	14	$2,262,000	118	131	$17,300	23
9	SYR	ML/Exit 43/EB/3	336.10- 337.20	4970	0	14	$3,008,000	89	193	$15,600	23
10	NY	NE/Conn. Line/SB/2	14.3 – 14.8	3157	583	18	$2,816,000	98	167	$16,900	23
11	NY	ML/Exit 3/SB/1	0.90 - 1.40	0	2882	12	$1,917,000	57	121	$15,800	22
12	NY	NE/Exit 16/NB/1	6.75 - 7.15	2260	0	22	$1,912,000	161	150	$12,700	22
13	SYR	ML/Exit 43/EB/1	339.36- 339.77	2160	0	18	$1,563,000	45	102	$15,300	22
14	BUF	ML/Exit 52A/EB/1	424.30- 424.90	3250	0	16	$2,158,000	93	134	$16,100	20
15	BUF	ML/Exit 51/EB/1	420.71- 421.49	4570	0	14	$2,763,000	107	146	$18,900	20
16	SYR	ML/Exit 38/EB/2	284.25- 284.77	2650	70	16	$1,829,000	52	107	$17,100	20
17	BUF	ML/Exit 51/WB/1	421.74- 422.50	3800	0	16	$2,526,000	132	123	$20,500	20
18	SYR	ML/Exit 35/WB/1	280.95- 281.90	4650	0	16	$3,093,000	51	166	$18,600	17
19	BUF	ML/Exit 55/EB/2	428.00- 428.35	2000	0	16	$1,329,000	65	65	$20,400	17
20	ALB	ML/Exit 19/SB/1	90.18 - 90.66	2470	90	16	$1,726,000	55	85	$20,300	17
21	BUF	ML/Exit 50A/EB/1	420.30- 420.67	1750	0	16	$1,166,000	30	58	$20,100	17
22	BUF	N/Exit N3/NB/1	2.28 - 2.90	2895	345	12	$1,807,000	88	94	$19,200	17
23	BUF	N/Exit N5/SB/2	3.09 - 3.50	2137	483	14	$1,674,000	96	107	$15,600	16
24	NY	ML/Exit 1/SB/1	0.00 - 0.57	0	3049	12	$2,028,000	30	93	$21,800	15

Priority Ranking	Div.	Site ID	Approx. Mile Post	Recommended Noise Barrier				No. of Residences		Cost per Residence Benefited	Priority Index
				Ground-Mounted Length (ft)	Structure-Mounted Length (ft)	Height ft)	Estimated Cost	Impacted	Benefited		
25	NY	ML/Exit 10/SB/1	16.05 - 16.69	3340	270	16	$2,444,000	91	83	$29,400	15
26	SYR	ML/Exit 31/EB/2	225.47- 225.91	1850	70	14	$1,169,000	25	48	$24,300	15
27	NY	ML/Exit 6A/NB/1	7.30 - 8.08	4240	0	20	$3,324,000	101	119	$27,900	14
28	NY	ML/Exit 16/SB/1	34.05 - 34.87	3820	0	12	$2,081,000	14	97	$21,500	14
29	NY	ML/Exit 0/NB/1	0.00 - 0.30	0	1950	10	$1,141,000	18	38	$30,000	13
30	ALB	ML/Exit 28/WB/1	182.32- 182.95	3210	110	14	$2,028,000	54	76	$26,700	13
31	NY	ML/Exit 14A/NB/1	24.65 - 25.40	3805	145	14	$2,407,000	64	80	$30,100	13
32	NY	ML/Exit 15A/NB/1	35.69 - 36.35	3430	50	13	$2,019,000	54	58	$34,800	12
33	NY	ML/Exit 13/SB/1	19.49 - 20.40	4583	127	12	$2,585,000	87	79	$32,700	11
34	BUF	ML/Exit 52/EB/1	421.74- 422.66	4830	0	16	$3,211,000	98	97	$33,100	11
35	BUF	N/Exit N8/NB/1	5.93 - 6.17	2420	0	12	$1,318,000	32	41	$32,100	11
36	BUF	ML/Exit 56/WB/2	432.86- 433.48	3210	0	16	$2,133,000	37	55	$38,800	11
37	SYR	ML/Exit 45/EB/1	347.00- 347.30	2530	0	16	$1,680,000	12	65	$25,800	11
38	BUF	N/Exit N3/SB/1	1.38 - 1.63	1770	0	14	$1,077,000	29	38	$28,300	10
39	SYR	ML/Exit 30/WB/3	232.57- 232.80	1720	0	12	$938,000	26	25	$37,500	9
40	NY	NE/Exit 17/NB/1	7.80 - 8.40	2720	260	20	$2,388,000	60	53	$45,100	9
41	NY	ML/Exit 12/SB/1	18.00 - 18.70	4290	0	16	$2,852,000	37	72	$39,600	9
42	NY	ML/Exit 2/SB/1	0.35 - 0.85	0	3448	12	$2,293,000	30	64	$35,800	8
43	BUF	N/Exit N3/NB/2	2.92 - 3.22	1063	807	14	$1,159,000	22	34	$34,100	8
44	NY	ML/Exit 15/SB/1	29.36 – 29.96	2627	363	20	$1,862,000	80	51	$36,500	8
	SYR	ML/Exit 39/EB/1(2)	285.90- 286.67	4310	0	18	$3,125,000	27	56	*$55,800*	7
	NY	NE/Exit 16/SB/1(2)	6.12- exit ramp	2590	0	12	$1,424,000	8	19	*$75,000*	4
	BUF	N/Exit N7/NB/1(2)	5.68 - 5.85	1740	0	24	$1,571,000	3	22	*$71,400*	3
	BUF	N/Exit N2/SB/1(2)	1.10 - 1.38	2270	0	18	$1,645,000	13	12	*$137,100*	2

Notes *(1)* – This noise barrier was excluded from a previous noise study because a portion of it is located on a viaduct. Further investigation, as part of a detailed noise study and preliminary design, is needed to confirm the feasibility of constructing a noise barrier on this existing viaduct.

(2) – Cost per Residence Benefitted exceeds $50,000, and thus is not considered reasonable per the NYSDOT Noise Analysis Policy. Therefore, this noise barrier is not recommended for construction

Table 20 Noise Barrier Priority Rankings: Tier 2

Priority Ranking	Div.	Site ID	Approx. Mile Post	Recommended Noise Barrier				No. of Residences		Cost per Residence Benefited	Priority Index
				Ground-Length (ft)	Structure-Length (ft)	Height ft)	Estimated Cost	Impacted	Benefited		
1	ALB	ML/Exit 23/NB/1	142.00- 142.50	2710	0	18	$1,968,000	28	110	$17,900	16
2	SYR	ML/Exit 38/EB/1	284.73- 285.47	3750	150	14	$2,379,000	56	117	$20,300	15
3	ALB	ML/Exit 23/NB/2	142.50- 143.20	3640	0	18	$2,639,000	49	107	$24,700	14
4	NY	ML/Exit 16/SB/2	33.57 - 34.25	3350	220	12	$1,972,000	46	61	$32,300	13
5	BUF	ML/Exit 46/WB/1	364.70- 365.60	4950	0	18	$3,587,000	39	111	$32,300	12

APPENDIX A FUNDAMENTALS OF HIGHWAY TRAFFIC NOISE

This appendix has been taken, with permission, from Judith L. Rochat, and Gregg G. Fleming, *Acoustics and Your Environment: The Basics of Sound and Highway Traffic Noise*, Report DTS-34-HW966-LR1, U.S. Department of Transportation, John A. Volpe National Transportation Systems Center, Acoustics Facility, Cambridge, MA, February 1999. The original publication was formatted as text for an accompanying video. Here it has been converted to report format. In addition, in several places the technical text was updated to pertain to the FHWA Traffic Noise Model (FHWA TNM), the computer model used in this study.

A.1 Acoustics and Sound

Acoustics is the science of sound, including its production, transmission and effects. Applications of acoustics include medical ultrasonics, underwater acoustics, architectural acoustics, active or passive noise control, nondestructive evaluation, environmental noise and many more. Environmental noise produced by highway traffic is the subject of this appendix.

A.1.1 Parameters of sound

Sound is a vibratory disturbance in the air created by a vibrating source. As the source vibrates, surrounding air molecules are temporarily displaced from their still-air positions and form a disturbance that moves away from the sound source.

Wavelength. In Figure 3, a sound source pulsates in and out in regular time intervals, forming sound waves that propagate away from the source—just as water waves propagate away from someone tapping a finger on the water's surface. These outward-propagating waves are represented mathematically by the trigonometric sine function, which repeats itself periodically. The wavelength of these waves, represented by the Greek letter lambda, λ, is the repetition length—that is, the distance between wave crests in the figure. As a wave propagates through an unchanging medium, its wavelength remains constant.

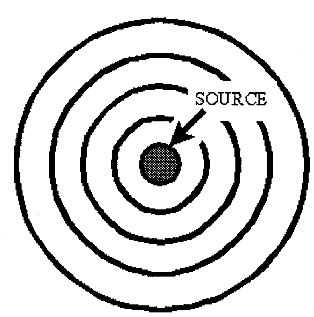


Figure 3 Vibrating Source

Amplitude and decibels. Another parameter of a sound wave is its "pressure amplitude." The pressure amplitude determines the strength of the wave. More vigorous pulsations of the source lead to greater strengths—greater amplitudes—of the propagating sound wave. In non-technical terms, greater amplitudes mean higher sound "volume."

The amplitude of a sound wave can be quantified by the wave's pressure disturbance—that is, the change in pressure from its ambient value. This change in pressure is called the acoustic pressure. The unit of acoustic pressure is the Pascal, abbreviated Pa. Sound-wave amplitudes range from the hundred *thousandths* (1/100,000) to the hundred *thousands* (100,000) of Pascals. Because of this wide range of common amplitudes, it is convenient and customary to plot sound-wave amplitudes on the more-compact logarithmic scale. On this scale, the amplitude unit is the decibel, abbreviated dB.

The equation for converting acoustic pressure to sound pressure level, abbreviated SPL, is:

$$\mathrm{SPL} = 10\log_{10}\left(\frac{p}{p_{ref}}\right)^2 . \tag{2}$$

In this equation, p is the time-averaged acoustic pressure and p_{ref} is the "reference pressure," a quantity that depends on the medium in which the sound wave is propagating. In air, $p_{ref} = 20 \times 10^{-6}$ Pa, which equals $20\ \mu\text{Pa}$. (The Greek letter mu, μ, means one millionth.) This reference pressure is approximately the threshold of unimpaired human hearing, for a 1 kHz tone—in other words, the quietest audible sound at that frequency.

Here is an example calculation:

$$\begin{aligned}\mathrm{SPL} &= 10\log_{10}\left(\frac{0.036\ \text{Pa}}{10\ \mu\text{Pa}}\right)^2 \\ &= 65\ \text{dB}.\end{aligned} \tag{3}$$

The acoustic pressure is 0.036 Pa. The corresponding sound pressure level is therefore 65 decibels. This is the approximate sound pressure level for normal conversation. Table 21 shows other typical sound levels.

Combining Sound Pressure Levels. Sound pressure level is represented by the letter L. Adding simultaneous sounds together does not mean simply adding their sound pressure levels. For example, two simultaneous sounds of 80 dB do not combine to a total of 160 dB. As mentioned above, the decibel scale is logarithmic. For that reason, to combine decibels properly, each must first be converted to a linear scale, then added, and then converted back to a logarithmic scale. Mathematically:

$$L_{total} = 10\log_{10}\left(10^{L_1/10} + 10^{L_2/10} + \cdots + 10^{L_n/10}\right). \tag{4}$$

With this equation, two simultaneous sounds of 80 dB combine to a total of 83 dB.

Table 21 Typical Sound Levels

Sound level (dBA)	Outdoor sounds	Indoor sounds
100-110	Landing Concorde aircraft at 1000 meters (3300 feet) from end of runway	Rock band
90-100	Departing 727-100 aircraft at 6500 meters (20,000 feet) from start of takeoff roll	Inside subway train (New York City)
80-90	Diesel truck at 15 meters (50 feet)	Food blender at 1 meter (3 feet) Garbage disposal at 1 meter (3 feet)
70-80	Noisy urban daytime	Shouting at 1 meter (3 feet)
60-70	Commercial area	Vacuum cleaner at 3 meters (10 feet) Normal speech at 1 meter (3 feet)
50-60	Quiet urban daytime	Large business office
40-50	Quiet urban nighttime	Dishwasher in next room Heating/ventilation noise in small theater or large conference room
30-40	Quiet suburban nighttime	Library
20-30	Quiet rural nighttime	Bedroom at night Heating/ventilation noise in concert hall
10-20	Backcountry areas in quiet National Parks	Broadcast and recording studio
0-10	Wilderness areas	Threshold of hearing

For applications requiring only integer decibel accuracy, the following steps substitute for the equation above:

- First, find the decibel difference between two sound pressure levels.
- Then add an adjustment factor to the higher of the two sound pressure levels. As shown in Table 22, if the decibel difference is 0 or 1, add 3 dB. If the decibel difference is 2 or 3, add 2 dB. If the decibel difference lies between 4 and 9, add 1 dB. Whenever the decibel difference is 10 dB or more, the lower-level source is not significant. Under these conditions, the higher-level source is said to "mask" the lower one.

Table 22 Approximate Decibel Addition

Decibel value difference	Add to higher value
0 or 1	3 dB
2 or 3	2 dB
4 to 9	1 dB
10 or more	0 dB

Figure 4 shows an example that combines three sound pressure levels. For best accuracy, the smallest values are combined first. Start by combining the 80-dB levels. Their decibel difference is zero, so add 3 dB to 80 dB to get 83 dB. Then the decibel difference of 83 dB and 90 dB is 7, so add 1 dB to 90 dB—for a total sound level of 91 dB.

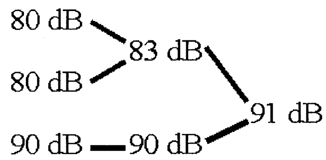


Figure 4 Example of Decibel Addition

Frequency. Waves also have an associated frequency. Frequency, abbreviated with a lower case f, is defined as the number of cycles of repetition per second. In other words, frequency is the number of wavelengths that pass by a stationary point in one second's time. The unit of frequency is called Hertz, abbreviated Hz.

$$\text{Units of frequency} = \text{cycles per second} = \text{Hertz (Hz)}.$$

When the frequency of a sound exceeds 1,000 Hz, it is common to write the amount in units of kilohertz. For example, 1,000 Hz = 1 kHz.

Frequency is inversely proportional to wavelength. The equation relating the two parameters is $c_0 = f\lambda$, in which c_0 is the speed of sound in the medium. In air at a temperature of 20 degrees Celsius, the speed of sound is 343 meters per second (1125 feet per second). This equation implies that longer wavelengths are associated with lower frequencies, and shorter wavelengths are associated with higher frequencies.

Sound can have a single frequency component or it can have multiple frequency components at varying amplitudes, thus making each sound distinctive. A sound with multiple frequency components is call "complex." Most real-life sounds are complex.

For convenience, the frequency components of a complex sound source are often measured in octave or one-third-octave frequency bands. Each frequency band covers a range of frequencies and is referred to by its center frequency. When a sound is complex, it is called "broadband," because it encompasses many frequency bands.

For octave-band analysis, the entire frequency spectrum is divided into the octave bands shown in Table 23. The center frequency of each band is one octave higher (frequency times two) than the previous band. Notice the center frequencies' associated wavelengths. At the frequency of 31.5 Hz, the wavelength in air is 10.89 meters (35.72 feet), and at 8,000 Hz the wavelength is 0.04 meters (0.14 ft).

Table 23 Octave Bands

Center frequency (Hz)	Associated wavelength in air at 20° C	Approximate range (Hz)
31.5	10.89 m (35.72 ft)	22.4 to 45
63	5.44 m (17.86 ft)	45 to 90
125	2.74 m (9.00 ft)	90 to 175

250	1.37 m (4.50 ft)	175 to 355
500	0.69 m (2.25 ft)	355 to 700
1000	0.34 m (1.13 ft)	700 to 1400
2000	0.17 m (0.56 ft)	1400 to 2800
4000	0.09 m (0.28 ft)	2800 to 5700
8000	0.04 m (0.14 ft)	5700 to 11300

A.1.2 Sound propagation

Sound waves must propagate through some medium, since it is the medium's particles that support the wave. For highway traffic sounds, this medium is air.

In their undisturbed state, these air particles form a region of unfluctuating atmospheric pressure—that is, still air as shown in Figure 5. When a sound source starts to vibrate, it first presses *outward* on these air particles and thereby bunches them up at the source's surface. When the air particles bunch up, they form a positive-pressure region—that is, an acoustic "condensation." The bunched particles then press upon those further outward, which starts sound propagation outward from the source.

Next the source vibrates *inward*, which spreads the particles further apart and thereby produces a negative-pressure region (below atmospheric pressure)—that is, an acoustic "rarefaction." Figure 6 shows these condensations and rarefactions, while Figure 7 illustrates the resulting sound wave moving outward from the source, as the source vibration continues: first higher pressure, then lower pressure, and so forth. These amplitude oscillations consist of a change in pressure, up and down, from its ambient value. This change in pressure is called the sound wave's "acoustic pressure."

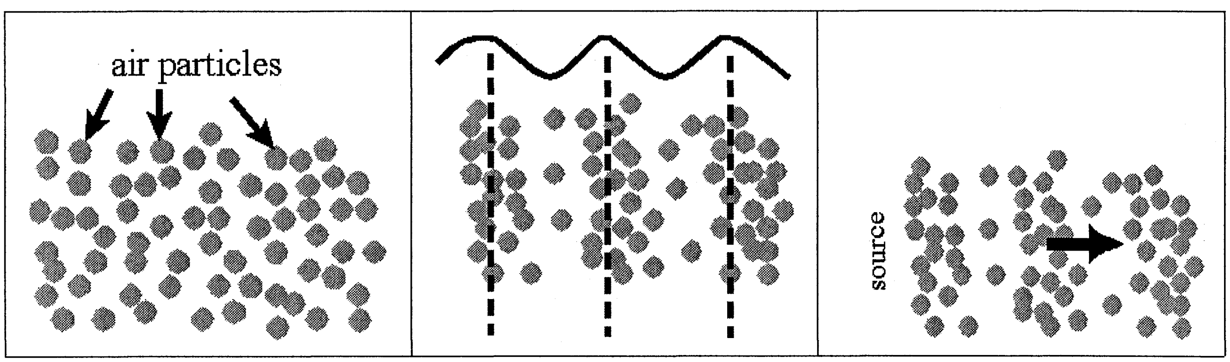


Figure 5 Still Air **Figure 6 Condensations and Rarefactions** **Figure 7 Resulting Sound Wave**

A.1.3 The receiver

Sound waves travel through the air and interact with the human ear or with a measurement microphone. Either of these is called the sound's "receiver."

Perfect human hearing lies in the range of approximately 20 to 20,000 Hz. Frequencies below 20 Hz and above 20 kHz are heard by other living creatures and by microphones and their electronics, but not by humans. This range, 20 to 20,000 Hz, is called the audible sound range. In contrast, infrasound consists of frequencies below some 20 Hz, and ultrasound consists of frequencies above some 20 kHz.

The notes on a piano covers a frequency range of 27 to 4,186 Hz. The piano's "middle C" is at a frequency of 262 Hz. Nearly all information in human speech is contained in the frequency range from 200 to 6,000 Hz. Human hearing is most sensitive between approximately 1.0 and 6.3 kHz.

A.2 Noise

Noise is defined as unwanted sound. Although some sounds may or may not be called "noise" by different listeners, several types of sound are nearly always unwanted, and therefore are always noise. These types include the sound of highway traffic, loud machinery or tools, and aircraft.

A.2.1 Loudness

A sound's loudness is a subjective rather than an objective description of noise, since it depends on how the sound is perceived by a particular individual. As a result of extensive human testing, objective "descriptors" of loudness were constructed and applied to human perception.

When community noise increases or decreases, people can generally perceive a change in loudness if the sound pressure level changes by 3 dB or more. A change in community noise of 1 or 2 dB will usually go unnoticed. A 5-dB change, on the other hand, can be easily detected by most people. In addition, sound will be perceived as "twice as loud" if the sound pressure level increases by 10 dB and as "half as loud" if it decreases by 10 dB. It is common to perceive a 20-dB change as four times as loud (or one quarter as loud). Table 24 shows these same subjective changes in perception.

Table 24 Sound Level Changes

Sound level change	Subjective change in perception
+20 dB	Four times as loud
+10 dB	Twice as loud
+5 dB	Readily perceptible increase
+3 dB	Barely perceptible increase
0 dB	Reference
-3 dB	Barely perceptible reduction
-5 dB	Readily perceptible reduction
-10 dB	Half as loud
-20 dB	One quarter as loud

A.2.2 Frequency and its measurement

As stated above, the audible sound range for humans is from 20 to 20,000 Hz. Even though perfect human hearing lies in this range, people do not hear equally well at all frequencies. Human hearing is most sensitive in the range of about 1,000 to 6,300 Hz.
To measure sound levels in a manner that approximates normal human hearing, sound level meters contain an "A-weighting filter." This filter assigns to each frequency a "weight" that is related to the sensitivity of the human ear at that frequency. Frequencies at which the human ear is less sensitive are weighted less than those at which the ear is more sensitive. In all, the A-weighting filter emphasizes frequencies in the 1,000 to 6,300 Hz range and de-emphasizes frequencies out of that range.

Table 25 contains the A-weighting filter in tabular form, for octave bands. For each octave-band center frequency, the table shows the corresponding decibel adjustment. For example, for the 125 Hz octave band, the adjustment is –16.1 dB. The 500-Hz band requires a –3.2 dB adjustment. The 1,000 Hz band, which can be thought of as the reference frequency for A-weighting, has no adjustment. The 2,000 Hz band requires a +1.2 dB adjustment in sound pressure level.

Table 25 Octave-band Adjustments

Frequency (Hz)	A-weighting adjustment (dB)
31.5	– 39.4
63	– 26.2
125	– 16.1
250	– 8.6
500	– 3.2
1000	0.0
2000	+ 1.2
4000	+ 1.0
8000	– 1.1

A sound pressure level with A-weighting applied has units of dBA and its abbreviation is L_A. The A-weighted sound level is the most widely used measure of environmental noise and is internationally accepted.

A.2.3 Fluctuations in time

Noise can be a steady continuous sound or it may fluctuate between loud and quieter moments. An example of the latter is the noise produced by road traffic. It peaks with the passage of a heavy truck and has relatively quiet moments in between individual vehicle passbys.

Because of the many types of noise and the need to understand these many types from different perspectives, there are several ways to describe the time-varying aspect of noise. These include sound exposure level, maximum sound level, hourly equivalent sound level, day-night sound level and community noise equivalent level.

While all of these A-weighted noise descriptors can be applied to highway traffic noise, the equivalent sound level is almost universally used to described, measure, and predict traffic noise. The hourly equivalent sound level, L_{Aeq1h}, is the energy-average A-weighted sound level occurring during a one-hour period.

Many peaks and dips in the sound pressure level occur over a one-hour period. The L_{Aeq1h} noise descriptor flattens these peaks and dips out. It averages them in the following very specific way. If the time-varying sound is replaced by its L_{Aeq1h} , then the same amount of acoustic energy will enter our ears, or enter a microphone. Figure 8 shows a time-varying noise with L_{Aeq1h} equal to 72dB, for example. Figure 9 replaces that fluctuating noise with a steady one at 72dB, which provides the same acoustic energy over the one-hour time period.

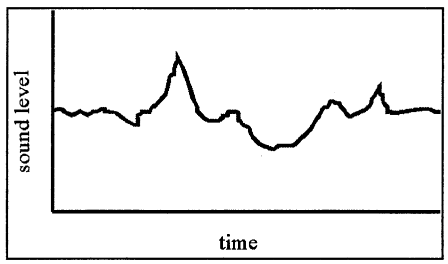


Figure 8 Fluctuating Noise

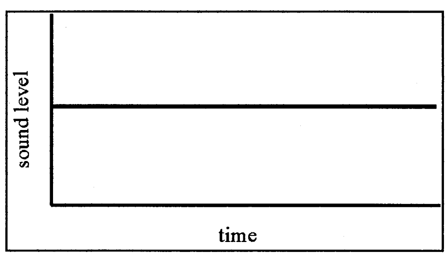


Figure 9 Equivalent Steady Noise

A.3 Highway Traffic Noise

Highway traffic noise involves a noise source, noise receivers adjacent to the highway, and noise propagation between them.

A.3.1 The highway noise source

Categorizing vehicles into several different groups is important to predicting noise levels. Vehicles are typically divided into these categories:

- Automobiles: all vehicles with four tires, including sport utility vehicles and four-tire trucks,

- Medium trucks: all cargo vehicles with six tires (and generally only two axles),
- Heavy trucks: all cargo vehicles with more than six tires (and generally more than two axles),
- Buses: all vehicles designated for transportation of nine or more passengers,
- Motorcycles: all vehicles (either two or three tires) with an open-air driver and/or passenger compartment.

The major noise sources in vehicles of all types (including heavy trucks) are the exhaust at low speeds and the tire/pavement interaction at high speeds. And except at the very lowest speeds, noise levels of individual vehicles depend significantly upon vehicle speed.

In general, the loudest vehicles are heavy trucks. At a distance of 15 meters (50 feet), a single heavy truck traveling at normal highway speeds produces a maximum sound level around 85 dBA. The quietest vehicles are automobiles. For the same conditions as the example heavy truck, the maximum sound level of an automobile is around 75 dBA.

A.3.2 Receivers of highway traffic noise

Most highway noise studies are born out of concern for people. People exposed to highway noise include those who live, go to school, or work in surrounding communities—or people who actually work on the highway itself. The concern lies in their comfort, safety and well being.

The major effect of highway traffic noise is its interference with activities such as sleeping, relaxation, study, TV/radio/hi-fi and conversation. In turn, activity interference causes annoyance and perhaps increased stress. In rare instances, highway noise can also be dangerous—for example, if it interferes with the inability to hear verbal warnings or warning signals by workers next to a noisy highway. Highway traffic noise is never loud enough at normal community distances, nor experienced for enough hours of the day, to produce hearing damage.

A.3.3 Highway noise propagation

Individual vehicles are acoustic point sources, while the full traffic stream is an acoustic line source (even when the vehicles are far apart). An acoustic point source is a source that is essentially concentrated at a single point, from which noise propagates outward uniformly (spherically) in all directions. Noise levels measured from a point source decrease at a rate of 6 dB per doubling of distance, in the absence of any other attenuating mechanisms. This "divergence" is commonly called "free-field spherical spreading." In contrast, a line source radiates sound cylindrically, outward from the line. Noise from a line source diverges at a rate of 3 dB per doubling of distance, commonly called "free-field cylindrical spreading."

The path the sound takes when traveling from the source to a receiver is never truly "free field." It almost always involves attenuating mechanisms, which can be quite complicated. Along the path are ground reflections, obstructions that block direct lines-of-sight, and wind and other conditions of the atmosphere. Noise levels at the receiver depend heavily upon the acoustical effects of these intervening mechanisms.

Ground attenuation. Sound reflects from the ground during propagation from source to receiver. The ground-reflected wave can acoustically "interfere" with the direct (non-reflected) wave to produce a net increase or decrease in noise level at the receiver.

Ground surfaces such as pavement or water are called acoustically "hard." Compared to no ground at all (free field), these hard ground surfaces generally increase the noise level at receivers by 1-to-3 decibels, uniformly at all distances. So intervening hard ground increases noise levels somewhat, but does not change the rate of divergence—still 3 dB per doubling of distance.

In contrast, surfaces such as lawn, field grass, plowed earth, and snow are called acoustically "soft." These surfaces can cause a significant broadband attenuation, except at very low frequencies. Over flat ground, these surfaces attenuate the sound by an additional 3 dB per distance doubling, starting some 8-to-50 meters from the highway depending upon receiver height.

Sound will often travel over terrain that is not flat, but "rolling," instead. Over ground that drops downward first and then back upward to the receiver, the resulting "valley" causes the sound to travel further above the ground, thereby reducing soft-ground attenuation. In contrast, where the terrain bulges upward between source and receiver, the ground comes closer to the sound path and may even interrupt that path. For this terrain, ground attenuation is increased.

Barrier noise reduction. Natural terrain features such as hills, as well as man-made objects such as large walls, sometimes obstruct the sound path between source and receiver. When they do obstruct, they reduce noise levels at the receiver. The term "noise barrier" refers to any large object that blocks the line of sight between source and receiver, including the ground itself if it protrudes upward through the line-of-sight between source and receiver. A noise barrier is commonly a wall or earth berm (high, long mound of earth) specifically constructed for the purpose of noise reduction. This type of obstruction is the most commonly used traffic noise-abatement measure.

The amount of noise reduction provided by these "noise barriers" depends on their height and the frequency content of noise. In addition, the noise reduction depends upon the amount of soft-ground attenuation otherwise present, since part of this ground attenuation is lost as the obstruction forces the sound path higher above the ground.

When sound encounters a noise barrier, a part of it heads toward the barrier's top edge and then "diffracts" (bends) over the barrier top. Another part of the sound heads toward the barrier surface and then both (1) passes through the barrier (greatly reduced in amplitude) and (2) reflects back towards the traffic. Diffraction also occurs around barrier ends, but is only important for receivers very near the end of the barrier.

Sound reflected from the barrier back towards the traffic. Sound reflected back towards the traffic is important because it then continues towards the other side of the highway, perhaps affecting people on that side. Reflective barriers can cause noise to affect people on the opposite side of the highway. After barriers are installed along highways, people on the opposite side often hear an increase, or change in quality, of the highway noise. Measurements commonly show a 1-to-2 dB increase in such cases—for first and second-row residences. This small increase is generally not readily perceptible. Nevertheless, residents on the opposite side of the highway may perceive a change in the quality of the sound. It may sound different due to change in frequency content, for example. And reflected sound from individual vehicles may be readily heard.

The amount of sound that reflects depends upon the barrier's ability to absorb sound upon reflection. This ability is measured by the barrier material's Noise Reduction Coefficient (NRC). Noise Reduction Coefficients range from zero to 0.95. A value of zero means that the barrier material does not absorb any sound—that it is totally reflective. A value of 0.95 means that nearly all the sound (95 percent of it) is absorbed by the barrier, rather than reflected back. NRC values for common absorptive barriers generally range between 0.6 and 0.9.

Barrier noise reduction: through the barrier. The amount of sound that passes through the barrier depends mostly upon the barrier material's weight, the angle of sound incidence on the barrier face and the frequency content of the sound.

The amount of sound reduction during transmission is called the "transmission loss" of the barrier. Typically, transmission loss improves with increased weight of the surface material (not including structural ribbing or posts). Most common materials used in barrier construction provide a transmission loss of 20 dB or better. For barrier materials such as concrete or masonry block, transmission loss is more than sufficient—generally more than 30 dB—to guarantee that this sound portion is insignificant, compared to the portion over the barrier top.

Barrier noise reduction: over the top. Almost always, the portion of the sound that diffracts over the top of the barrier into the barrier's "noise shadow" predominates. It is much stronger that the portion that passes through the barrier and also the portion that passes around the ends of the barrier. For this reason, this diffracted portion is always computed, while the other portions are almost always neglected.

The noise shadow behind a barrier is not very well defined—much different from a light shadow, for instance. When a large surface obstructs light, it produces a well-defined region of "near darkness" behind it, with a very abrupt shadow edge. On the other hand, noise shadows are areas of noise reduction rather than areas of noise absence. The deeper a receiver is positioned in the shadow zone—closer to the base of the barrier and/or further below the top edge—the greater that receiver's barrier attenuation.

The frequency content of the diffracted sound is important. Lower frequencies have longer wavelengths, which diffract over the barrier top with less attenuation than do higher frequencies. Therefore, the noise shadow is not as "deep" for lower frequencies as for higher ones.

Mathematically, barrier noise reduction is the difference in noise level produced by the noise barrier. That is:

$$\text{Barrier Noise Reduction} = L_{\text{BeforeBarrier}} - L_{\text{AfterBarrier}}. \qquad (5)$$

Construction of a noise barrier usually results in a partial loss of soft-ground attenuation, compared to the no-barrier case. In effect, the barrier forces the sound to take a higher path relative to the ground. Physically, the barrier noise reduction is the total of these two effects: (1) the attenuation over the top of the barrier, and (2) the increase in noise due to partial loss of soft-ground attenuation. Over hard ground, no ground attenuation is lost, and so barrier noise reductions are greater than over soft ground.

As a general rule, a wall barrier that breaks the line-of-sight between source and receiver provides some 2-to-5 decibels of noise reduction over soft ground. Higher barriers achieve approximately 1-to-1.5 decibel of additional attenuation for every 1 meter (3 feet) of additional height over soft ground. However, this general rule is very approximate.

Breaking the line-of-sight with a barrier (the first 2-to-5 dB of noise reduction) is relatively simple. A 10-dB noise reduction is usually attainable, using walls or berms of reasonable height. However, greater noise reduction than this is difficult to achieve. A 15-dB noise reduction is very difficult and a 20-dB noise is nearly impossible. Noise barriers are usually designed with a noise-reduction goal of 7-to-10 decibels. Table 26 provides further detail.

Table 26 Barrier Feasibility

Barrier noise reduction	Barrier feasibility
2-to-5 dB	simple
10 dB	attainable
15 dB	very difficult
20 dB	nearly impossible

Very distant receivers start with more ground attenuation to lose, and are therefore much harder to protect with noise barriers.

Noise barriers that flank the highway. With vertical barriers that flank the highway—that is, on both sides of the highway—the situation becomes much more complicated. Such "parallel barriers" reflect the traffic noise back and forth across the roadway many times and build up a "reverberant" sound field between them. This reverberation increases the sound level at nearby receivers on both sides of the highway, compared to what would exist without the opposite-side barrier. This increase can be as much as 5-to-6 decibels. For example, a barrier that would achieve a 9-dB noise reduction might only achieve 4 decibels (9 minus 5) with a barrier on the opposite side of the highway.

This reduction in barrier effectiveness due to multiple reflections from parallel barriers is called "parallel-barrier degradation" (the barrier noise reduction is "degraded.") This also occurs for vertical retaining walls that flank the highway, when the roadway is depressed below the terrain.

Measurements show the following:

- If the ratio of roadway width to average barrier height is 10:1 or less, parallel barrier degradation will range between 3 and 6 decibels.
- If this ratio lies between 10:1 and 20:1, degradation will range between 1 and 3 decibels.
- If this ratio is 20:1 or greater, degradation will be less than 1 decibel.

Remember that changes less than 3 dB are typically not perceivable.

Solutions to parallel barrier degradation include:

- Increasing barrier heights on both sides, which is expensive and increases barrier bulk,
- Tilting barriers away from the traffic by some 10 degrees, which "spills" the reverberation to the sky (although upper-floor receivers may then get direct reflections),
- Applying absorbing material to the face of the barrier, which is the most common solution.

Rows of buildings. In addition to obstructions that are specifically constructed for noise abatement, rows of buildings can partially block sound propagation from source to receiver.

For rows of buildings, the amount of noise reduction varies with building heights and the percentage of gaps in the building row. If the gap percentage is less than 10 percent, then the row of buildings provides noise reduction comparable to that of a noise barrier (no gaps) of similar height—which depends upon building height. For 20-to-30 percent gaps, the expected noise reduction will be about 5-to-7 dB, maximum, no matter how tall the buildings. For 50 percent gaps or more, the noise reduction will be 3 dB or less, again no matter how tall the buildings. Beyond the first row of buildings, additional rows contribute an additional 1.5 dB, up to a maximum of about 10 dB, total.

Dense foliage. In addition to noise barriers and rows of buildings, areas of dense foliage (trees and undergrowth) can provide some noise reduction. This noise reduction is caused by sound scattering into the sky from trunks and limbs (affecting middle frequencies) and from leaves (affecting very high frequencies). In addition, some low-frequency noise reduction results from ground attenuation within the wooded area, where the roots of underbrush produce acoustically soft ground.

To achieve any significant noise reduction due to foliage, that foliage must be dense enough to completely obscure the sound source from the receiver—in winter as well, if winter attenuation is necessary. The foliage area should generally extend 5 meters (16 feet) above the line-of-sight. Under such conditions, approximately 5 dB of noise reduction is achieved after the sound path travels through the first 70 meters (230 feet) of dense foliage. Another 100 meters (330 feet) is needed to achieve the next 5 dB of noise reduction.

Using foliage to reduce community noise along highways is appealing. However, foliage of sufficient width and density to reduce noise is not usually found along highways. In addition, foliage planted as part of a highway project cannot provide sufficient noise abatement.

Meteorological effects. Consider the simplest propagation path: the path going directly from the highway source to a nearby receiver. Besides geometrical spreading (divergence), which causes the noise level to decrease with distance to the receiver, the atmosphere itself can additionally reduce (or increase) noise levels at the receiver.

First, "atmospheric absorption" reduces sound levels by converting some of the sound energy into heat. For normal highway-receiver distances, atmospheric attenuation is only significant at very high frequencies: greater than 5,000 Hz. In general, this attenuation is very small compared to other noise attenuations, and so it can almost always be neglected.

Local meteorological conditions can also affect the direct propagation path. These conditions consist of vertical wind-speed gradients (changes of wind speed with height above the ground) and vertical temperature gradients.

The effects of these two mechanisms depend upon how they affect sound "refraction" (bending).

Whenever meteorology refracts sound *upwards*, sound rays initially headed toward receivers tend to swoop upward over their heads, instead, thereby missing them. The sound that does reach these receivers is the sound that starts downward, below the horizontal, and then bends upwards as it propagates to the receivers. This sound travels closer to the ground along most of its path, and so soft-ground attenuation is increased. At larger distances, the ground may even interrupt these upward-swooping sound paths, thereby greatly increasing attenuation to distant receivers.

In summary, *upward* refraction means more attenuation. Upward refraction occurs when sound travels *upwind*, due to vertical wind-speed gradients caused by friction with the ground. It also occurs when sound travels in the *summer daytime hours*, due to vertical temperature gradients caused by heat radiation from a ground surface hotter than the air above it.

In contrast, *downward* refraction means less attenuation as sound paths "arc" over the tops of intervening obstructions (and further away from the ground, itself). Downward refraction occurs when sound travels *downwind* and also at night, when the air temperature generally becomes warmer with increasing height ("temperature inversion").

These two atmospheric conditions can have major effects on propagation of highway traffic noise beyond some 300 meters (1000 feet). However, many highway neighbors live closer than that, and most highway noise measurements are made closer than that, as well. In these instances, meteorological effects are generally negligible.

In addition, the acoustical effects of fog and precipitation are generally negligible. Atmospheric turbulence, which can be generated by moving vehicles or heated pavement, can potentially cause fluctuations in noise levels or can sometimes reduce soft-ground attenuation.

APPENDIX B FINAL NOISE POLICY & INITIAL SCREENING DATA

This appendix contains the Final Noise Policy, Initial Screening Locations, Initial Screening Database examples, Database Summary Table, and Microsoft® Access Database CD-ROM.

FINAL NOISE POLICY (AS ADOPTED BY THE BOARD IN DECEMBER 1997 AND REVISED PURSUANT TO THE JANUARY 1998 BOARD RESOLUTION)

NEW YORK STATE THRUWAY AUTHORITY
NOISE ABATEMENT PROGRAM

The New York State Thruway Authority, at its January 23, 1997 Board meeting, adopted a six-year capital improvement plan which includes $15 million for Thruway-wide noise mitigation. This funding represents a dramatic change in policy by the Thruway Authority in that it marks the first time in its history, funds are specifically set aside for noise remediation. This was done despite the fact that the Thruway predates many of the buildings now located adjacent to it.

In the past, the Authority conformed to federal policy, which limited financial participation to noise mitigation projects arising solely from new highway construction or expansion or realignment of an existing highway. While continuing to ameliorate noise conditions related to these types of projects, the Authority's new program recognizes that traffic, and consequently noise, has increased dramatically along many sections of the Thruway since its original construction. The Noise Abatement Program will identify and address high priority locations where noise levels exceed acceptable standards. This program will improve the quality of life for those living along the Thruway and should result in increased property values.

The program also recognizes that noise mitigation measures must be developed in concert with the communities that will benefit from the resulting projects. In order to achieve the best results, municipalities must participate in the selection of the type of treatment and materials that will be used to reduce noise. Based upon the collective experience of other states and toll authorities across the nation, the construction of noise barriers can be controversial. Some communities prefer treatments other than using tall concrete or metal barriers. For example, earthen berms with landscaping, lower wood fences or a combination of these types may be considered less obtrusive. These treatments may not provide as much noise reduction as concrete walls, but they do have advantages: improved aesthetics, lower cost and reduced time for completion for both design and construction.

This document will describe the Noise Abatement Program and outline the framework for selecting noise mitigation project locations along the Thruway.

GOALS OF THE PROGRAM

The goals of the Noise Abatement Program are twofold: (1) to provide relief to effected communities on a prioritized basis, relying on existing detailed data documenting noise impacts; and (2) to undertake a comprehensive review of locations where noise impacts may be severe but remain unquantified.

ELIGIBILITY

Projects eligible for funding under this program must be located along sections of roadways where the Thruway Authority has maintenance, operation and capital improvement responsibilities and where noise impacts are directly related to Thruway traffic. The Thruway Authority does not have capital improvement responsibilities for the Cross-Westchester Expressway or Interstate 84. Projects along these roadways are ineligible under this program. Funding from this program will be used to construct noise barriers, earthen berms, screening or a combination of these improvements.

SUMMARY OF THE SELECTION PROCESS

The Authority has completed two technical studies that evaluate the acoustical environment along heavily traveled sections of the Thruway and analyze how effective noise abatement measures would be for areas affected by traffic noise. These studies, which have been subject to public scrutiny, document noise impacts in Rockland and Westchester counties and will form the basis for selecting early noise mitigation projects totaling $15 million. These projects will be funded from the existing six-year capital plan and will be progressed, in priority order.

The priority order will be based upon the results of the technical studies; however, special consideration will be given to locations that have a relatively lower ranking in the noise studies when a municipality elects to share in the responsibility for noise reduction. Shared responsibility could include: (1) acceptance by the municipality of a lower cost noise reduction treatment such as screening, rather than the construction of a more costly noise barrier; or (2) the voluntary contribution of a matching share toward the costs of the project. Opting for a less expensive treatment and/or the provision of a local match will be a significant factor in the selection of noise projects.

The Authority will also provide limited supplemental funding, over and above the $15 million, to work with communities and undertake new studies in certain locations. The results of these studies will be used to prioritize noise mitigation projects that will be funded from future capital plans.

PRIORITIZATION OF EARLY NOISE PROJECTS

Early noise reduction projects will be limited to locations where the Thruway Authority has completed technical studies documenting noise impacts and project benefits. The Rockland and Westchester county studies pinpoint noise-sensitive areas along the Thruway and measure in decibels the actual noise experienced at nearby receptors. The studies utilize federal standards as the criteria for determining impact on areas adjacent to the Thruway. In the federal standards, 67 decibels are the recommended upper limit for residential building exteriors. Each potentially

impacted area was evaluated separately and a benefit index was prepared based on the following factors:

- Total number of people benefiting from noise mitigation who reside within 500 feet of the Thruway
- An impact factor which represents existing noise levels
- A reduction factor which represents potential noise reductions if a noise barrier were to be constructed
- Estimated cost of noise reduction

The benefit index will serve as the basis for ranking noise mitigation projects. The Authority will then prioritize project locations based on this ranking and any special consideration factors where a municipality voluntarily agrees to share in the responsibility for a project. The results of this effort will culminate in a project location schedule that will be updated periodically to coincide with the development of future capital plans.

PARTNERSHIP WITH COMMUNITIES FOR NOISE REDUCTION PROJECTS

Successful development of noise reduction projects must be undertaken in partnership with benefiting communities. Once a location has been identified as a candidate for immediate remediation, communities must participate in the selection of the preferred treatment --- barrier, berm, screening or a combination, and the materials that will be used to reduce noise. The Authority will utilize a three-step process to involve the community and to ensure expeditious completion of the project.

Confirm a Consensus on the Type of Treatment and Materials: The first step is to develop and confirm a consensus with the community on the preferred noise treatment and type of materials that will be used to construct the project. Unless otherwise requested by a community, the Authority will utilize standard types of materials --- concrete for noise barriers and wood for screening. Alternative materials will be considered at the request of a municipality but a local contribution may be required if the cost of materials exceed the standards provided by the Authority. A consensus will be developed by holding a community meeting that will describe alternative treatments, advantages and disadvantages of each, and standard construction materials.

Agreed Upon Preliminary Design: Once a consensus has been achieved, the second step will be for the Thruway Authority to complete the preliminary design of the project. Upon completion, this information will be shared with the community. Prior to proceeding with construction, concurrence with the preliminary design will be required in the form of a letter from the highest ranking elected official in the immediately effected municipality.

Project Construction and Maintenance: Following acceptance of the preliminary design, the Authority will complete the design phase of the project and its construction. The new facility will be maintained by the Authority on an as needed basis.

THE IDENTIFICATION OF FUTURE NOISE PROJECTS

The Authority will provide funding and undertake new studies that will result in the identification of future noise mitigation projects. Prior to undertaking these studies, the Authority will perform a Thruway-wide assessment to identify potential locations where future noise reduction projects will benefit the greatest number of residents and will mitigate the worst noise impacts. This initial screening will utilize the following specific criteria to determine whether a location will be a candidate for a noise study:

- **Density Greater Than 25 Residential Structures:** To enhance the effectiveness of noise projects and ensure that they will benefit the greatest number of impacted residents, the density of the area will be considered in the criteria for studying noise impacts. In order to be eligible, an affected area must include at least 25 residential structures.

- **Area for Potential Mitigation Must Be Within 200 Feet of the Thruway*:*** Noise reduction projects typically will have a direct benefit within 500 feet from the source of the noise. Within this target zone, those residents that are closest to the Thruway are impacted the greatest by noise and also stand to benefit the most from mitigation measures. Beyond the 500 feet target zone the effectiveness of abatement measures diminishes significantly. In order to provide relief for those residents experiencing the worst noise impacts, the study eligibility criteria includes a requirement that the structures within the potential mitigation area be located no more than 200 feet from the Thruway.

Upon completing this preliminary assessment of candidate noise study locations, the Authority will then prioritize these areas based upon the date when the residents impacted by noise were constructed. While some complaints regarding noise impacts come from residences that existed prior to the building of the Thruway, many have come from communities that were erected after the Thruway's construction. In many cases, a key contributing factor to noise impacts on these relatively newer residences has been the failure of developers to provide adequate, or in many cases, any noise abatement measures in the construction of these homes.

This historic lack of appropriate land use planning was recognized by the federal government in 1976 when it established a policy of shared responsibility for noise reduction and limited its participation in noise abatement projects. Federal noise regulations required local officials to take measures to exercise land use control over undeveloped lands adjacent to highways to prevent development of incompatible activities before federal funds could be used to abate noise impacts on land uses which came into existence after May 14, 1976.

While the federal regulations have since been made more restrictive, the intent of tying

land use planning to noise abatement remains valid as a means to prevent these types of situations in the future. The 1976 benchmark date established by the federal government continues to be meaningful in the formulation of a noise abatement program in as much as it served notice on localities to provide adequate noise-related planning. Taking this into account, the following three tiered approach will be applied to determine the priorities for Thruway funded noise abatement studies.

- **TIER 1 --- Residential Construction Prior To 1976:** The Authority will give first priority to studying all noise-impacted areas where residential structures were constructed prior to 1976.

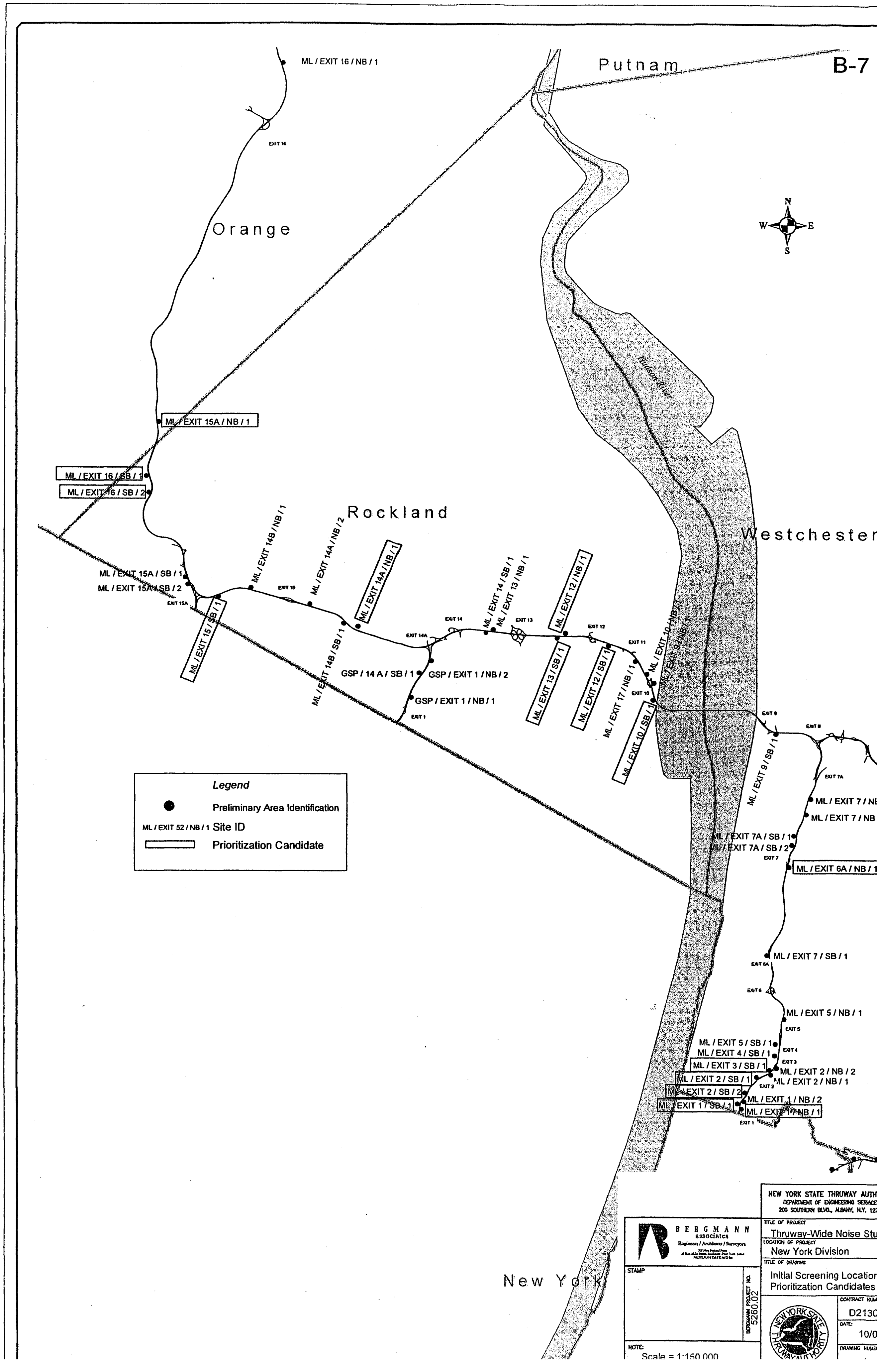
- **TIER 2 --- Residential Construction Between 1976 And 1998:** Subsequent to completing studies eligible under Tier 1, the Authority will evaluate noise in areas where residential structures were constructed between 1976 and 1998.

- **TIER 3 --- Residential Construction After 1998**: Areas where residential structures are constructed after 1998 will not be eligible for noise studies.

Based upon the prioritization, studies will be undertaken with the cooperation of impacted communities. Community leaders will be apprised of the scope of the study and the timeframe for completion. Upon completion of a noise study that concludes that there is an impact that exceeds acceptable standards, the identified benefit indexes will be utilized to rank noise remediation projects that will be eligible for funding in future capital plans.

PROGRAM REEVALUATION

The Noise Abatement Program will be reevaluated biennially to ensure its success. A report will be submitted to the Authority Board recommending changes, if necessary, based on the actual experience with the program.



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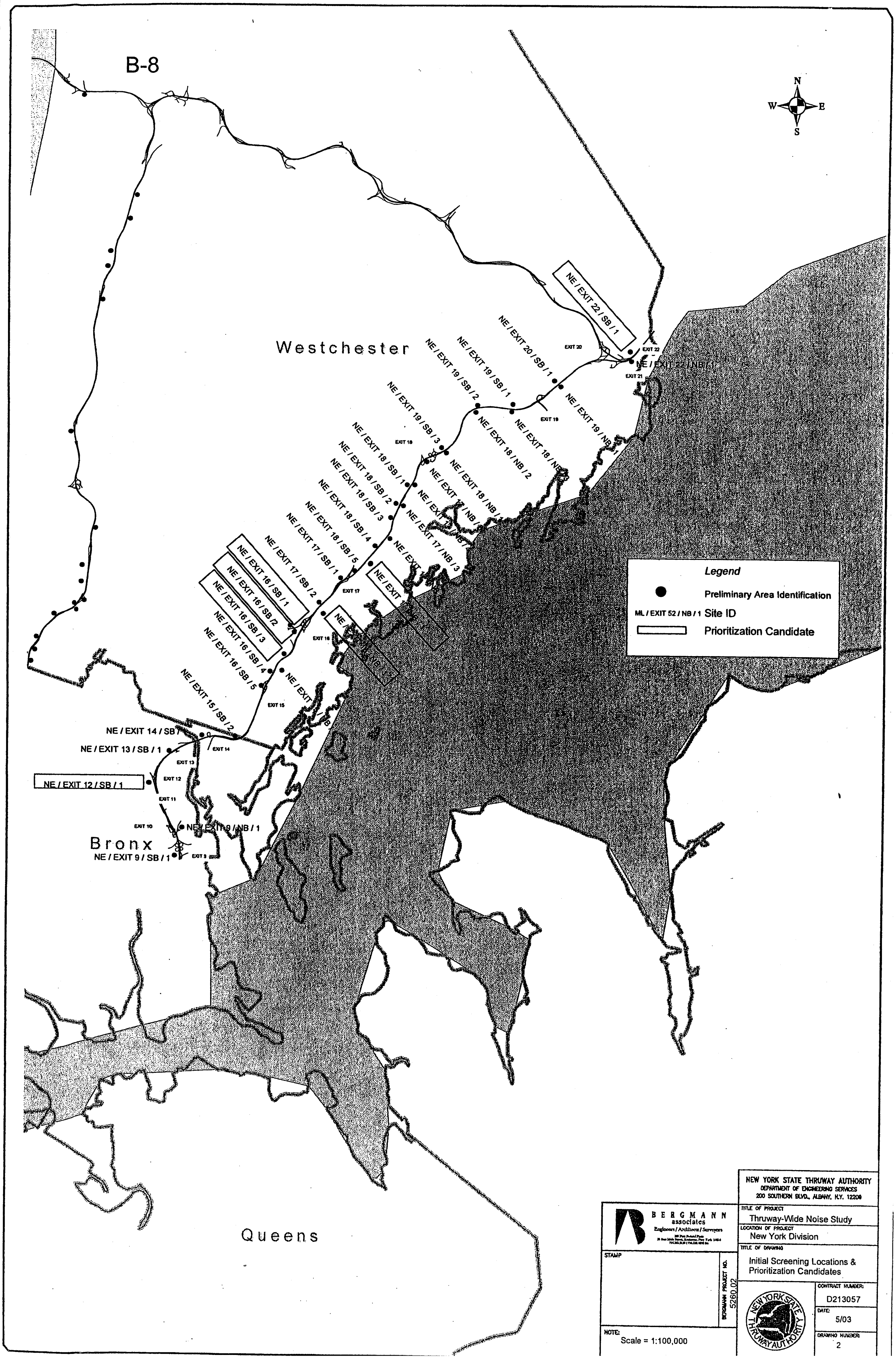
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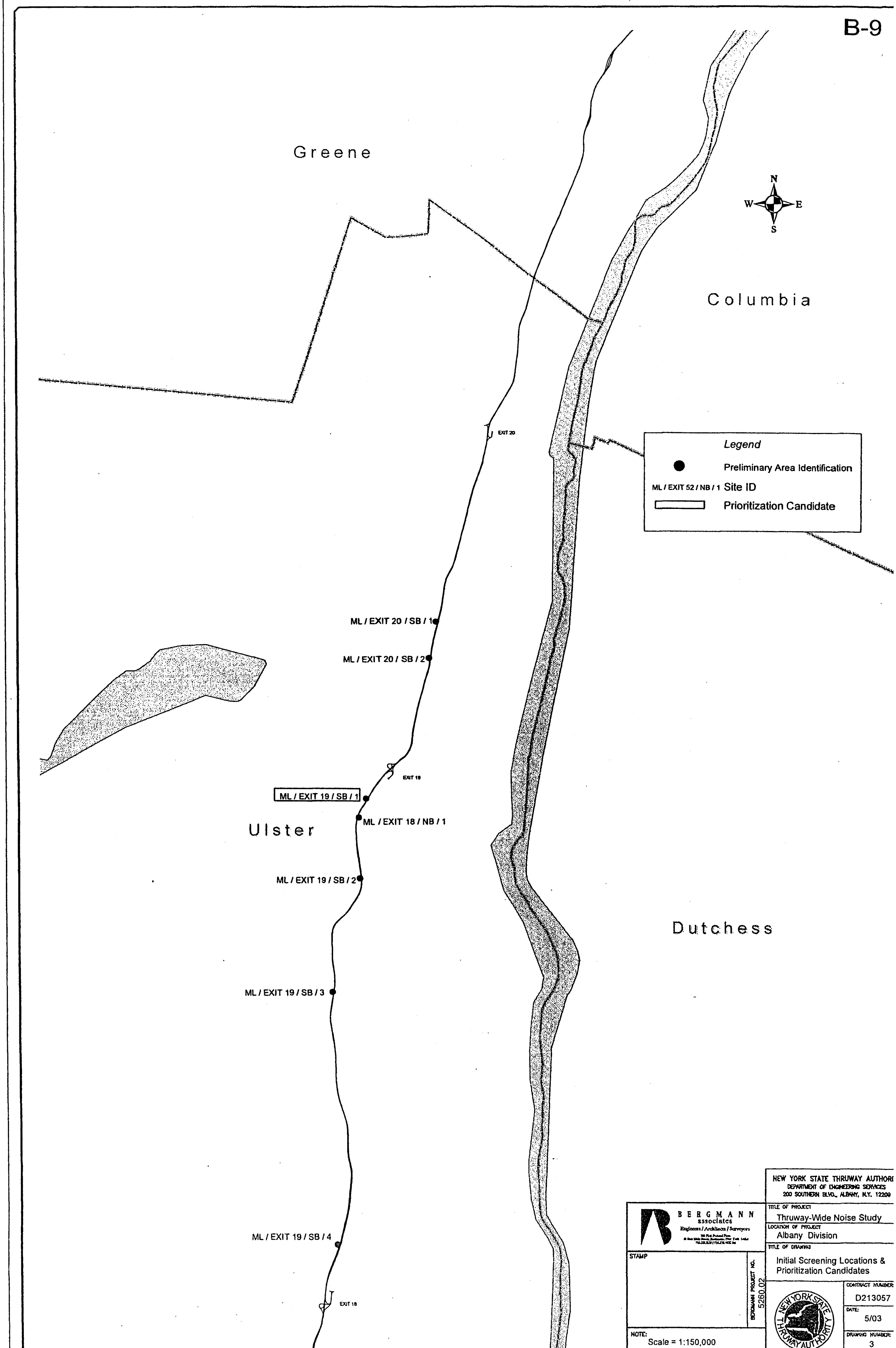
Engineers / Architects / Surveyors
TITLE OF PROJECT
Thruway-Wide Noise Study
LOCATION OF PROJECT
New York Division
TITLE OF DRAWING
Initial Screening Locations & Prioritization Candidates
STAMP
BERGMANN PROJECT NO.
5260.02
CONTRACT NUMBER:
D213057
DATE:
5/03
DRAWING NUMBER:
2
NOTE:
Scale = 1:100,000


B-9
Greene
Columbia
N
W
E
S
Legend
Preliminary Area Identification
ML / EXIT 52 / NB / 1 Site ID
Prioritization Candidate
EXIT 20
ML / EXIT 20 / SB / 1
ML / EXIT 20 / SB / 2
EXIT 19
ML / EXIT 19 / SB / 1
ML / EXIT 18 / NB / 1
Ulster
ML / EXIT 19 / SB / 2
Dutchess
ML / EXIT 19 / SB / 3
ML / EXIT 19 / SB / 4
EXIT 18
NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING SERVICES
200 SOUTHERN BLVD., ALBANY, N.Y. 12209
BERGMANN associates
Engineers / Architects / Surveyors
TITLE OF PROJECT
Thruway-Wide Noise Study
LOCATION OF PROJECT
Albany Division
TITLE OF DRAWING
Initial Screening Locations & Prioritization Candidates
STAMP
BERGMANN PROJECT NO.
5260.02
CONTRACT NUMBER
D213057
DATE
5/03
DRAWING NUMBER
3
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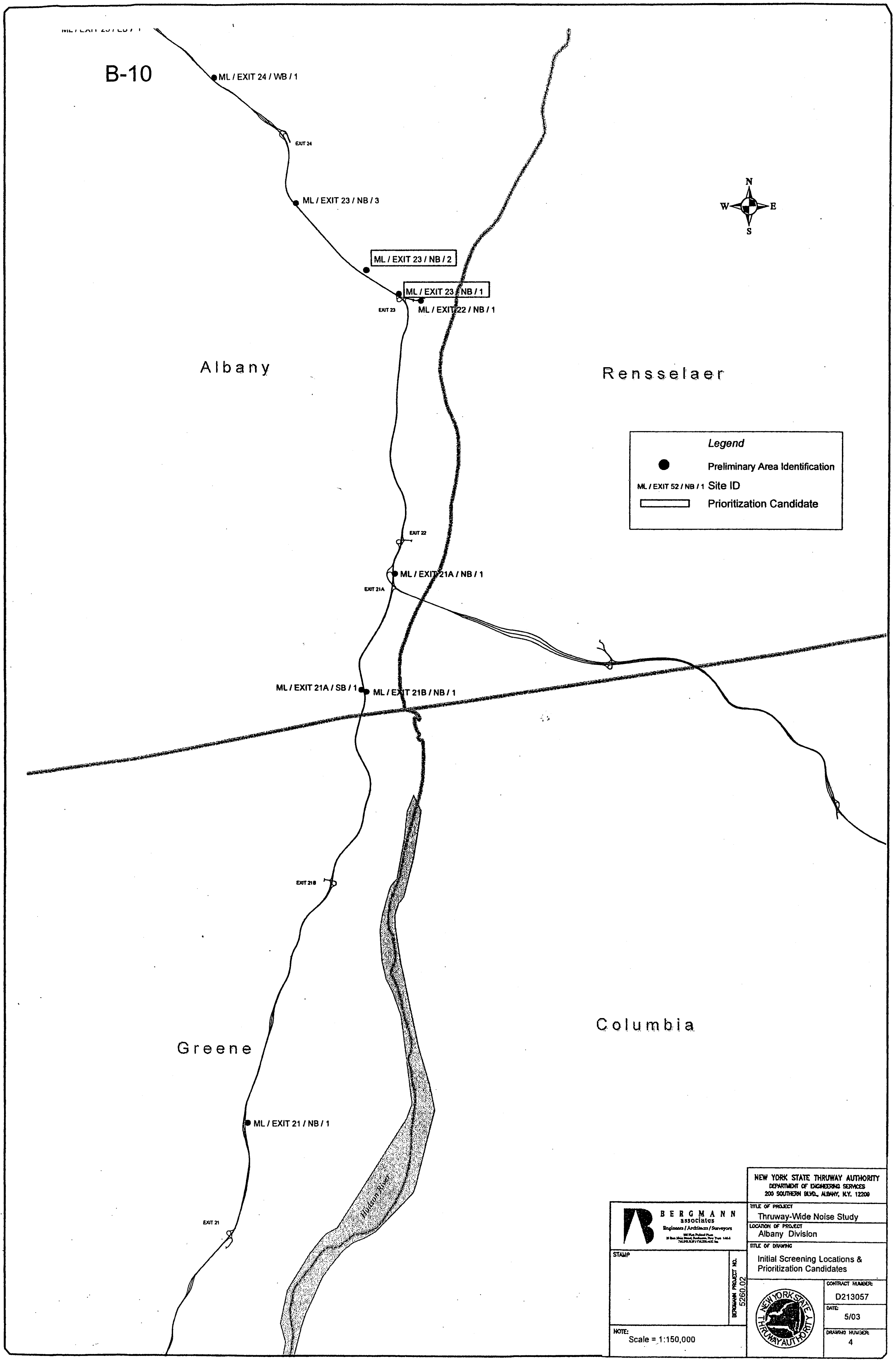
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EXIT 24
ML / EXIT 23 / NB / 3
ML / EXIT 23 / NB / 2
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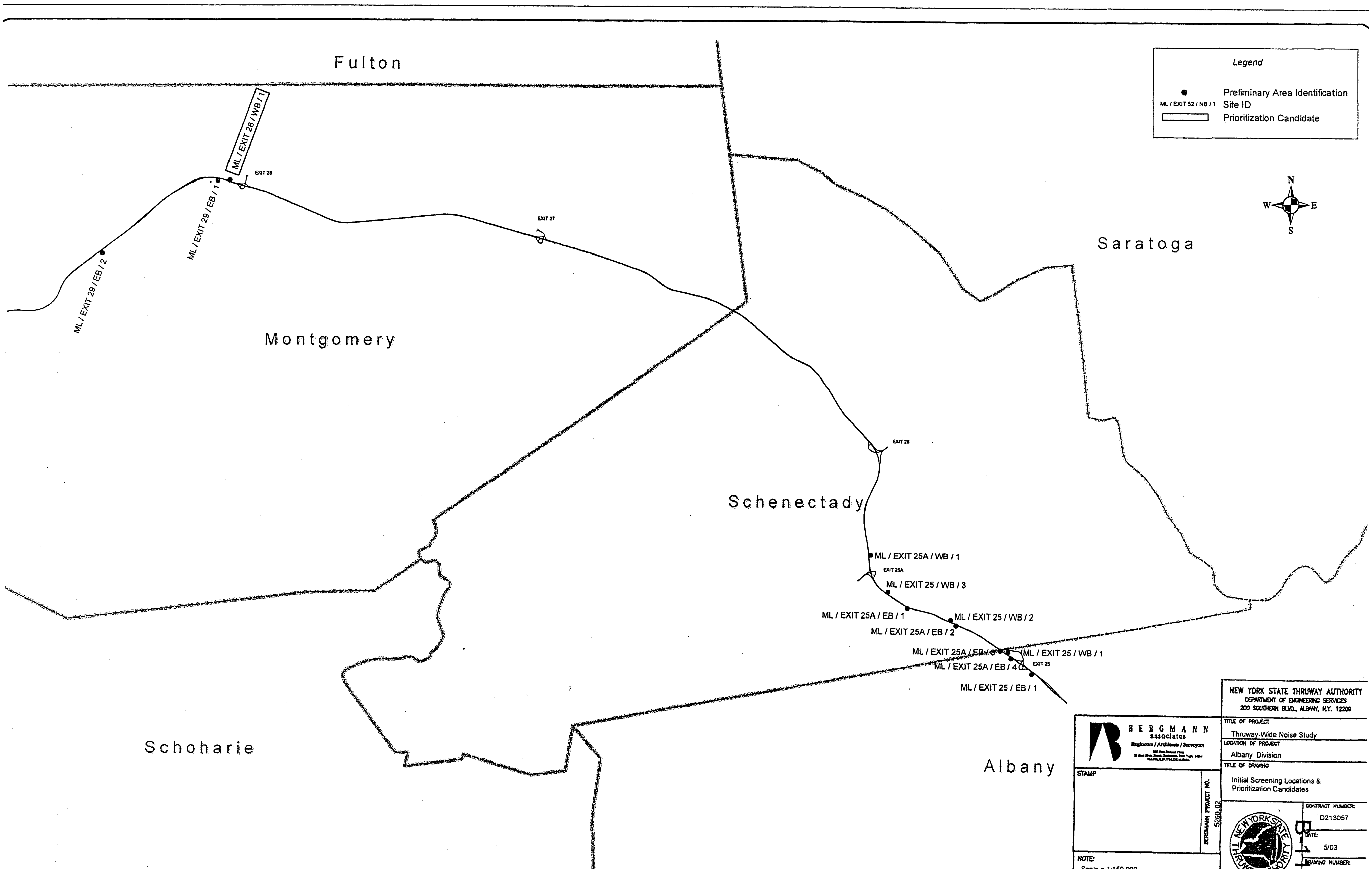
EXIT 23
ML / EXIT 22 / NB / 1
Albany
Rensselaer
N
W
E
S
Legend
Preliminary Area Identification
ML / EXIT 52 / NB / 1 Site ID
Prioritization Candidate
EXIT 22
ML / EXIT 21A / NB / 1
EXIT 21A
ML / EXIT 21A / SB / 1
ML / EXIT 21B / NB / 1
EXIT 21B
Columbia
Greene
ML / EXIT 21 / NB / 1
EXIT 21
Hudson River
NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING SERVICES
200 SOUTHERN BLVD., ALBANY, N.Y. 12209
BERGMANN associates
Engineers / Architects / Surveyors
TITLE OF PROJECT
Thruway-Wide Noise Study
LOCATION OF PROJECT
Albany Division
TITLE OF DRAWING
Initial Screening Locations & Prioritization Candidates
STAMP
BERGMANN PROJECT NO.
5260.02
CONTRACT NUMBER:
D213057
DATE:
5/03
NOTE:
Scale = 1:150,000
DRAWING NUMBER:
4
NEW YORK STATE THRUWAY AUTHORITY



BERGMANN associates
Engineers / Architects / Surveyors

STAMP

BERGMANN PROJECT NO. 5260.02

NOTE:

NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING SERVICES
200 SOUTHERN BLVD., ALBANY, N.Y. 12209

TITLE OF PROJECT: Thruway-Wide Noise Study

LOCATION OF PROJECT: Albany Division

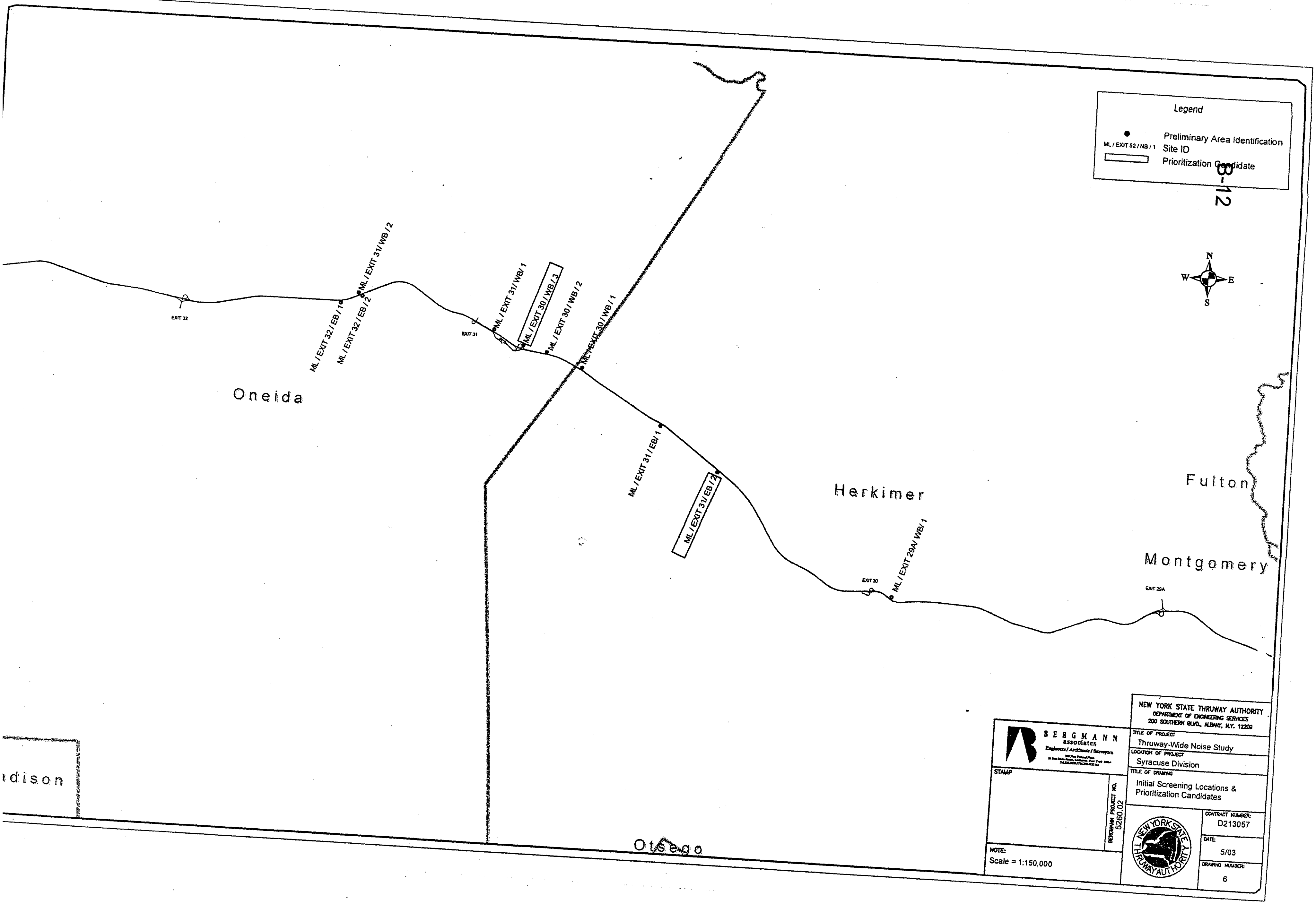
TITLE OF DRAWING: Initial Screening Locations & Prioritization Candidates

CONTRACT NUMBER: D213057

DATE: 5/03

DRAWING NUMBER: B-11

B-12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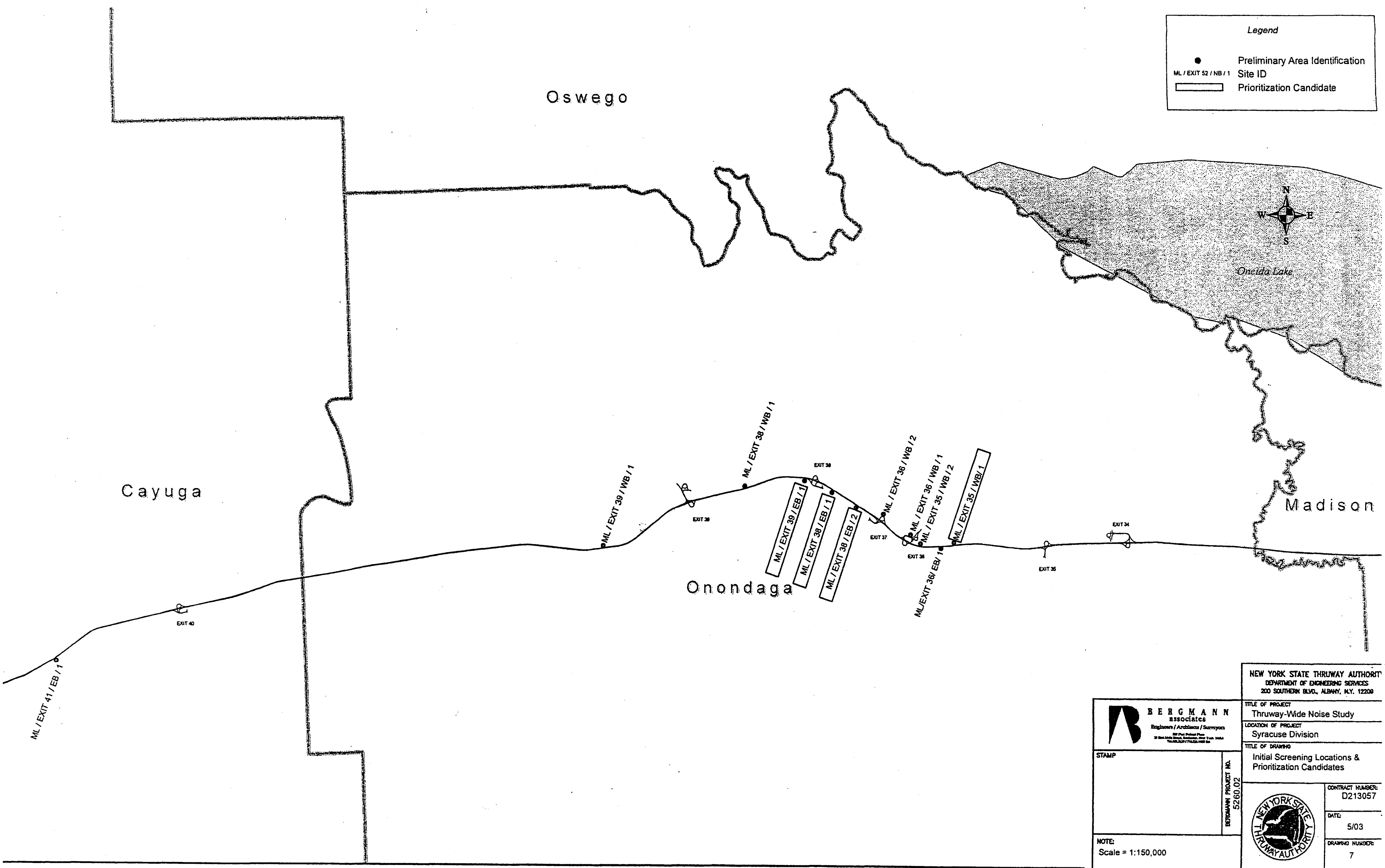
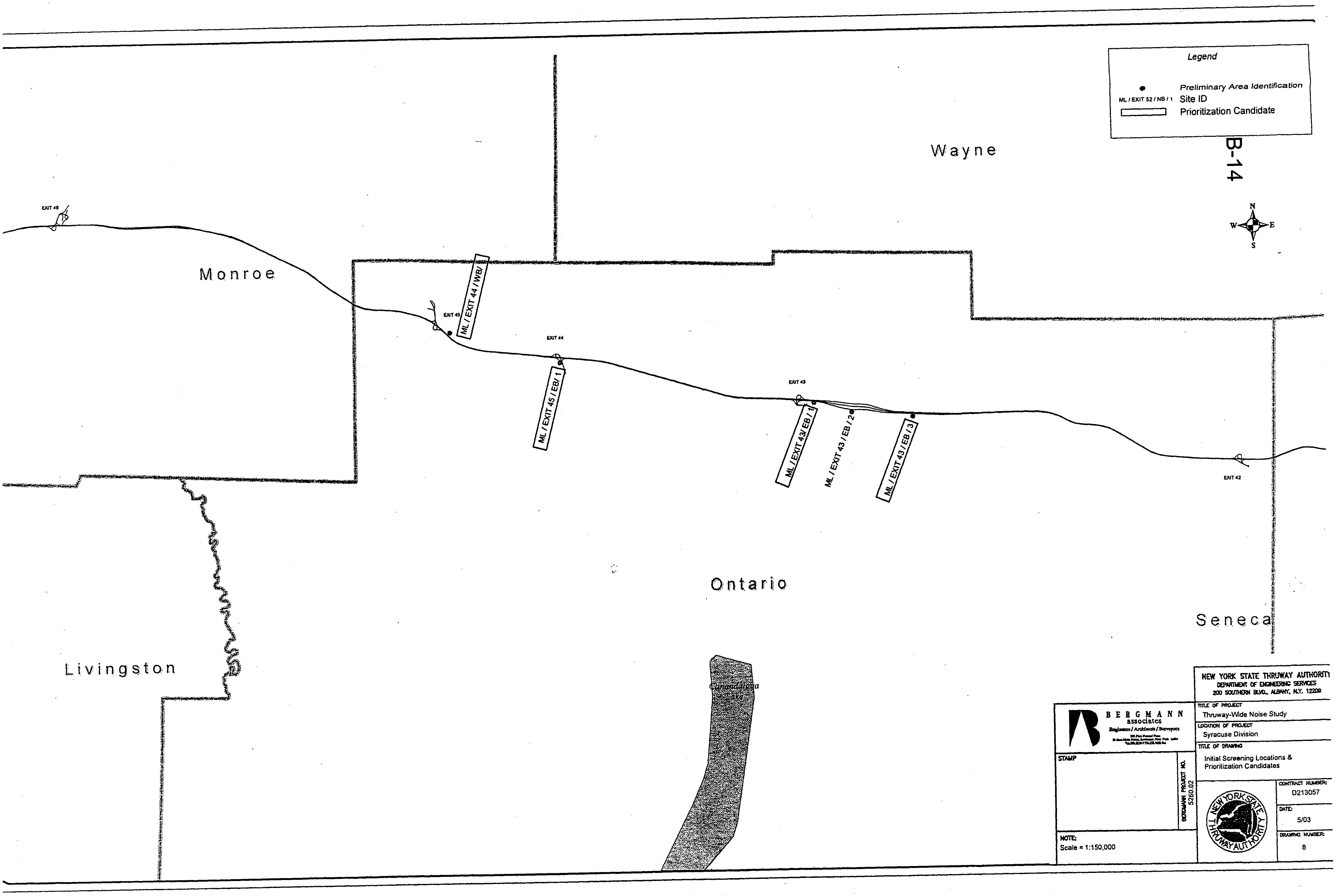
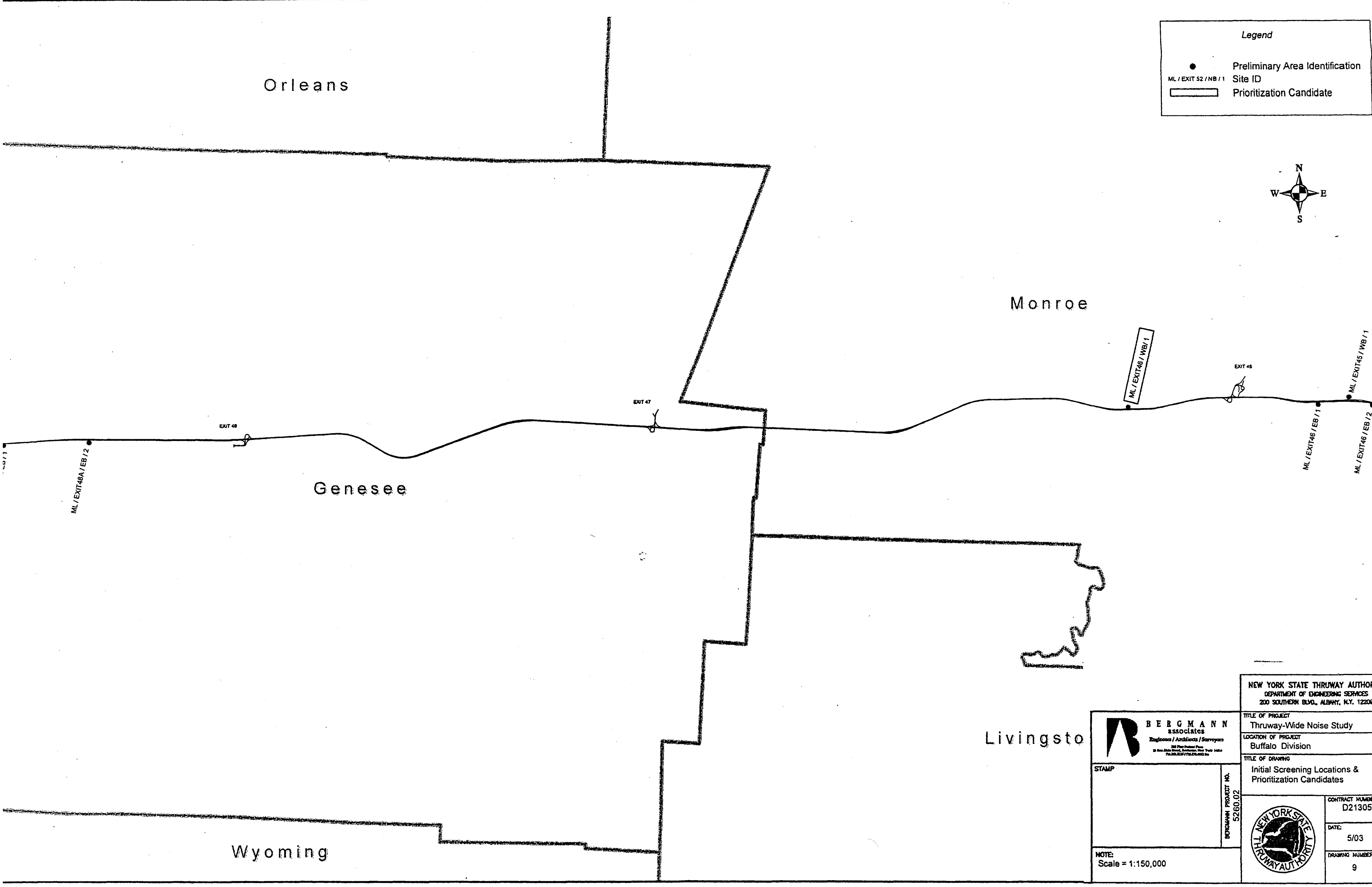
ML / EXIT 52 / NB / 1
Preliminary Area Identification
Site ID
Prioritization Candidate
N
W
E
S
Oneida
Herkimer
Fulton
Montgomery
Otsego
adison
EXIT 32
EXIT 31
EXIT 30
EXIT 29A
ML / EXIT 32 / EB / 1
ML / EXIT 32 / EB / 2
ML / EXIT 31 / WB / 2
ML / EXIT 31 / WB / 1
ML / EXIT 30 / WB / 3
ML / EXIT 30 / WB / 2
ML / EXIT 30 / WB / 1
ML / EXIT 31 / EB / 1
ML / EXIT 31 / EB / 2
ML / EXIT 29A / WB / 1
NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING SERVICES
200 SOUTHERN BLVD., ALBANY, N.Y. 12209
TITLE OF PROJECT
Thruway-Wide Noise Study
LOCATION OF PROJECT
Syracuse Division
TITLE OF DRAWING
Initial Screening Locations & Prioritization Candidates
BERGMANN associates
Engineers / Architects / Surveyors
STAMP
BERGMANN PROJECT NO.
5260.02
NOTE:
Scale = 1:150,000
CONTRACT NUMBER:
D213057
DATE:
5/03
DRAWING NUMBER:
6
NEW YORK STATE THRUWAY AUTHORITY


Legend
Preliminary Area Identification
ML / EXIT 52 / NB / 1 Site ID
Prioritization Candidate
Oswego
Oneida Lake
N
W
E
S
Cayuga
Onondaga
Madison
ML / EXIT 41 / EB / 1
EXIT 40
ML / EXIT 39 / WB / 1
EXIT 39
ML / EXIT 38 / WB / 1
EXIT 38
ML / EXIT 39 / EB / 1
ML / EXIT 38 / EB / 1
ML / EXIT 38 / EB / 2
ML / EXIT 36 / WB / 2
EXIT 37
ML / EXIT 36 / WB / 1
ML / EXIT 35 / WB / 2
EXIT 36
ML/EXIT 36/ EB/ 1
ML / EXIT 35 / WB / 1
EXIT 35
EXIT 34
NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING SERVICES
200 SOUTHERN BLVD., ALBANY, N.Y. 12209
TITLE OF PROJECT
Thruway-Wide Noise Study
LOCATION OF PROJECT
Syracuse Division
TITLE OF DRAWING
Initial Screening Locations &
Prioritization Candidates
BERGMANN associates
Engineers / Architects / Surveyors
STAMP
BERGMANN PROJECT NO.
5260.02
NOTE:
Scale = 1:150,000
CONTRACT NUMBER:
D213057
DATE:
5/03
DRAWING NUMBER:
7
NEW YORK STATE THRUWAY AUTHORITY


Legend
Preliminary Area Identification
ML / EXIT 52 / NB / 1 Site ID
Prioritization Candidate
B-14
N
E
S
W
Wayne
Monroe
Ontario
Seneca
Livingston
EXIT 46
EXIT 45
EXIT 44
EXIT 43
EXIT 42
ML / EXIT 44 / WB/
ML / EXIT 45 / EB/ 1
ML / EXIT 43/ EB / 1
ML / EXIT 43 / EB / 2
ML / EXIT 43 / EB / 3
NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING SERVICES
200 SOUTHERN BLVD., ALBANY, N.Y. 12209
TITLE OF PROJECT
Thruway-Wide Noise Study
LOCATION OF PROJECT
Syracuse Division
TITLE OF DRAWING
Initial Screening Locations &
Prioritization Candidates
CONTRACT NUMBER:
D213057
DATE:
5/03
DRAWING NUMBER:
8
BERGMANN associates
Engineers / Architects / Surveyors
STAMP
BERGMANN PROJECT NO.
5260.02
NOTE:
Scale = 1:150,000
NEW YORK STATE THRUWAY AUTHORITY



BERGMANN associates
Engineers / Architects / Surveyors

NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING SERVICES
200 SOUTHERN BLVD., ALBANY, N.Y. 12209

TITLE OF PROJECT: Thruway-Wide Noise Study

LOCATION OF PROJECT: Buffalo Division

TITLE OF DRAWING: Initial Screening Locations & Prioritization Candidates

STAMP

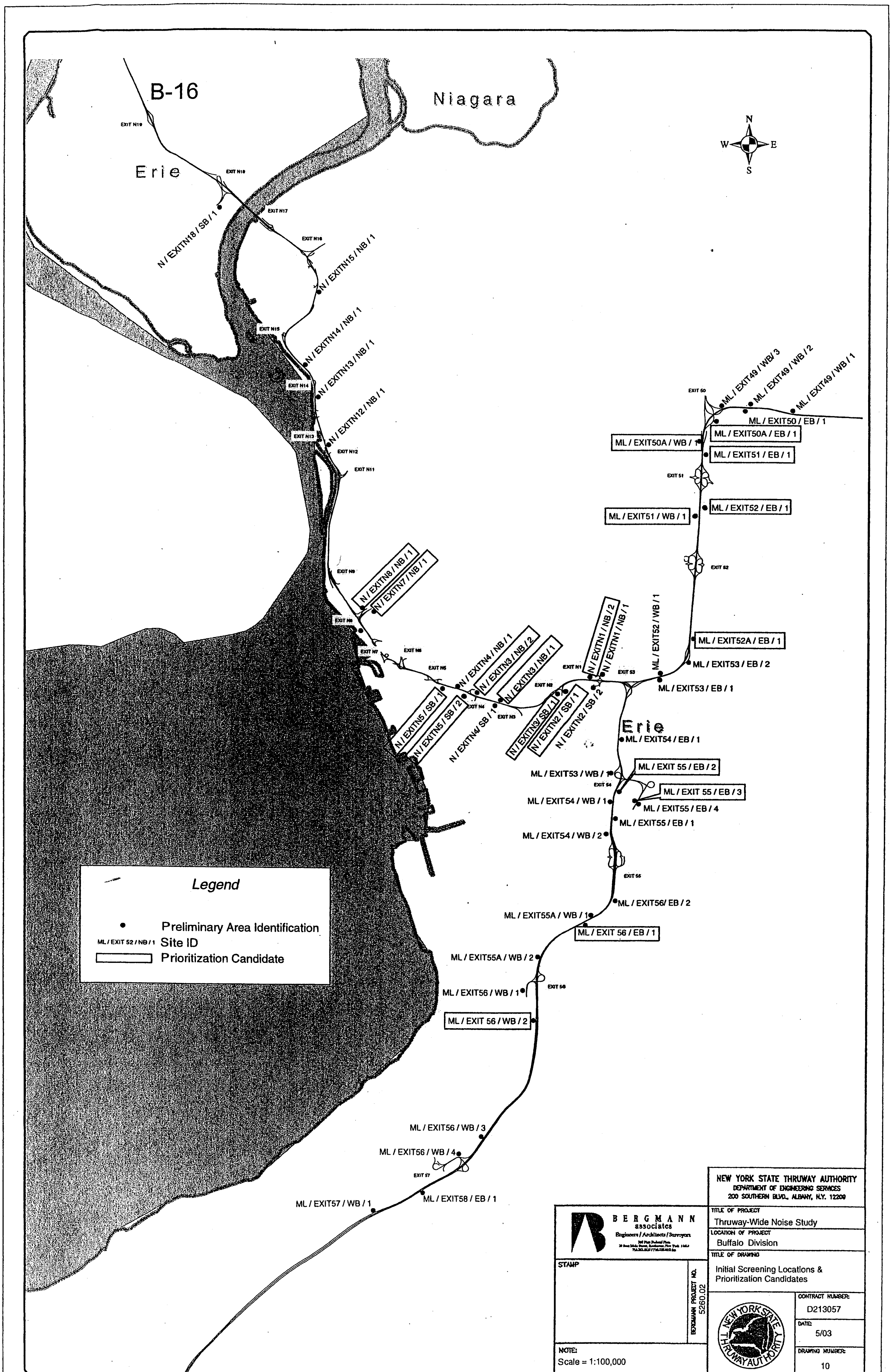
BERGMANN PROJECT NO. 5260.02

NOTE: Scale = 1:150,000

CONTRACT NUMBER: D213057

DATE: 5/03

DRAWING NUMBER: 9


B-16
Niagara
Erie
N
W
E
S
EXIT N19
EXIT N18
EXIT N17
EXIT N16
EXIT N15
EXIT N14
EXIT N13
EXIT N12
EXIT N11
EXIT N9
EXIT N8
EXIT N7
EXIT N6
EXIT N5
EXIT N4
EXIT N3
EXIT N2
EXIT N1
N / EXITN18 / SB / 1
N / EXITN15 / NB / 1
N / EXITN14 / NB / 1
N / EXITN13 / NB / 1
N / EXITN12 / NB / 1
N / EXITN8 / NB / 1
N / EXITN7 / NB / 1
N / EXITN4 / NB / 1
N / EXITN3 / NB / 2
N / EXITN3 / NB / 1
N / EXITN1 / NB / 2
N / EXITN1 / NB / 1
N / EXITN5 / SB / 1
N / EXITN5 / SB / 2
N / EXITN4/ SB / 1
N / EXITN3/ SB / 1
N / EXITN2 / SB / 1
N / EXITN2 / SB / 2
EXIT 50
EXIT 51
EXIT 52
EXIT 53
EXIT 54
EXIT 55
EXIT 56
EXIT 57
ML / EXIT49 / WB / 3
ML / EXIT49 / WB / 2
ML / EXIT49 / WB / 1
ML / EXIT50 / EB / 1
ML / EXIT50A / WB / 1
ML / EXIT50A / EB / 1
ML / EXIT51 / EB / 1
ML / EXIT52 / EB / 1
ML / EXIT51 / WB / 1
ML / EXIT52 / WB / 1
ML / EXIT52A / EB / 1
ML / EXIT53 / EB / 2
ML / EXIT53 / EB / 1
Erie
ML / EXIT54 / EB / 1
ML / EXIT 55 / EB / 2
ML / EXIT53 / WB / 1
ML / EXIT 55 / EB / 3
ML / EXIT54 / WB / 1
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ML / EXIT56/ EB / 2
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ML / EXIT 56 / EB / 1
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ML / EXIT56 / WB / 3
ML / EXIT56 / WB / 4
ML / EXIT57 / WB / 1
ML / EXIT58 / EB / 1
Legend
Preliminary Area Identification
ML / EXIT 52 / NB / 1 Site ID
Prioritization Candidate
BERGMANN associates
Engineers / Architects / Surveyors
STAMP
BERGMANN PROJECT NO. 5260.02
NOTE:
Scale = 1:100,000
NEW YORK STATE THRUWAY AUTHORITY
DEPARTMENT OF ENGINEERING SERVICES
200 SOUTHERN BLVD., ALBANY, N.Y. 12209
TITLE OF PROJECT
Thruway-Wide Noise Study
LOCATION OF PROJECT
Buffalo Division
TITLE OF DRAWING
Initial Screening Locations & Prioritization Candidates
NEW YORK STATE THRUWAY AUTHORITY
CONTRACT NUMBER:
D213057
DATE:
5/03
DRAWING NUMBER:
10

New York Division - Database Summary Table

SiteID	Division	Section	From milepost	To milepost	# of Residential < 200 ft	Number of Tier 1 and (Tier 2)	Number of Tier 3	Prioritization candidate
ML / EXIT 1 / SB / 1	New York	Mainline	0	0.2	25	25 (0)		Yes
ML / EXIT 1 / NB / 1	New York	Mainline	0	0.2	25	25 (0)		Yes
ML / EXIT 2 / SB / 3	New York	Mainline	0.2	0.5	17			No
ML / EXIT 1 / NB / 2	New York	Mainline	0.3	0.5	0			No
ML / EXIT 2 / SB / 2	New York	Mainline	0.5	0.8	25	25 (0)		Yes
ML / EXIT 2 / SB / 1	New York	Mainline	0.9	1.4	25	25 (0)		Yes
ML / EXIT 3 / SB / 1	New York	Mainline	1.4	1.85	25	25 (0)		Yes
ML / EXIT 2 / NB / 1	New York	Mainline	1.4	1.6	2			No
ML / EXIT 2 / NB / 2	New York	Mainline	1.6	1.8	3			No
ML / EXIT 4 / SB / 1	New York	Mainline	2.2	2.8	0			No
ML / EXIT 5 / SB / 1	New York	Mainline	2.2	2.45	5			No
ML / EXIT 5 / NB / 1	New York	Mainline	2.9	3.2	20			No
ML / EXIT 7 / SB / 1	New York	Mainline	4.4	5.2	10			No
ML / EXIT 6A / NB / 1	New York	Mainline	7.45	8	28	25 (0)		Yes
ML / EXIT 7A / SB / 2	New York	Mainline	8.1	8.4	0			No
ML / EXIT 7A / SB / 1	New York	Mainline	8.4	8.8	0			No
ML / EXIT 7 / NB / 1	New York	Mainline	9.1	9.5	8			No
ML / EXIT 7 / NB / 2	New York	Mainline	9.5	10	7			No
ML / EXIT 9 / SB / 1	New York	Mainline	12.4	12.7	16			No
ML / EXIT 10 / SB / 1	New York	Mainline	16.15	16.6	37	37 (0)		Yes
ML / EXIT 9 / NB / 1	New York	Mainline	16.3	16.7				barrier constructed
ML / EXIT 10 / NB / 1	New York	Mainline	16.9	17.45				barrier constructed
ML / EXIT 11 / SB / 1	New York	Mainline	17.4	17.5	4			No
ML / EXIT 12 / SB / 1	New York	Mainline	18	18.7	28	28 (0)		Yes
ML / EXIT 13 / SB / 1	New York	Mainline	19.65	20.4	25	25 (0)		Yes
ML / EXIT 12 / NB / 1	New York	Mainline	20.5	21.2	3			No
ML / EXIT 13 / NB / 1	New York	Mainline	21.3	22				barrier constructed
ML / EXIT 14 / SB / 1	New York	Mainline	21.7	22.3				barrier constructed
ML / EXIT 14A / NB / 1	New York	Mainline	24.4	25.4	26	26 (0)		Yes
ML / EXIT 14A / NB / 2	New York	Mainline	25.6	25.9	10			No
ML / EXIT 14B / SB / 1	New York	Mainline	25.75	26.1	16			No
ML / EXIT 14A / NB / 3	New York	Mainline	26.7	27.1				barrier constructed
ML / EXIT 14B / NB / 1	New York	Mainline	28.5	29.1				barrier constructed
ML / EXIT 15 / SB / 1	New York	Mainline	29.5	30	26	26 (0)		Yes
ML / EXIT 15A / SB / 2	New York	Mainline	30.5	30.7	12			No
ML / EXIT 15A / SB / 1	New York	Mainline	30.7	30.9	11			No
ML / EXIT 16 / SB / 2	New York	Mainline	33.6	34.1	26	20 (6)		Yes

New York Division - Database Summary Table

SiteID	Division	Section	From milepost	To milepost	# of Residential < 200 ft	Number of Tier 1 and/or Tier 2	Number of Tier 3	Prioritization candidate
ML / EXIT 16 / SB / 1	New York	Mainline	34.1	34.8	30	26 (4)		Yes
ML / EXIT 15A / NB / 1	New York	Mainline	35.8	36.3	28	25 (0)		Yes
ML / EXIT 16 / NB / 1	New York	Mainline	47.8	49	20			No
ML / EXIT 17 / SB / 1	New York	Mainline	57.4	58.4	13			No
ML / EXIT 18 / SB / 2	New York	Mainline	62.6	63.5	6			No
ML / EXIT 18 / SB / 1	New York	Mainline	72.6	73.64	8			No
NE / EXIT 9 / SB / 1	New York	New England	0	0.2	0			No
NE / EXIT 9 / NB / 1	New York	New England	0.4	0.6	17			No
NE / EXIT 12 / SB / 1	New York	New England	1.1	1.6	26	26 (0)		Yes
NE / EXIT 13 / SB / 1	New York	New England	2	2.3	20			No
NE / EXIT 14 / SB / 1	New York	New England	2.7	2.9	3			No
NE / EXIT 15 / SB / 2	New York	New England	3	3.6	0			No
NE / EXIT 14 / NB / 1	New York	New England	3.6	4	0			No
NE / EXIT 15 / SB / 1	New York	New England	3.8	4.1	0			No
NE / EXIT 15 / NB / 1	New York	New England	4.1	5.1	2			No
NE / EXIT 16 / SB / 5	New York	New England	4.5	4.8	23			No
NE / EXIT 16 / SB / 4	New York	New England	4.8	5	0			No
NE / EXIT 16 / SB / 3	New York	New England	5.2	5.5	28	28 (0)		Yes
NE / EXIT 16 / SB / 2	New York	New England	5.6	5.9	30	30 (0)		Yes
NE / EXIT 16 / SB / 1	New York	New England	6		25	25 (0)		Yes
NE / EXIT 17 / SB / 2	New York	New England	6.1	6.7	0			No
NE / EXIT 16 / NB / 1	New York	New England	6.6	7.5	25	25 (0)		Yes
NE / EXIT 17 / SB / 2	New York	New England	6.9	7.2	14			No
NE / EXIT 18 / SB / 5	New York	New England	7.3	7.6				barrier constructed
NE / EXIT 17 / NB / 1	New York	New England	7.7	8	25	25 (0)		Yes
NE / EXIT 18 / SB / 4	New York	New England	7.85	8.4	0			No
NE / EXIT 17 / NB / 2	New York	New England	8.2	8.5	10			No
NE / EXIT 17 / NB / 3	New York	New England	8.45	8.8				barrier constructed
NE / EXIT 18 / SB / 3	New York	New England	8.5	8.8	0			No
NE / EXIT 18 / SB / 2	New York	New England	8.8	9.1				barrier constructed
NE / EXIT 17 / NB / 4	New York	New England	8.9	9.1	10			No
NE / EXIT 18 / SB / 1	New York	New England	9	9.5	16			No
NE / EXIT 17 / NB / 5	New York	New England	9.3	9.6				barrier constructed
NE / EXIT 17 / NB / 6	New York	New England	9.6	10.1				barrier constructed
NE / EXIT 19 / SB / 1	New York	New England	9.9	10.4				barrier constructed
NE / EXIT 18 / NB / 1	New York	New England	10.1	10.45				barrier constructed

New York Division - Database Summary Table

SiteID	Division	Section	From milepost	To milepost	# of Residential < 200 ft	Number of Tier 1 and/or Tier 2	Number of Tier 3	Prioritization candidate
NE / EXIT 18 / NB / 2	New York	New England	11	11.6	0			No
NE / EXIT 19 / SB / 2	New York	New England	11.2	11.65				barrier constructed
NE / EXIT 19 / SB / 3	New York	New England	11.6	12.5				barrier constructed
NE / EXIT 18 / NB / 3	New York	New England	11.6	12.7				barrier constructed
NE / EXIT 19 / NB / 1	New York	New England	12.7	13.2				barrier constructed
NE / EXIT 20 / SB / 1	New York	New England	12.7	13.2				barrier constructed
NE / EXIT 22 / SB / 2	New York	New England	14.3	14.5	25	25 (0)		Yes
NE / EXIT 22 / SB / 1	New York	New England	14.5	14.8	3			No
NE / EXIT 22 / NB / 1	New York	New England	14.8	14.5				barrier constructed
GSP / 14 A / SB / 1	New York	GSP Connection	640.1	641.3	20			No
GSP / NJ / NB / 2	New York	GSP Connection	640.1	640.8	12			No
GSP / NJ / NB / 1	New York	GSP Connection	641.3		17			No

Albany Division - Database Summary Table

SiteID	Thruway Division	Thruway Section	From milepost	To milepost	Number of Residential Dwellings < 200 ft	Number of Tier 1 and/or Tier 2	Number of Tier 3	Prioritization candidate
ML / EXIT 19 / SB / 4	Albany	Mainline	78.2	77.15	4			No
ML / EXIT 19 / SB / 3	Albany	Mainline	84.6	85	5			No
ML / EXIT 19 / SB / 2	Albany	Mainline	88.5	87.8	7			No
ML / EXIT 18 / NB / 1	Albany	Mainline	89.55	90.1	13			No
ML / EXIT 19 / SB / 1	Albany	Mainline	90.25	90.5	38 (0)	38		Yes
ML / EXIT 20 / SB / 2	Albany	Mainline	95.15	94.45	5			No
ML / EXIT 20 / SB / 1	Albany	Mainline	96.2	95.4	18			No
ML / EXIT 21 / NB / 1	Albany	Mainline	117.1	117.5	5			No
ML / EXIT 22 / NB / 1	Albany	Mainline	I-787 ramp (~141.75)	142	17			No
ML / EXIT 23 / NB / 1	Albany	Mainline	142	142.5	16 (12)	28		Yes
ML / EXIT 23 / NB / 3	Albany	Mainline	145.8	144.4	21			No
ML / EXIT 21A / SB / 1	Albany	Mainline	130.61	130.6	16			No
ML / EXIT 21B / NB / 1	Albany	``	130.2	130.7	12			No
ML / EXIT 21A / NB / 1	Albany	Mainline	133.9	134.6	5			No
ML / EXIT 23 / NB / 2	Albany	Mainline	142.5	144.2	14 (12)	26		Yes
ML / EXIT 24 / WB / 1	Albany	Mainline	150.25	150.8	9			No
ML / EXIT 25 / EB / 1	Albany	Mainline	153.65 RAMP	153.25	19			No
ML / EXIT 25A / EB / 4	Albany	Mainline	154.4	154.0	14			No
ML / EXIT 25 / WB / 1	Albany	Mainline	154.41	154.05	7			No
ML / EXIT 25A / EB / 1	Albany	Mainline	154.6	154.41	6			No
ML / EXIT 25A / EB / 2	Albany	Mainline	156.1	155.55	2			No
ML / EXIT 25 / WB / 2	Albany	Mainline	155.85	156.175	0			No
ML / EXIT 25A / EB / 1	Albany	Mainline	157.45	157.3	6			No
ML / EXIT 25 / WB / 3	Albany	Mainline	157.7	158.3	16			No
ML / EXIT 25A / WB / 1	Albany	Mainline	159.22	159.3	2			No
ML / EXIT 29 / EB / 2	Albany	Mainline	183.18	182.73	4			No
ML / EXIT 28 / WB / 1	Albany	Mainline	182.4	182.95	30 (0)	30	1	Yes
ML / EXIT 29 / EB / 1	Albany	Mainline	186.75	186.55	0			No

B-20

Syracuse Division - Database Summary Table

SiteID	Thruway Division	Thruway Section	From milepost	To milepost	# of Residential Dwellings < 200 ft	Number of Tier 1 and/or Tier 2	Number of Tier 3	Prioritization candidate
ML / EXIT 29A/ WB/ 1	Syracuse	Mainline	219.0	219.2	9			No
ML / EXIT 31/ EB / 2	Syracuse	Mainline	225.5	225.9	25	32 (0)		Yes
ML / EXIT 31 / EB/ 1	Syracuse	Mainline	227.85	228.1	18			No
ML / EXIT 30 / WB / 1	Syracuse	Mainline	230.7	230.9	21			No
ML / EXIT 30 / WB / 2	Syracuse	Mainline	231.5	232.15	10			No
ML / EXIT 30 / WB / 3	Syracuse	Mainline	232.6	232.9 (Ramp)	25	48 (0)		Yes
ML / EXIT 31/ WB/ 1	Syracuse	Mainline	233.5	234	0			No
ML / EXIT 31/ WB / 2	Syracuse	Mainline	238.05	238.2	6			No
ML / EXIT 32 / EB / 2	Syracuse	Mainline	238.1	238.3	12			No
ML / EXIT 32 / EB / 1	Syracuse	Mainline	238.65	239	23			No
ML / EXIT 35 / WB/ 1	Syracuse	Mainline	281.1	281.9	51	46 (5)		Yes
ML/EXIT 36/ EB/ 1	Syracuse	Mainline	281.75	281.9	20			No
ML / EXIT 35 / WB / 2	Syracuse	Mainline	282.25	282.6	17			No
ML / EXIT 36 / WB / 1	Syracuse	Mainline	282.9 (Ramp)	283	9			barrier constructed
ML / EXIT 36 / WB / 2	Syracuse	Mainline	283.6 (Ramp)	283.8	18			No
ML / EXIT 38 / EB / 2	Syracuse	Mainline	284.2	284.8	25	15 (10)		Yes
ML / EXIT 38 / EB / 1	Syracuse	Mainline	284.8	285.5	26	20 (6)		Yes
ML / EXIT 39 / EB / 1	Syracuse	Mainline	285.7	286.7	30	25 (5)		Yes
ML / EXIT 38 / WB / 1	Syracuse	Mainline	287.7	288	26	22	4	No
ML / EXIT 38 / WB / 2	Syracuse	Mainline	291.7	292.7	11			No
ML / EXIT 41 / EB / 1	Syracuse	Mainline	307.5	308.2	7			No
ML / EXIT 43 / EB / 3	Syracuse	Mainline	336.3	337	52	52 (0)		Yes
ML / EXIT 43 / EB / 2	Syracuse	Mainline	338.7	338.45	11			No
ML / EXIT 43/ EB / 1	Syracuse	Mainline	339.5	339.8	25	25 (0)		Yes
ML / EXIT 45 / EB/ 1	Syracuse	Mainline	347.3	Exit 44 Ramp	25	25 (0)		Yes
ML/ EXIT 44 / WB / 1	Syracuse	Mainline	350.2	350.35	0			No

Buffalo Division - Database Summary Table

SiteID	Thruway Division	Thruway Section	From milepost	To milepost	# of Residential Dwellings < 200 ft	Number of Tier 1 and/or Tier 2	Number of Tier 3	Prioritization candidate
ML / EXIT46 / EB / 2	Buffalo	Mainline	358.3	358.7	2			No
ML / EXIT45 / WB / 1	Buffalo	Mainline	358.7	359.6	0			No
ML / EXIT46 / EB / 1	Buffalo	Mainline	359.7	360.1	4			barrier constructed
ML / EXIT46 / WB/ 2	Buffalo	Mainline	364.7	365.6	25	0 (25)		Yes
ML / EXIT48A / EB / 2	Buffalo	Mainline	394.1	394.5	5			No
ML / EXIT48A / EB / 1	Buffalo	Mainline	396.2	397.2	0			No
ML / EXIT49 / WB / 1	Buffalo	Mainline	418.6	419	12			No
ML / EXIT50 / EB / 1	Buffalo	Mainline	419.3	419.9	5			barrier constructed
ML / EXIT49 / WB / 2	Buffalo	Mainline	419.3	419.7	16			barrier constructed
ML / EXIT49 / WB/ 3	Buffalo	Mainline	420.2	419.9	19			No
ML / EXIT50A / EB / 1	Buffalo	Mainline	420.3	I-290 Ramp	98	32 (0)		Yes
ML / EXIT50A / WB / 1	Buffalo	Mainline	420.7	421.4	38	38 (0)		Yes
ML / EXIT51 / EB / 1	Buffalo	Mainline	420.7	421.5	25	38 (0)		Yes
ML / EXIT51 / WB / 1	Buffalo	Mainline	421.8	422.45	51	47 (0)		Yes
ML / EXIT52 / EB / 1	Buffalo	Mainline	421.7	422.7	31	31 (0)		Yes
ML / EXIT52A / EB / 1	Buffalo	Mainline	424.35	424.92	37	37 (0)		Yes
ML / EXIT53 / EB / 1	Buffalo	Mainline	424.85	425.05	7			No
ML / EXIT52 / WB / 1	Buffalo	Mainline	425.1	426	27			visual timber screen
ML / EXIT53 / EB / 1	Buffalo	Mainline	425.2	426	22			No
ML / EXIT54 / EB / 1	Buffalo	Mainline	426.8	427.6	57			visual timber screen
ML / EXIT53 / WB / 1	Buffalo	Mainline	427.7	428.0	5			earth berm
ML / EXIT55 / EB / 3	Buffalo	Mainline	428.0	Ramp	27	27 (0)		Yes
ML / EXIT55 / EB / 4	Buffalo	Mainline	219 Ramp	219 Ramp	7			No
ML / EXIT 55 / EB / 2	Buffalo	Mainline	428.0	428.35	27	27 (0)		Yes
ML / EXIT54 / WB / 1	Buffalo	Mainline	428.4	428.8	0			No
ML / EXIT55 / EB / 1	Buffalo	Mainline	428.85	428.6	9			No
ML / EXIT54 / WB / 2	Buffalo	Mainline	428.9	429.4	1			No
ML / EXIT 56 / EB / 1	Buffalo	Mainline	430.1	430.4	5			No
ML / EXIT55A / WB / 1	Buffalo	Mainline	430.7	430.8	9			No
ML / EXIT56/ EB / 1	Buffalo	Mainline	430.5	431.2	25	27 (0)		Yes
ML / EXIT55A / WB / 2	Buffalo	Mainline	431.6	432.15	9			No
ML / EXIT56 / WB / 1	Buffalo	Mainline	432.3	432.6	16			No
ML / EXIT 56 / WB / 2	Buffalo	Mainline	432.9	433.5	31	28 (3)	3	Yes

B-22

Buffalo Division - Database Summary Table

SiteID	Thruway Division	Thruway Section	From milepost	To milepost	Number of Residential	Number of Tier 1 and/or Tier 2	Number of Tier 3	Prioritization candidate
ML / EXIT56 / WB / 3	Buffalo	Mainline	435.4	435.8	15			No
ML / EXIT56 / WB / 4	Buffalo	Mainline	436	Ramp 57	9			No
ML / EXIT58 / EB / 1	Buffalo	Mainline	436.7	437.6	0			No
ML / EXIT57 / WB / 1	Buffalo	Mainline	437.7	438.6	7			No
N / EXITN1 / NB / 1	Buffalo	Niagara	0.3	0.7	11			No
N / EXITN2 / SB / 3	Buffalo	Niagara	0.5	1.1	87			earth berm
N / EXITN1 / NB / 2	Buffalo	Niagara	0.7	0.9	25	25 (0)		Yes
N / EXITN2 / SB / 1	Buffalo	Niagara	1.3	1.4	25	31 (0)		Yes
N / EXITN3 / SB / 1	Buffalo	Niagara	1.4	1.6	31	34 (0)		Yes
N / EXITN3 / NB / 1	Buffalo	Niagara	2.2	2.9	47	47 (0)		Yes
N / EXITN4/ SB / 2	Buffalo	Niagara	2.6	2.8	8			No
N / EXITN3 / NB / 2	Buffalo	Niagara	3	3.2	33	33 (0)		Yes
N / EXITN4 / SB /1	Buffalo	Niagara	3.1	3.3	24			No
N / EXITN4 / NB / 1	Buffalo	Niagara	3.3	3.6	7			No
N / EXITN5 / SB / 2	Buffalo	Niagara	3.35	3.5	25	40 (0)		Yes
N / EXITN5 / SB / 1	Buffalo	Niagara	3.65	4.1	57	57 (0)		Yes
N / EXITN8 / SB / 1	Buffalo	Niagara	5.5	5.8	16			No
N / EXITN8 / NB / 1	Buffalo	Niagara	5.8	Ramp N8	30	30 (0)		Yes
N / EXITN8 / NB / 2	Buffalo	Niagara	Ramp N8	5.9	52	52 (0)		Yes
N / EXITN12 / NB / 1	Buffalo	Niagara	9.1	9.8	24			No
N / EXITN13 / NB / 1	Buffalo	Niagara	10.1	10.5	18			No
N / EXITN14 / NB / 1	Buffalo	Niagara	10.8	11.05	6			No
N / EXITN15 / NB / 1	Buffalo	Niagara	12.5	12.8	9			No
N / EXITN18A / SB / 1	Buffalo	Niagara	14.9	RAMPN16	4			No

B-24

Table III-1. New York Division Prioritization Candidates

Assessment Area ID	Approx. Thruway Mileposts	Previous Study ID
ML / EXIT 1 / SB / 1	0.0 to 0.3	N/A
ML / EXIT 1 / NB / 1	0.0 to 0.3	N/A
ML / EXIT 2 / SB / 2	0.5 to 0.8	N/A
ML / EXIT 2 / SB / 1	0.9 to 1.4	N/A
ML / EXIT 3 / SB / 1	1.4 to 1.85	N/A
ML / EXIT 6A / NB / 1	7.45 to 8.0	WC-E2 (3)
ML / EXIT 10 / SB / 1	16.15 to 16.6	W1 (2)
ML / EXIT 12 / SB / 1	18.0 to 18.7	W4 (2)
ML / EXIT 13 / SB / 1	19.65 to 20.4	W5 (2)
ML / EXIT 14A / NB / 1	24.4 to 25.9	E14 (2)
ML / EXIT 15 / SB / 1	29.5 to 30.0	W14 (2)
ML / EXIT 16 / SB / 2	33.6 to 34.1	RC-W16BR/AR (3)
ML / EXIT 16 / SB / 1	34.1 to 34.8	RC-W16AR (3)
ML / EXIT 15A / NB / 1	35.8 to 36.3	OC-F1 (3)
NE / EXIT 12 / SB / 1	1.1 to 1.6	N/A
NE / EXIT 16 / SB / 3	5.2 to 5.5	SB B (1)
NE / EXIT 16 / SB / 2	5.6 to 5.9	SB C (1)
NE / EXIT 16 / SB / 1	6.0 to Exit Ramp	N/A
NE / EXIT 16 / NB / 1	6.6 to 7.5	NB C (1)
NE / EXIT 17 / NB / 1	7.7 to 8.2	NB 2 (1)
NE / EXIT 22 / SB / 2	14.3 to 14.8	SB 13 & SB 14 (1)

Notes:
(1) *Noise Barrier Study, New England Division Westchester County, Interstate Route 95 Pelham/New Rochelle Border to Connecticut State Line*, Prepared for: New York State Thruway Authority, Prepared by: Berger, Lehman Associates, P.C., September 1987, revised September 1990.
(2) *Noise Study Technical Report, Interstate Route 87 from the Hudson River to the Orange County line and the Garden State Parkway Connection*, Prepared for: New York State Thruway Authority, Prepared by: Rust Environment & Infrastructure, Inc., May 1996.
(3) "*Noise Mitigation Prioritization Study, I-87, Westchester, Rockland and Orange Counties, Final Technical Report,*" Acentech Report No. 251, Prepared by Acentech Incorporated, Prepared for Edwards & Kelcey Engineers, July 2000.

Table III-2. Albany Division Prioritization Candidates

Site ID	Thruway Mileposts
ML / EXIT 19 / SB / 1	90.25 to 90.55
ML / EXIT 23 / NB / 1	Toll Barrier to 142.5
ML / EXIT 23 / NB / 2	142.5 to 143.1
ML / EXIT 28 / WB / 1	182.4 to 182.95

Table III-3. Syracuse Division Prioritization Candidates

Site ID	Thruway Mileposts
ML / EXIT 31/ EB / 2	225.5 to 225.9
ML / EXIT 30 / WB / 3	232.6 to 232.9
ML / EXIT 35 / WB/ 1	281.1 to 281.9
ML / EXIT 38 / EB / 2	284.3 to 284.7
ML / EXIT 38 / EB / 1	284.8 to 285.5
ML / EXIT 39 / EB / 1	285.7 to 286.7
ML / EXIT 43 / EB / 3	336.3 to 337.0
ML / EXIT 43/ EB / 1	339.5 to 339.8
ML / EXIT 45/ EB / 1	347.4 to Exit Ramp

Table III-4. Buffalo Division Prioritization Candidates

Site ID	Thruway Mileposts
ML / EXIT 46/ WB / 2	364.7 to 365.6
ML / EXIT 50A/ EB / 1	I-290 Exit Ramp
ML / EXIT 50A/ WB / 2	420.7 to 421.4
ML / EXIT 51/ EB / 1	420.7 to 421.5
ML / EXIT 51/ WB / 1	421.8 to 422.45
ML / EXIT 52/ EB / 1	421.7 to 422.7
ML / EXIT 52A/ EB / 1	424.35 to 424.95
ML / EXIT 55/ EB / 3	428.0 to Exit Ramp
ML / EXIT 55/ EB / 2	428.0 to 428.4
ML / EXIT 56/ EB / 1	430.5 to 431.2
ML / EXIT 56/ WB / 2	432.9 to 433.5
N / EXIT N1/ NB / 2	0.7 to 0.9
N / EXIT N2/ SB / 1	1.0 to 1.4
N / EXIT N3/ SB / 1	1.4 to 1.6
N / EXIT N3/ NB / 1	2.2 to 2.9
N / EXIT N3/ NB / 2	3.0 to 3.2
N / EXIT N5/ SB / 2	3.3 to 3.5
N / EXIT N5/ SB / 1	3.65 to 4.1
N / EXIT N7/ NB / 1	5.8 to Exit Ramp
N / EXIT N8/ NB / 1	Entrance Ramp to 5.9

NEW YORK STATE THRUWAY AUTHORITY

Thruway-wide Noise Study: Screening and Prioritization

LOCATION INFORMATION

Site ID: ML / EXIT 2 / SB / 4

From Milepost:	*To Milepost:*	*Section:*	*Direction of Travel:*
0	0.2	Mainline	SB

Division:	*County:*	*Town:*	*City or Village*
New York	Westchester		Yonkers

SCREENING PROCESS

I. ELIGIBILITY INFORMATION

Operations:	*Maintenance:*	*Capital Improvments:*	*Eligibility:*
Yes	Yes	Yes	Yes

*** Note: If Eligibility is YES, If Noise Barrier Already Constructed is NO, and Total Number of Dwelling units within 200' of the Thruway is >= 25, then Candidate is YES.*

II. NOISE BARRIER INFORMATION

Noise Barrier Already Constructed:	*Noise Barrier Type:*
No	n/a

III. RESIDENTIAL STRUCTURE IDENTIFICATION

Total Number of Dwelling Units < 500':	*Total Number of Dwelling Units < 200':*	*Candidate:*	*Type(s) of Residential Housing:*	*Number of Stories:*
34	20	**No**		

Tier I Residential Units (Prior to 1976):	*Tier II Residential Units (1976 - 1998):*	*Tier III Residential Units (After 1998):*
No ORPS		

NEW YORK STATE THRUWAY AUTHORITY

Thruway-wide Noise Study: Screening and Prioritization

Site ID ML / EXIT 2 / SB / 4 **From Milepost:** 0 **To Milepost:** 0.2

FIELD VISIT

Field Visit Date: 15-May-2002

Distance from Pavement to Closest Dwelling Unit (feet):
60

Highway Section:
Depressed

Comments:
Highway Section: Depressed highway with retaining wall
Type of Housing: Single Family, Apartments, commercial (commercial is primarily 1st row)
Num. of Stories: 2 to 3
Distance to Nearest Residential Structure: 20 yards (Across Central Park Ave.)

Photos: (2)

AERIAL INFORMATION

Aerial (Click to Open) :

Date of Aerial: 3/13/1995

Aerial Tile Name: Yonkers se 1

NEW YORK STATE THRUWAY AUTHORITY

Thruway-wide Noise Study: Screening and Prioritization

Site ID	ML / EXIT 2 / SB / 4	***From Milepost:***	0	***To Milepost:***	0.2

Photo 1: c:\Photos\NYDiv\dcp_1201.jpg

Photo 2: c:\Photos\NYDiv\dcp_1202.jpg

Photo 3:

Photo 4:

Photo 5:

Photo 6:

NEW YORK STATE THRUWAY AUTHORITY

Thruway-wide Noise Study: Screening and Prioritization

Site ID:	NE / EXIT 16 / SB / 3	**Tier:**	1		
Priority Index:	106	**Basis of Tiering:**	ORPS + USGS Quad Sheets		
Cost Per Residence Benefited:	$3,600				

# of Residential Units Constructed:

Prior to 1976:	28
1976 to 1998:	0
Post 1998:	0

Short - Term Measurements

Location 1:	9 Odell	**Location 2:**	61 Crescent Ave.	**Location 3:**	9 1st
Milepost:	5.5	**Milepost:**	5.2	**Milepost:**	5.1
Measured Leq (dBA):	75	**Measured Leq (dBA):**	76	**Measured Leq (dBA):**	63
Distance to Thruway (ft):	140	**Distance to Thruway (ft):**	110	**Distance to Thruway (ft):**	390

Long - Term Measurements

Location 1:	16 Walnut Street	**Location 2:**	
Milepost:	5.3	**Milepost:**	
Measured Distance from the Lane (ft) :	80	**Measured Distance from the Lane (ft):**	
Loudest Hour (dBA) :	76.4	**Loudest Hour: (dBA):**	
Distance to Thruway (ft) :	50	**Distance to Thruway(ft):**	

Click Here to View Screening Information

NEW YORK STATE THRUWAY AUTHORITY

Thruway-wide Noise Study: Screening and Prioritization

Site ID	ML / EXIT 2 / SB / 4	*From Milepost:*	0	*To Milepost:*	0.2

#1

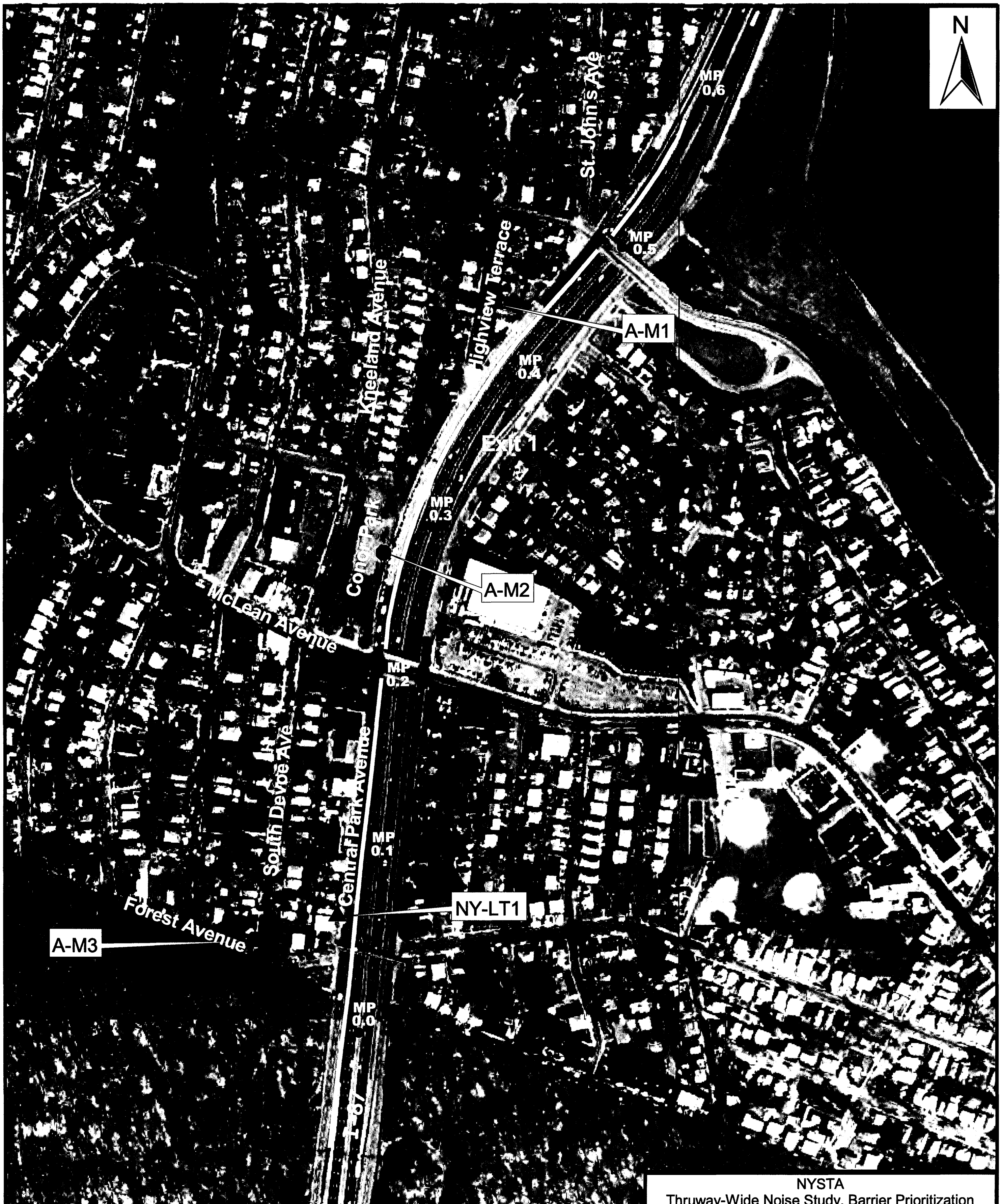
Comment:		*Date:*	
Address:		*Notes:*	
Response:			
Call Answered By:			

#2

Comment:		*Date:*	
Address:		*Notes:*	
Response:			
Call Answered By:			

APPENDIX C NOISE BARRIER ASSESSMENT AREA MAPS

This appendix contains color aerial photographs of each noise barrier assessment area. Each figure shows the approximate limits of the recommended noise barrier, milepost locations, the names of neighborhood and major intersecting streets, and long-term and short-term noise measurement locations.



NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/13/95

Legend

- ● Short Term Measurement Sites
- ▲ Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 ● Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 1/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 1

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/13/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 0/NB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 2

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/13/95

Legend
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites and Barrier Location Plan

Assessment Area
ML/EXIT 2/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 3

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/13/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites and Barrier Location Plan

Assessment Area ML/EXIT 3/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 4

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/13/95

Legend
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites and Barrier Location Plan

Assessment Area ML/EXIT 4/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 5

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 4/4/94

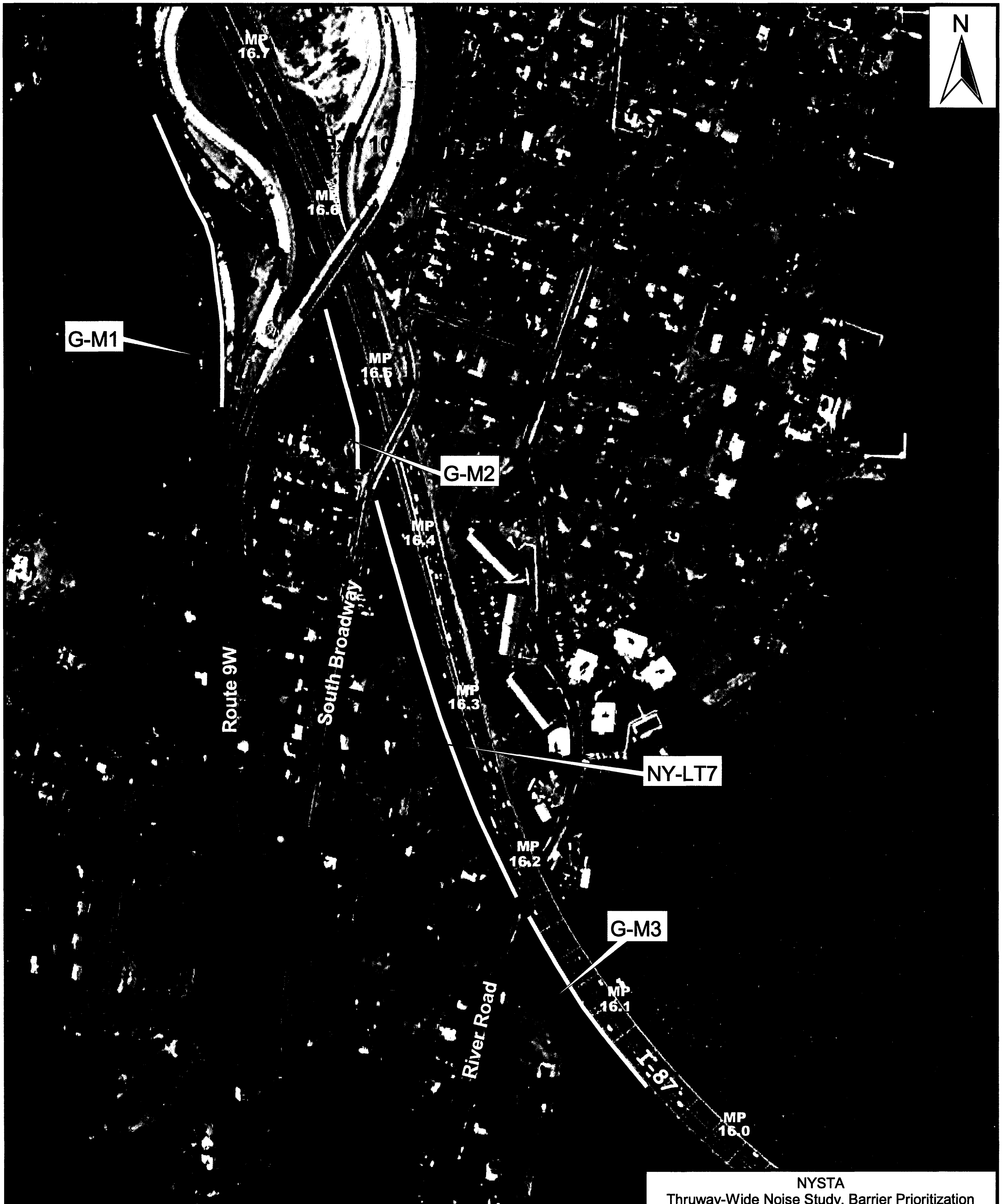
Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 6A/NB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 6



NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 4/4/94

Legend

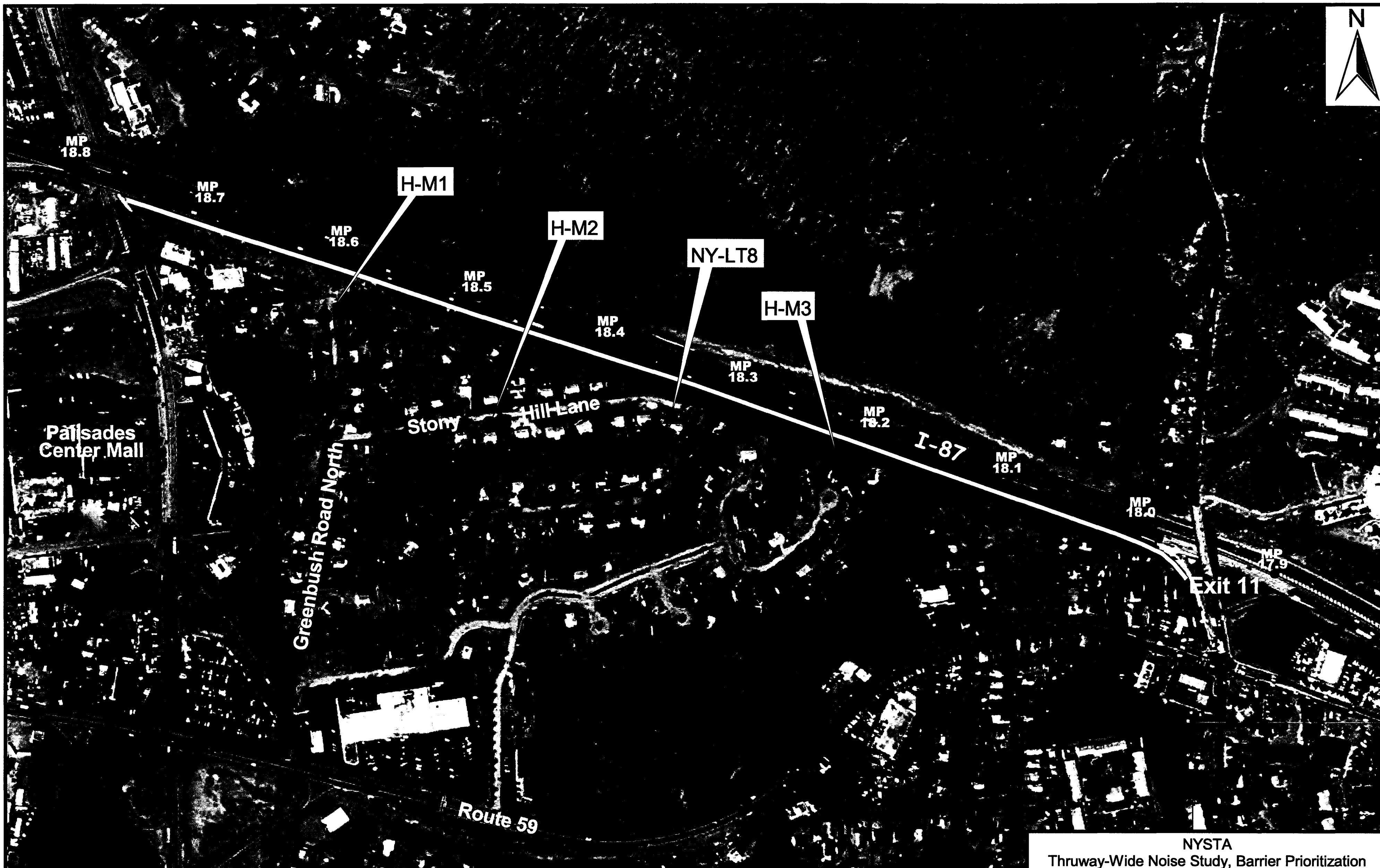
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 10/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 7

hmmh



Date of Aerial: 4/4/94

Legend

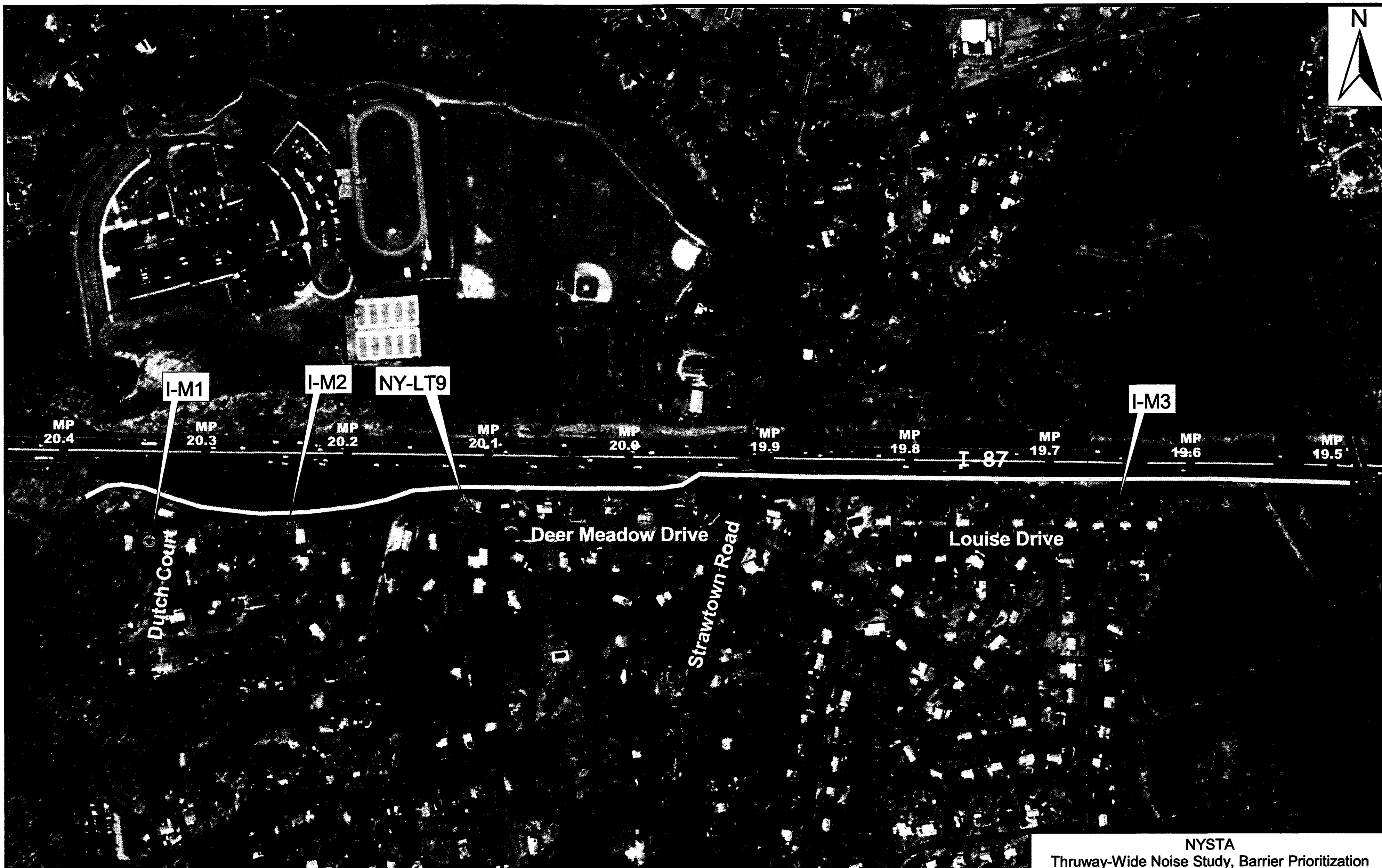
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites and Barrier Location Plan

Assessment Area
ML/EXIT 12/SB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 8



Date of Aerial: 3/29/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites and Barrier Location Plan

Assessment Area
ML/EXIT 13/SB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 9

Date of Aerial: 3/29/95

Legend

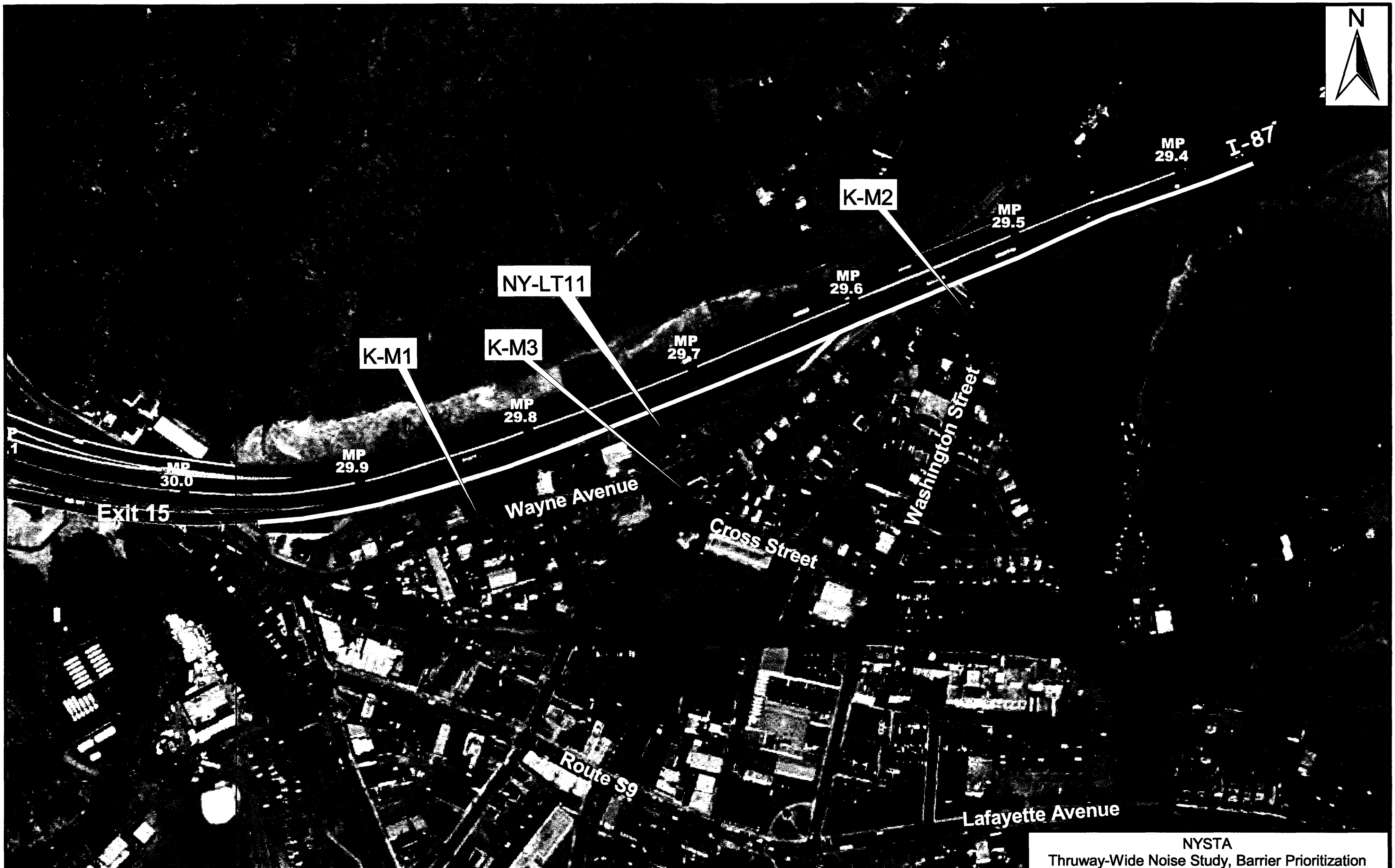
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 14A/NB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 10



Date of Aerial: 3/29/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 15/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 11

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 3/29/95

Legend

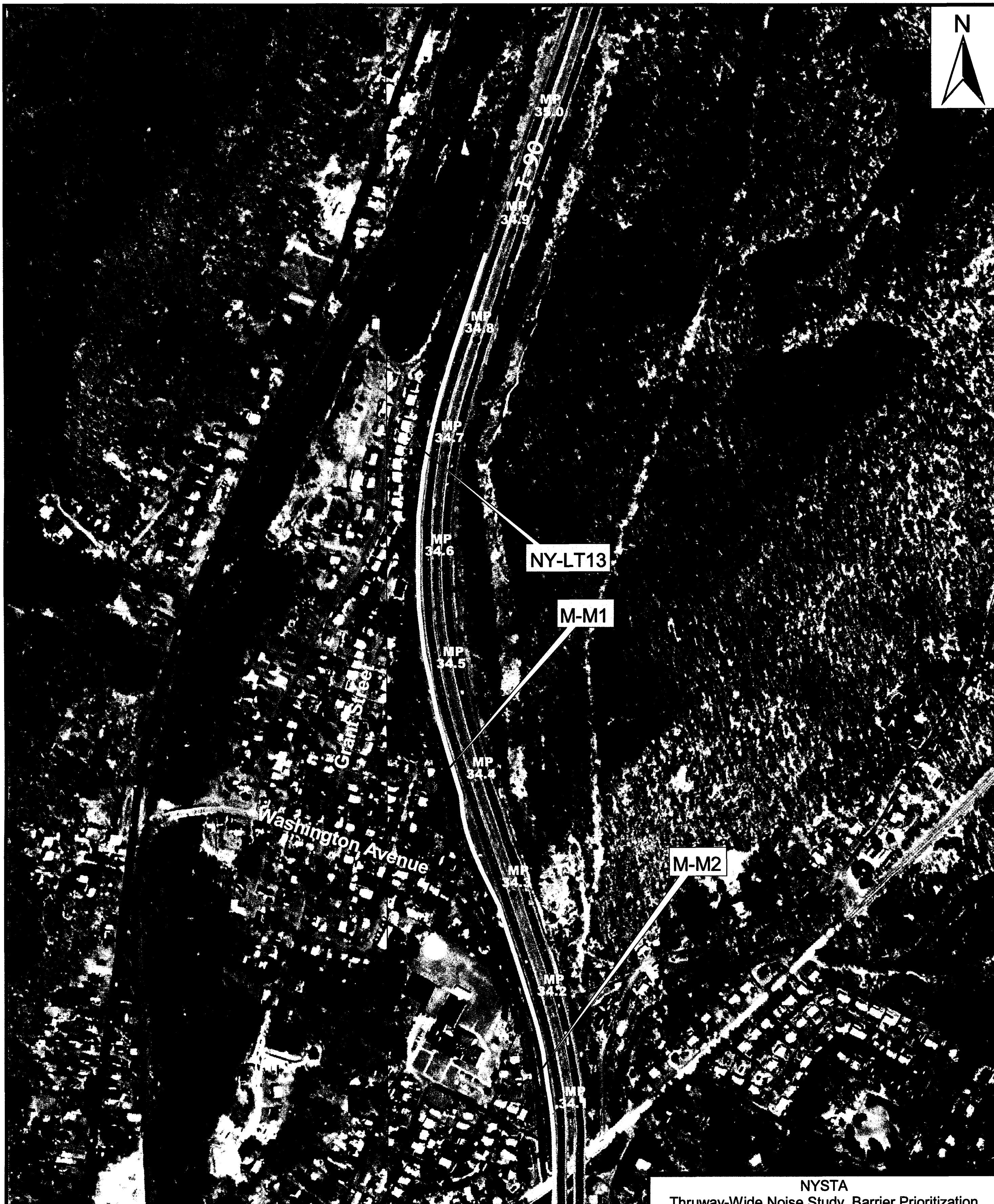
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites and Barrier Location Plan

Assessment Area ML/EXIT 16/SB/2

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 12

hmmh



NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 3/29/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 16/SB/1

SCALE:	DATE:	FIGURE:
1" = 600'	07/2003	B - 13

hmmh

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/29/95

Legend

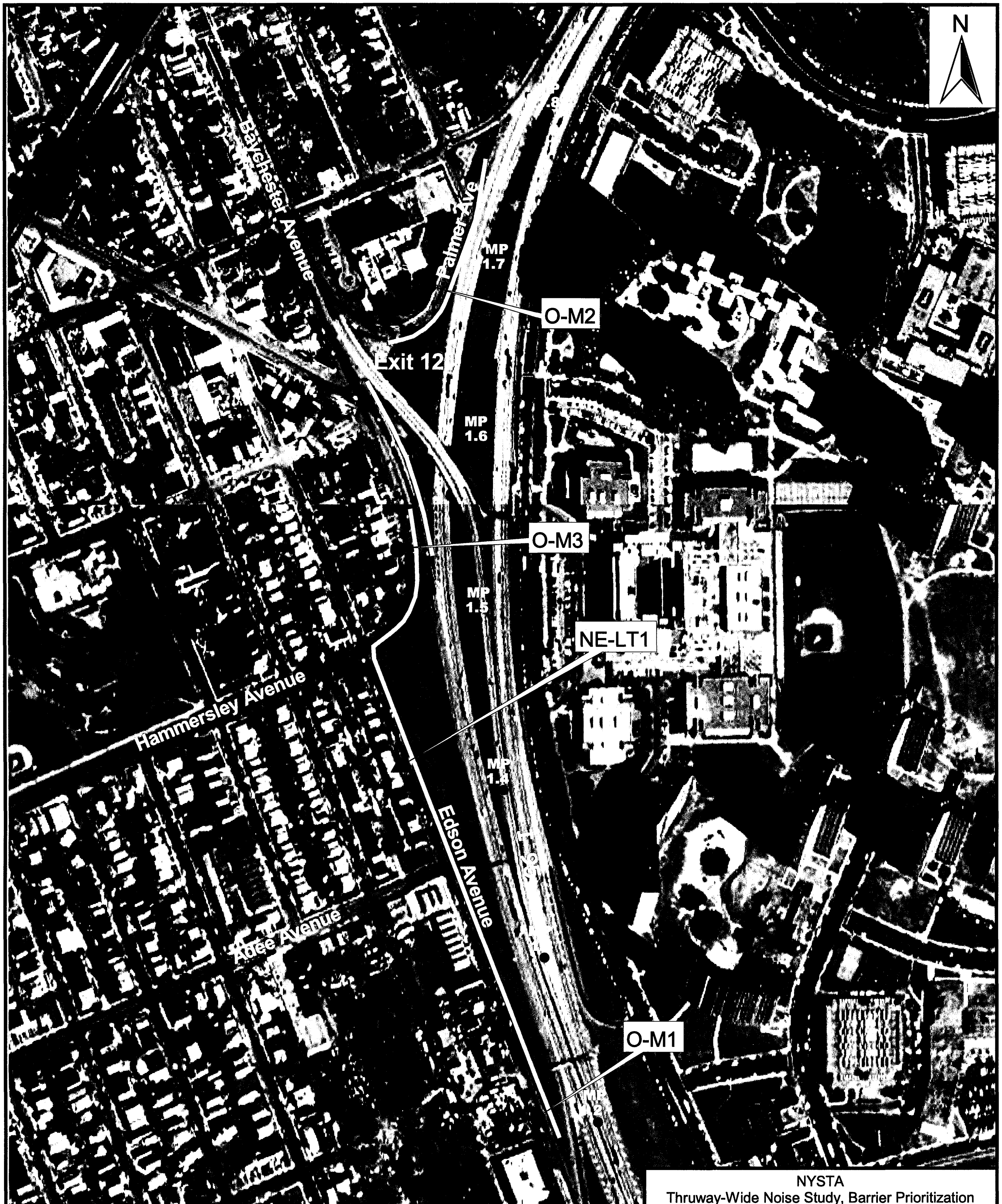
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 15A/NB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 14

hmmh



NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 4/8/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
NE/EXIT 12/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 15

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 4/8/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites and Barrier Location Plan

Assessment Area NE/EXIT 16/SB/3

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 16

NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 4/8/94

Legend

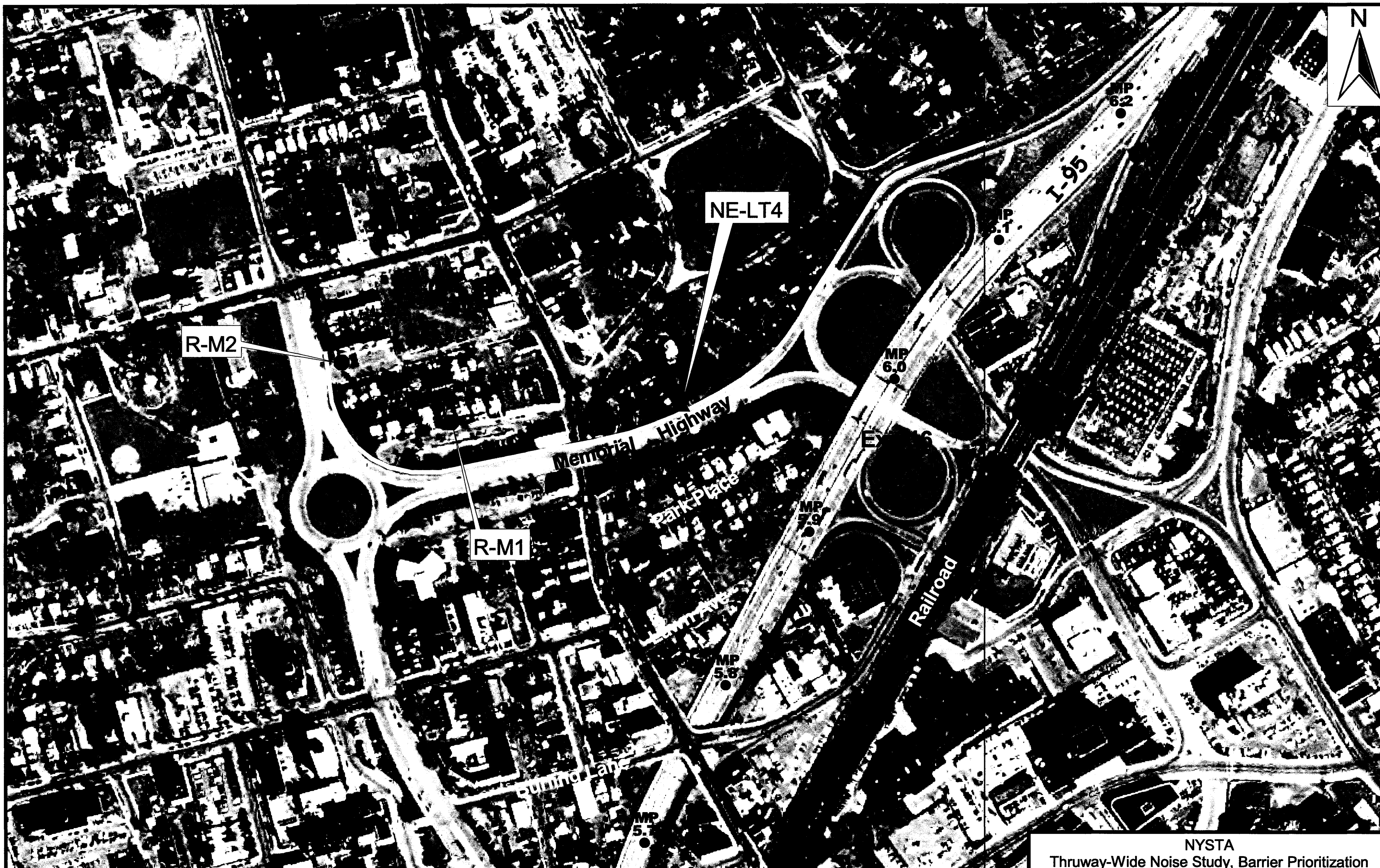
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
NE/EXIT 16/SB/2

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 17



Date of Aerial: 4/8/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
NE/EXIT 16/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 18

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NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 4/8/94

Legend

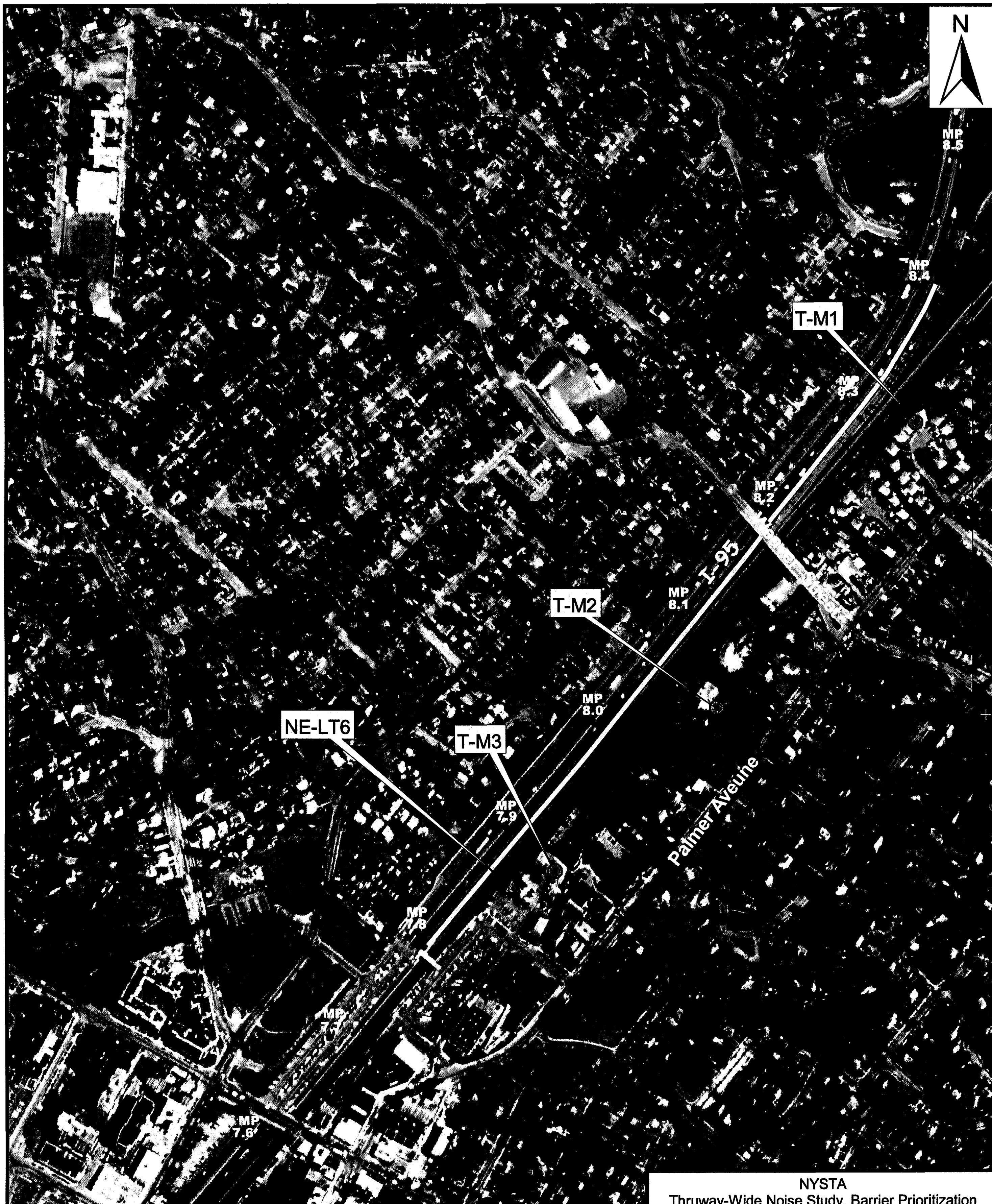
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
NE/EXIT 16/NB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 19

hmmh



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New York State Thruway Authority

Date of Aerial: 4/8/94

Legend
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
NE/EXIT 17/NB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 20

hmmh

Date of Aerial: 4/12/91

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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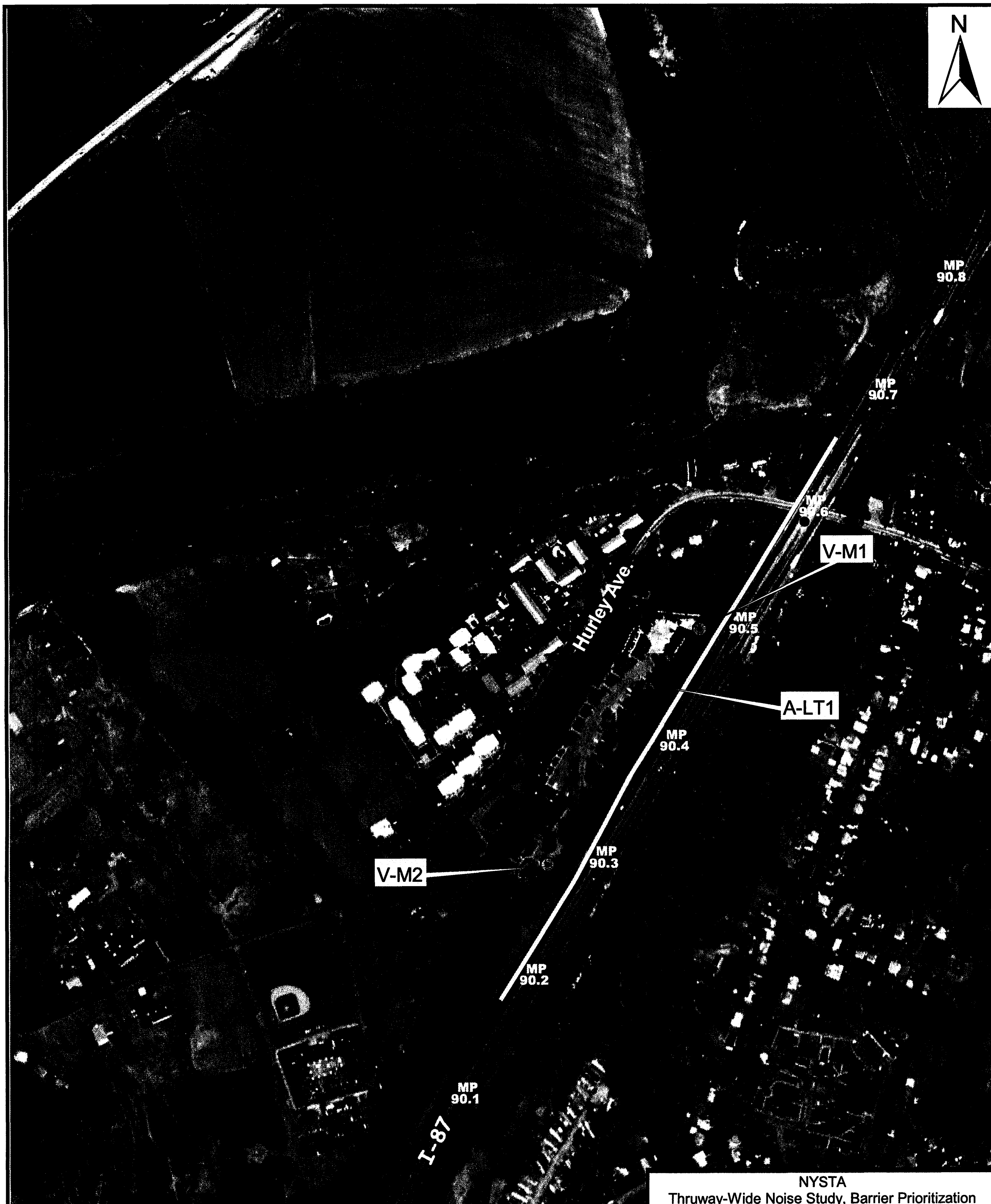
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
NE/CONN. LINE/SB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 21



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NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 4/20/94

Legend

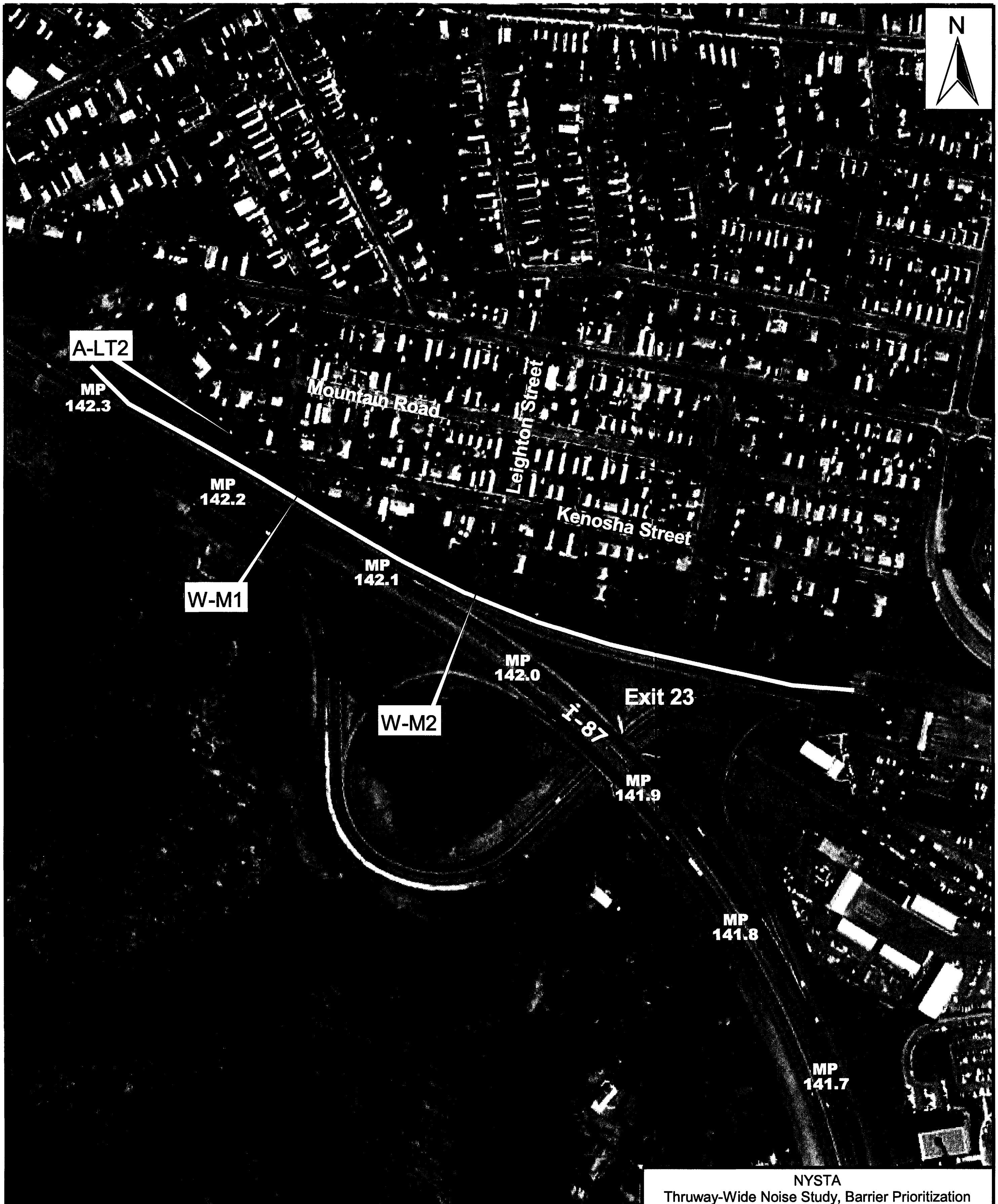
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 19/SB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 22

hmmh



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Date of Aerial: 5/7/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites and Barrier Location Plan

Assessment Area ML/EXIT 23/NB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 23

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NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 5/7/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 23/NB/2

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 24

NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 3/1/97

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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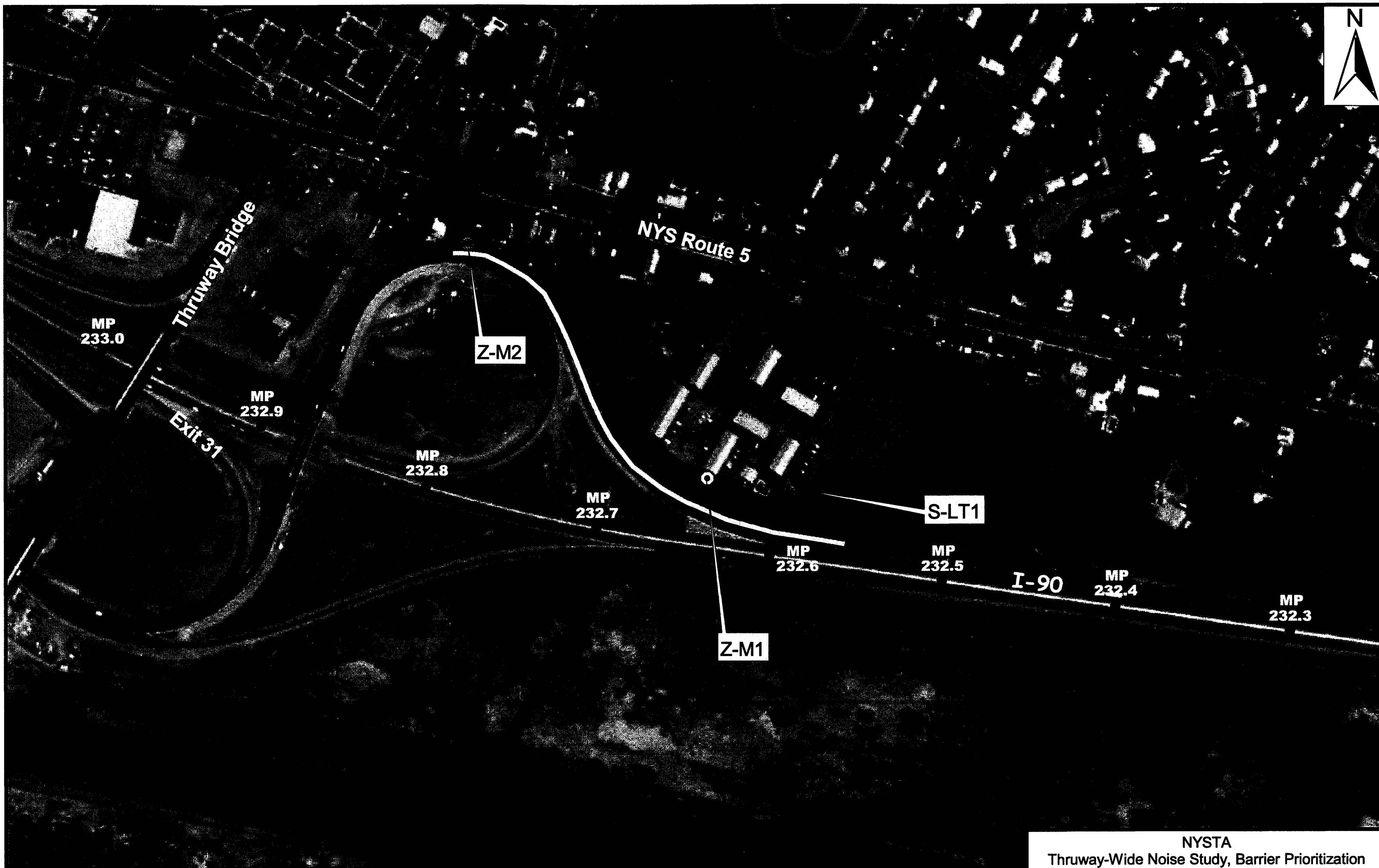
Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 28/WB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 25

hmmh



Date of Aerial: 5/7/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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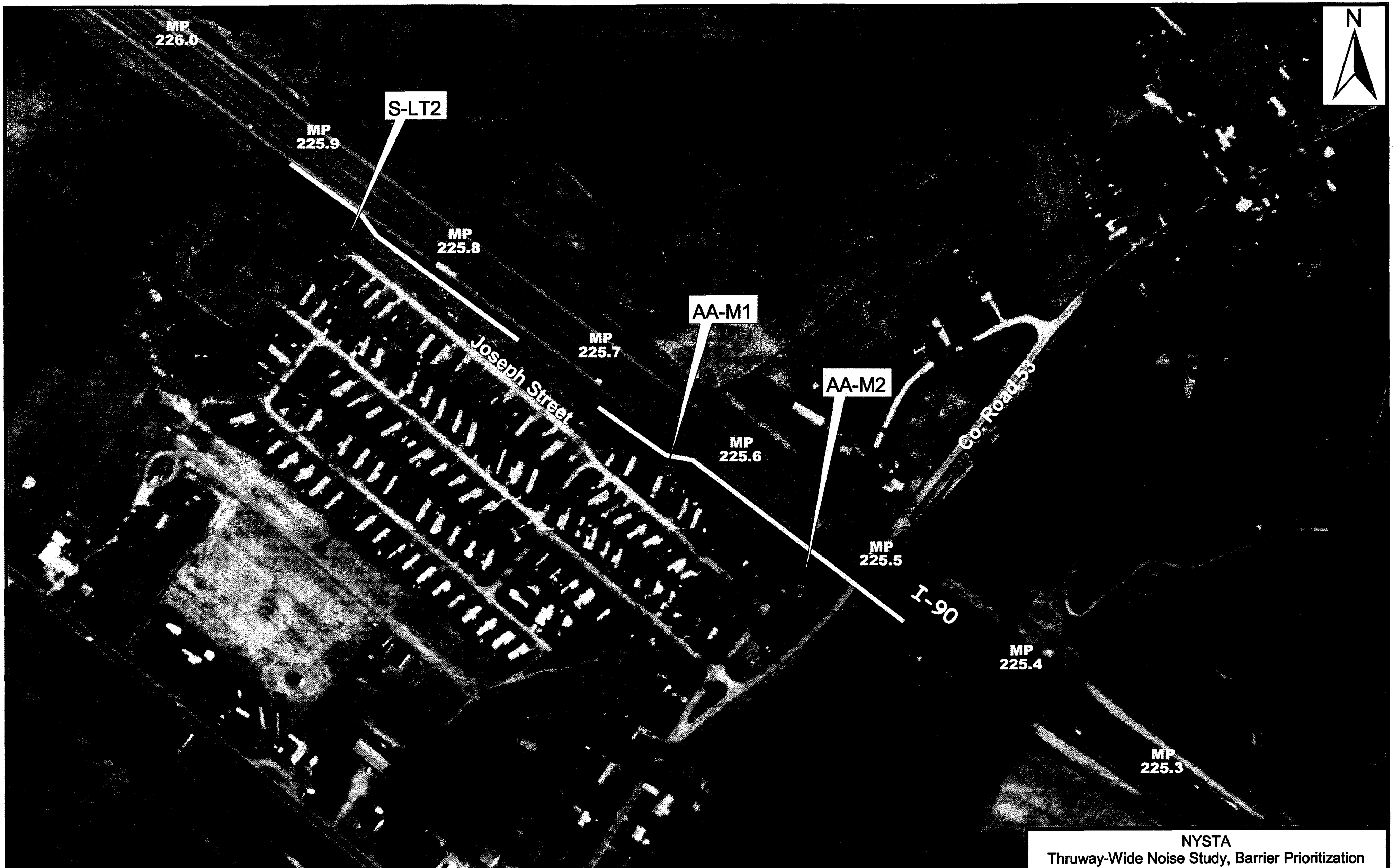
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 30/WB/3

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 26



Date of Aerial: 5/8/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

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Noise Measurement Sites and Barrier Location Plan

Assessment Area
ML/EXIT 31/EB/2

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 27

Date of Aerial: 4/22/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

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Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 35/WB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 28

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Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 38/EB/2

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 29

Date of Aerial: 4/22/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Date of Aerial: 4/22/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

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Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 38/EB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 30

Date of Aerial: 4/22/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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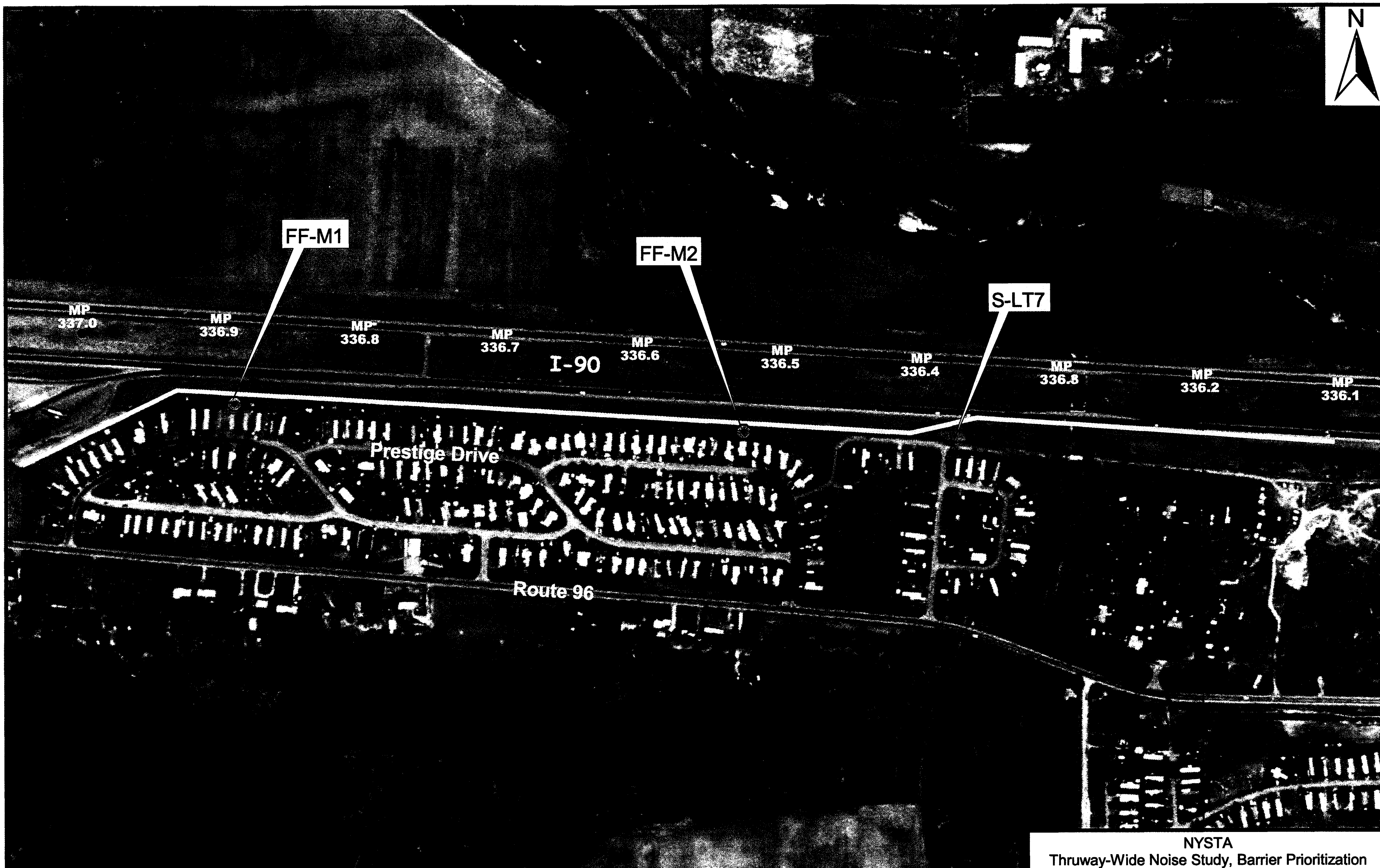
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 39/EB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 31



Date of Aerial: 4/22/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 43/EB/3

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 32

Date of Aerial: 4/22/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 43/EB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 33

Date of Aerial: 4/22/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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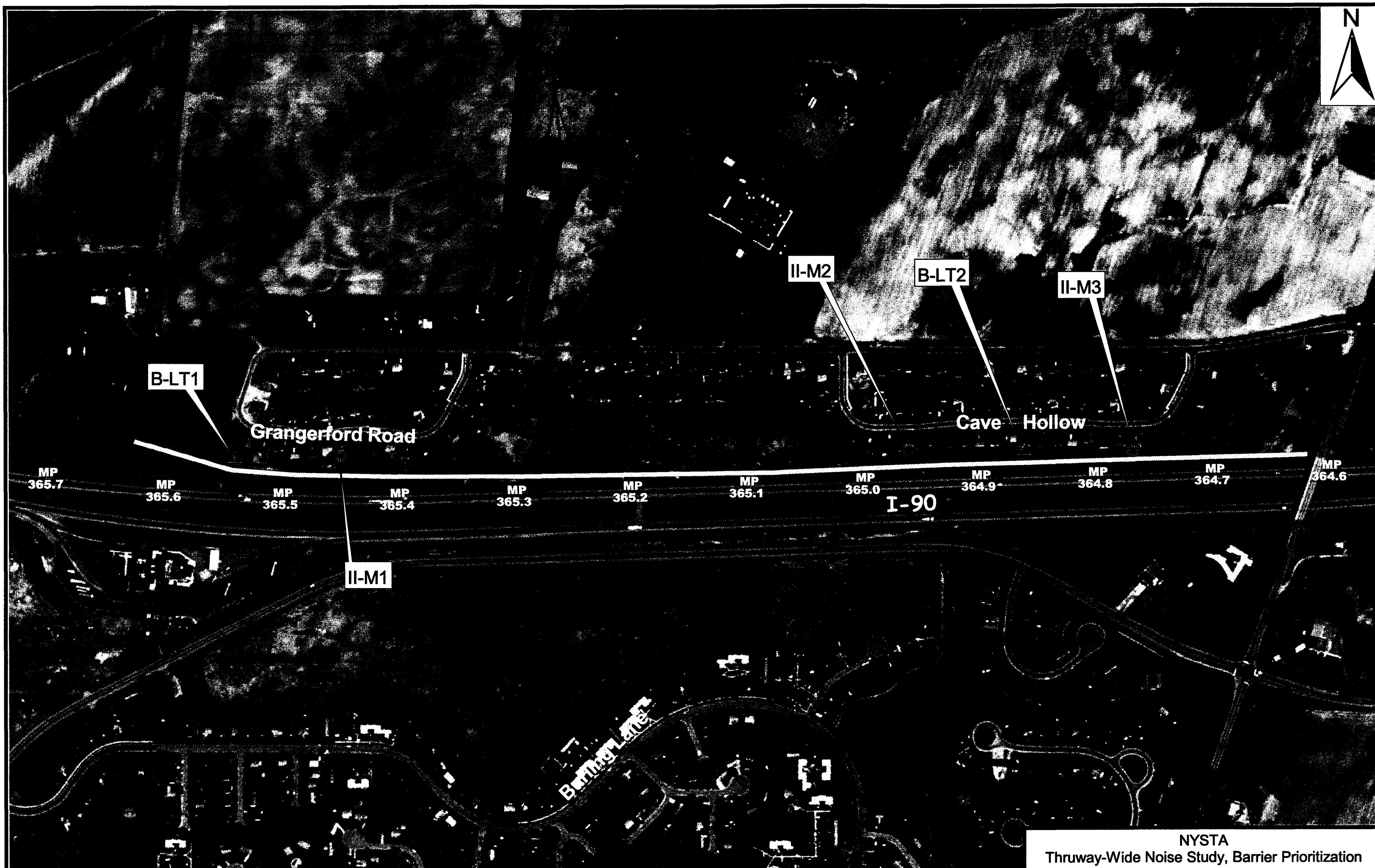
Noise Measurement Sites and Barrier Location Plan

Assessment Area
ML/EXIT 45/EB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 34



Date of Aerial: 4/22/94

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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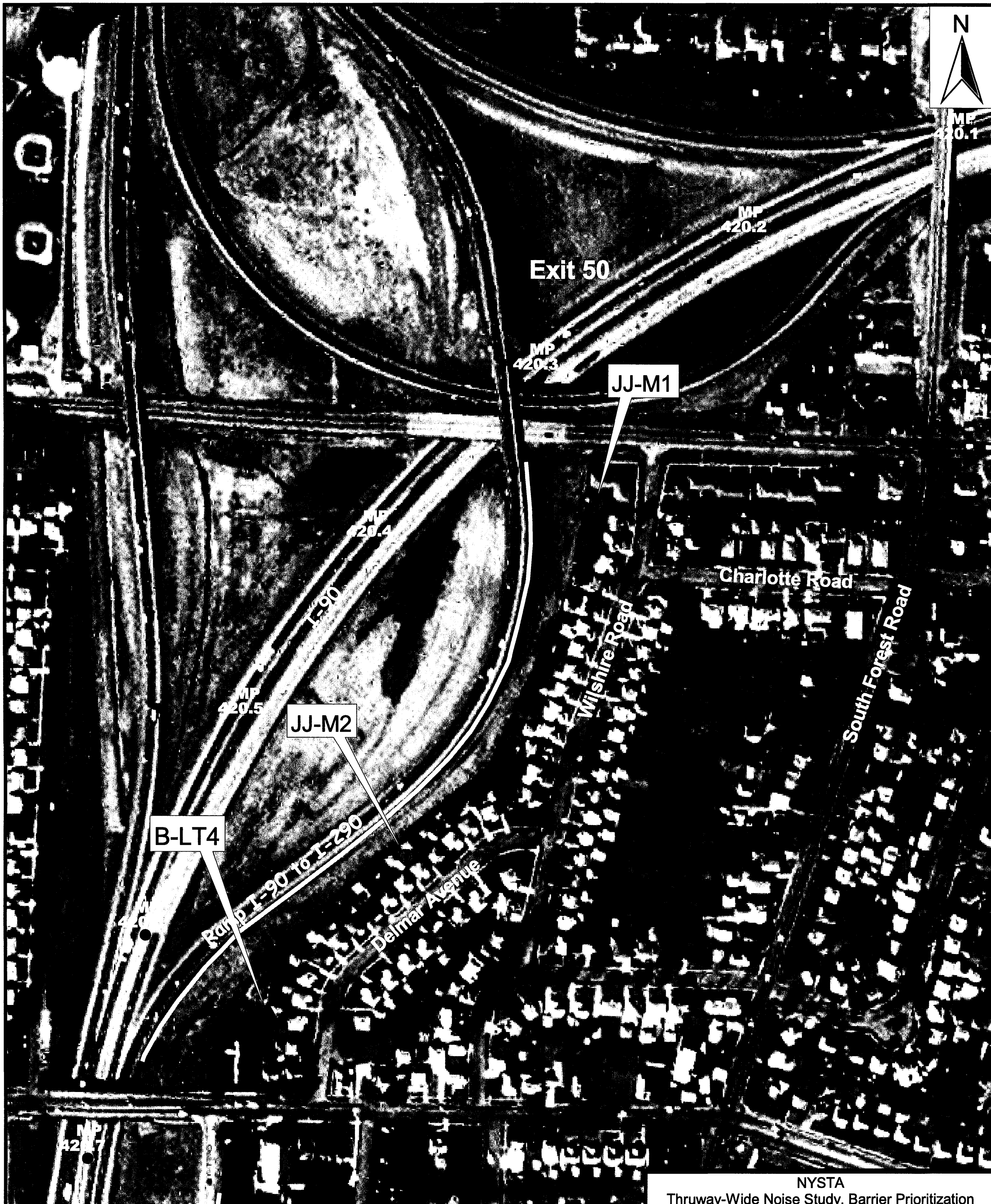
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 46/WB/1

SCALE:	DATE:	FIGURE:
1" = 600'	07/2003	B - 35



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Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/28/95

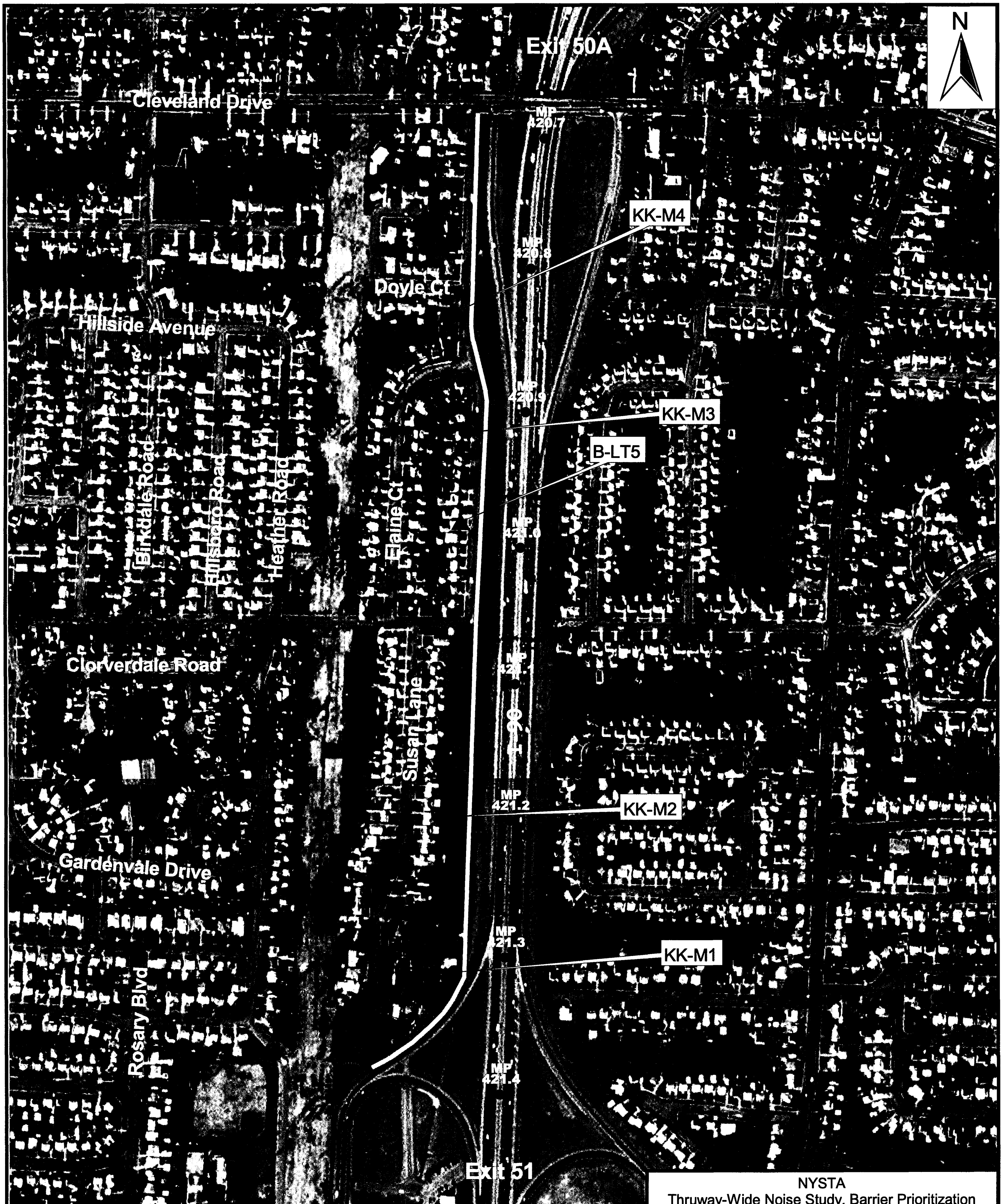
Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites and Barrier Location Plan

Assessment Area
ML/EXIT 50A/EB/1

SCALE:	DATE:	FIGURE:
1" = 300'	07/2003	B - 36



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Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 50A/WB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B-37

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Date of Aerial: 3/28/95

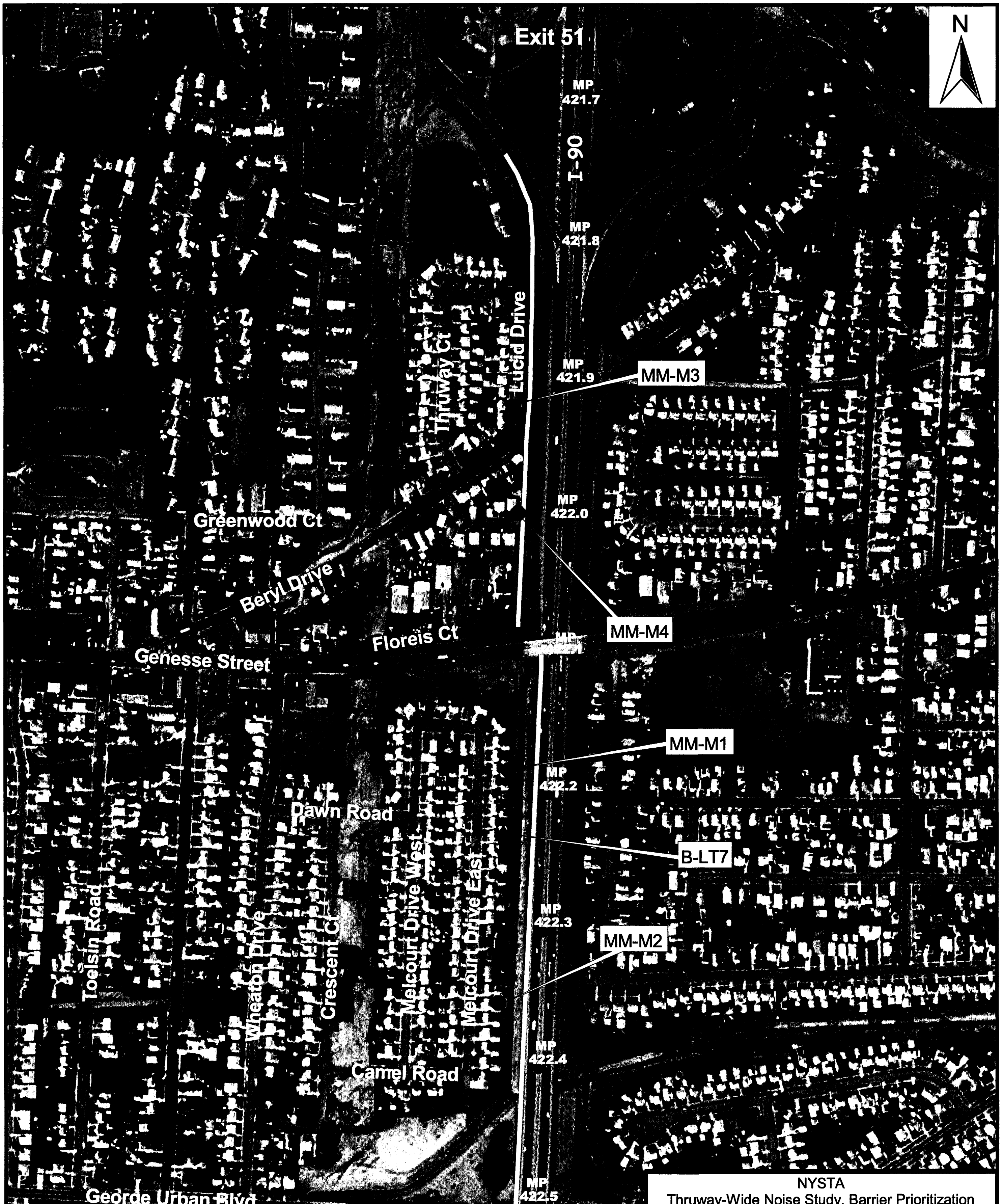
Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 51/EB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 38



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NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 51/WB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 39

hmmh

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NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 52/EB/1

SCALE:	DATE:	FIGURE:
1" = 600'	07/2003	B - 40

hmmh

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Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 52A/EB/1

SCALE:	DATE:	FIGURE:
1" = 500'	07/2003	B - 41

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Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/28/95

Legend
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 55/EB/3

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 42

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NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 55/EB/2

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 43

hmmh

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Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 56/EB/1

SCALE:	DATE:	FIGURE:
1" = 600'	07/2003	B - 44

Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

NEW YORK STATE THRUWAY AUTHORITY

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Thruway-Wide Noise Study, Barrier Prioritization

NEW YORK STATE THRUWAY AUTHORITY

Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT 56/WB/2

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 45

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Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/28/95

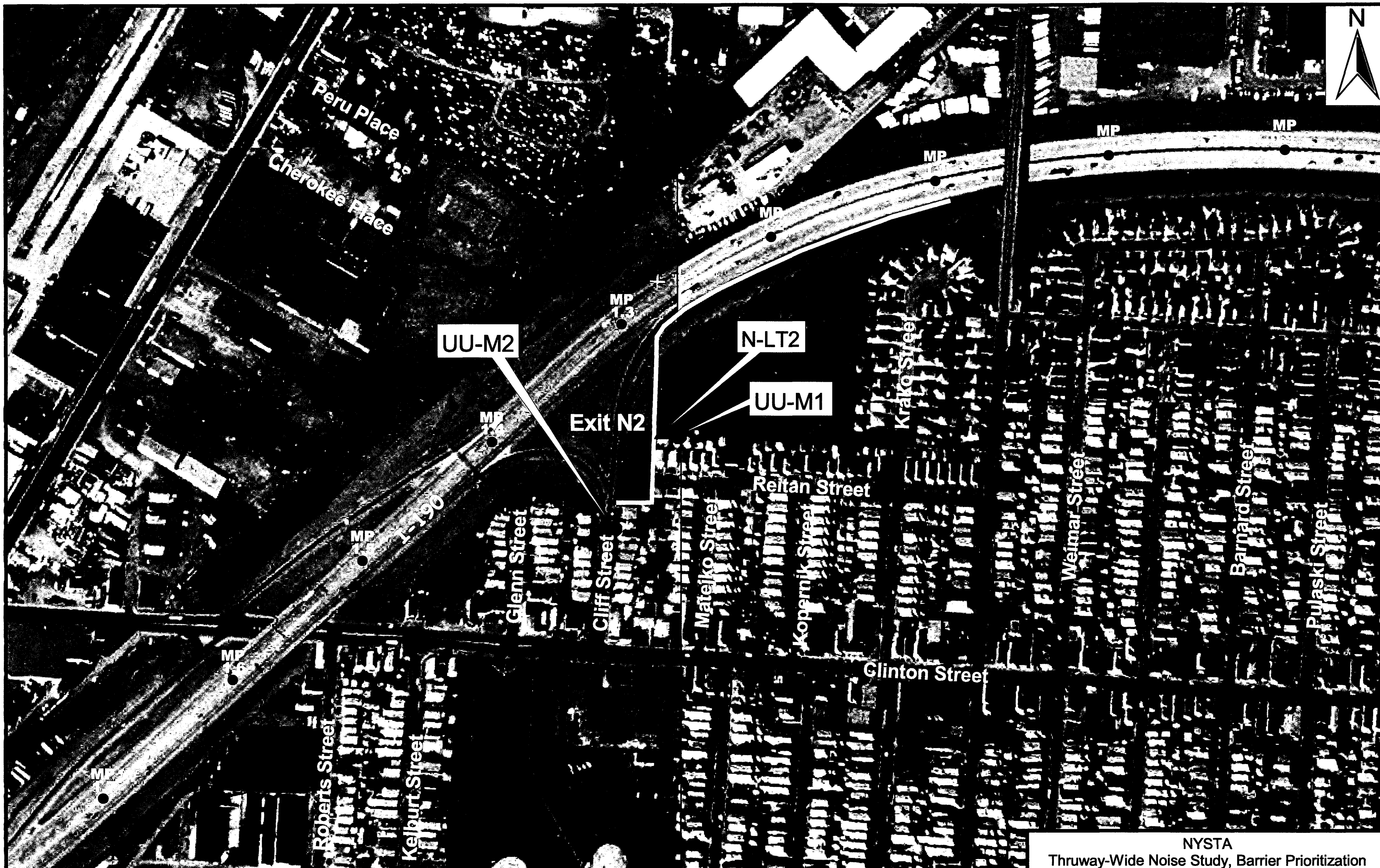
Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

Noise Measurement Sites and Barrier Location Plan

Assessment Area ML/EXIT N1/NB/2

SCALE:	DATE:	FIGURE:
1" = 300'	07/2003	B - 46



Date of Aerial: 3/28/95

Legend

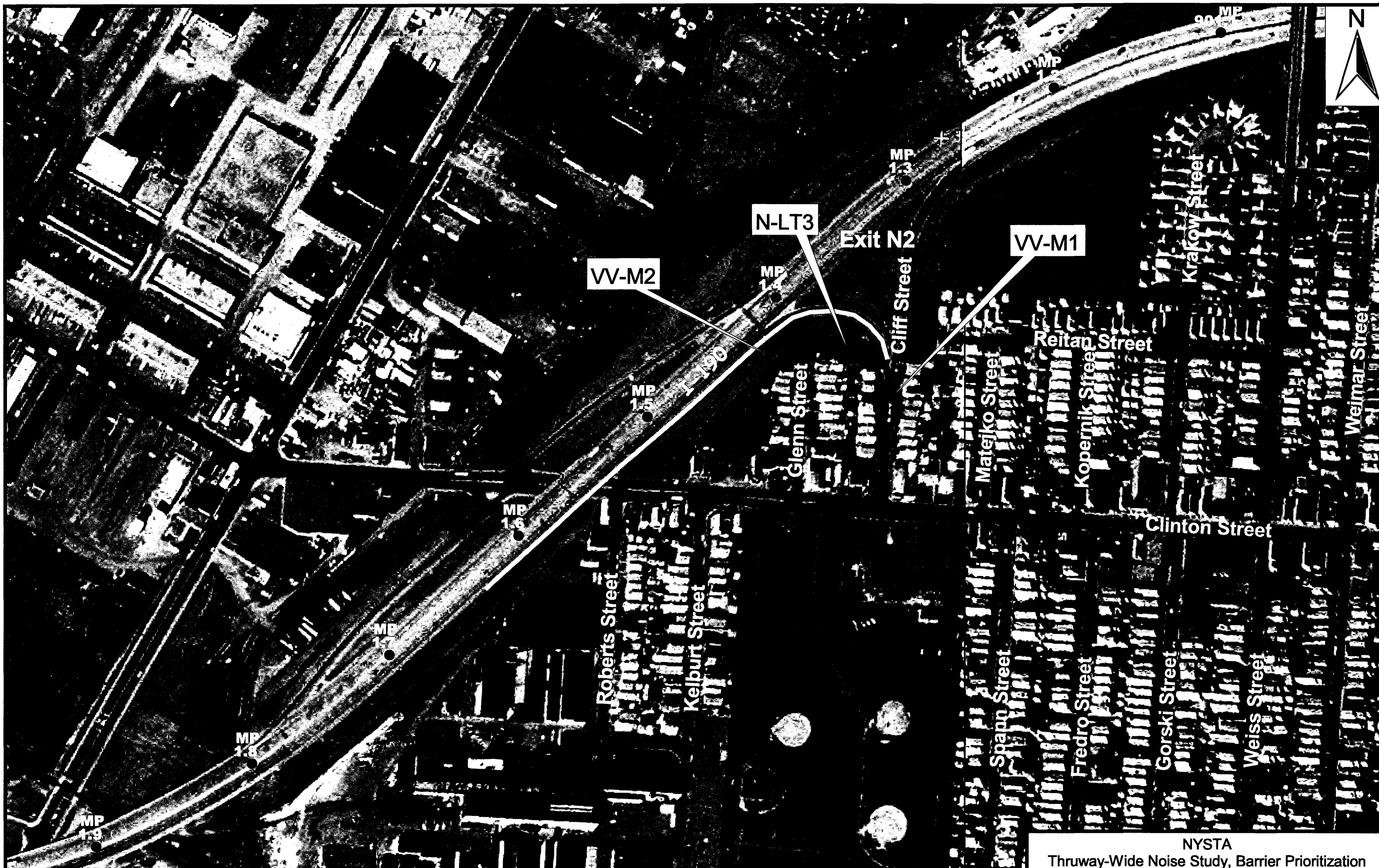
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT N2/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 47



Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

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Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT N3/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 48

Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT N3/NB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 49

Date of Aerial: 3/28/95

Legend

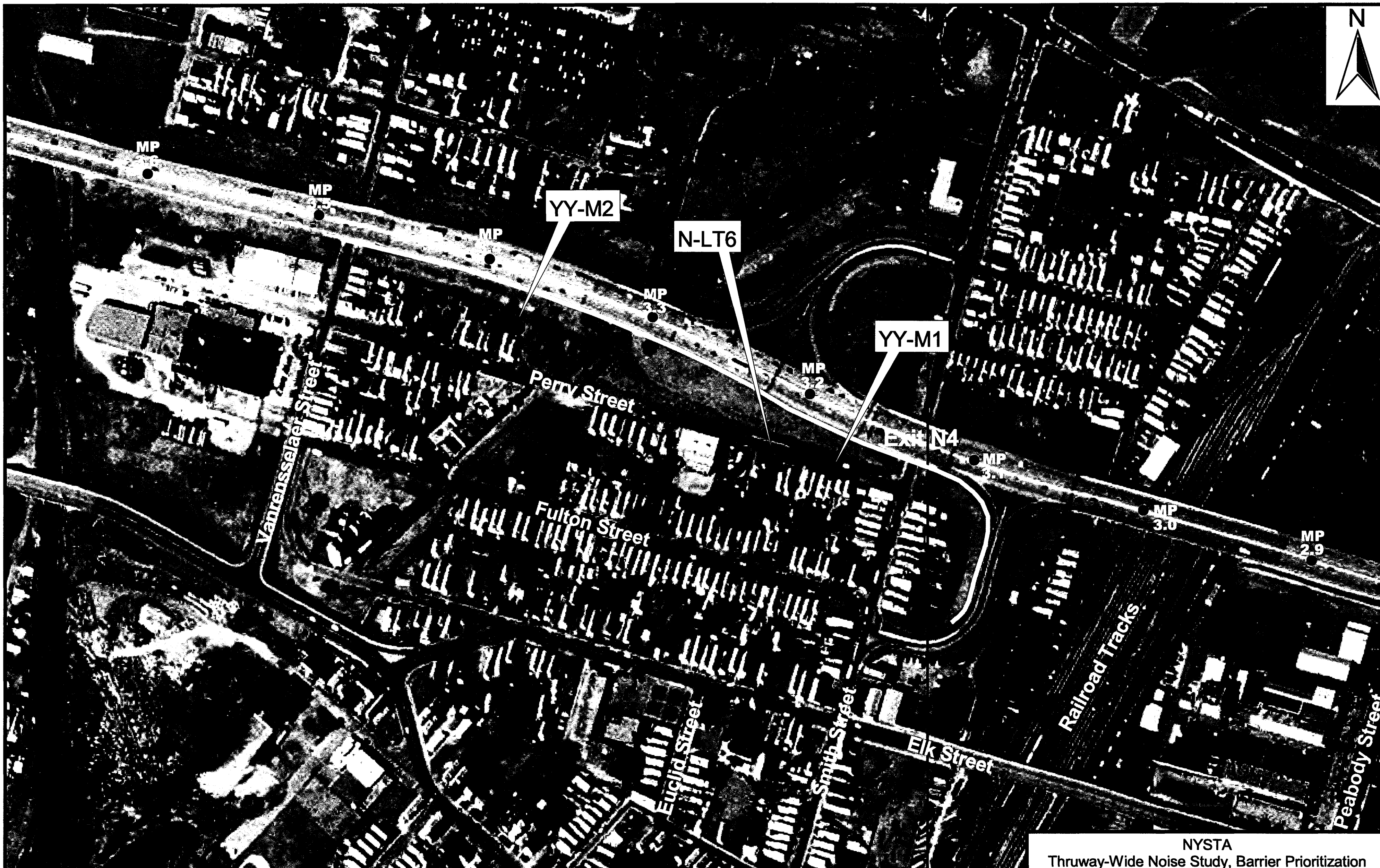
- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

NYSTA
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites and Barrier Location Plan

Assessment Area
ML/EXIT N3/NB/2

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 50



Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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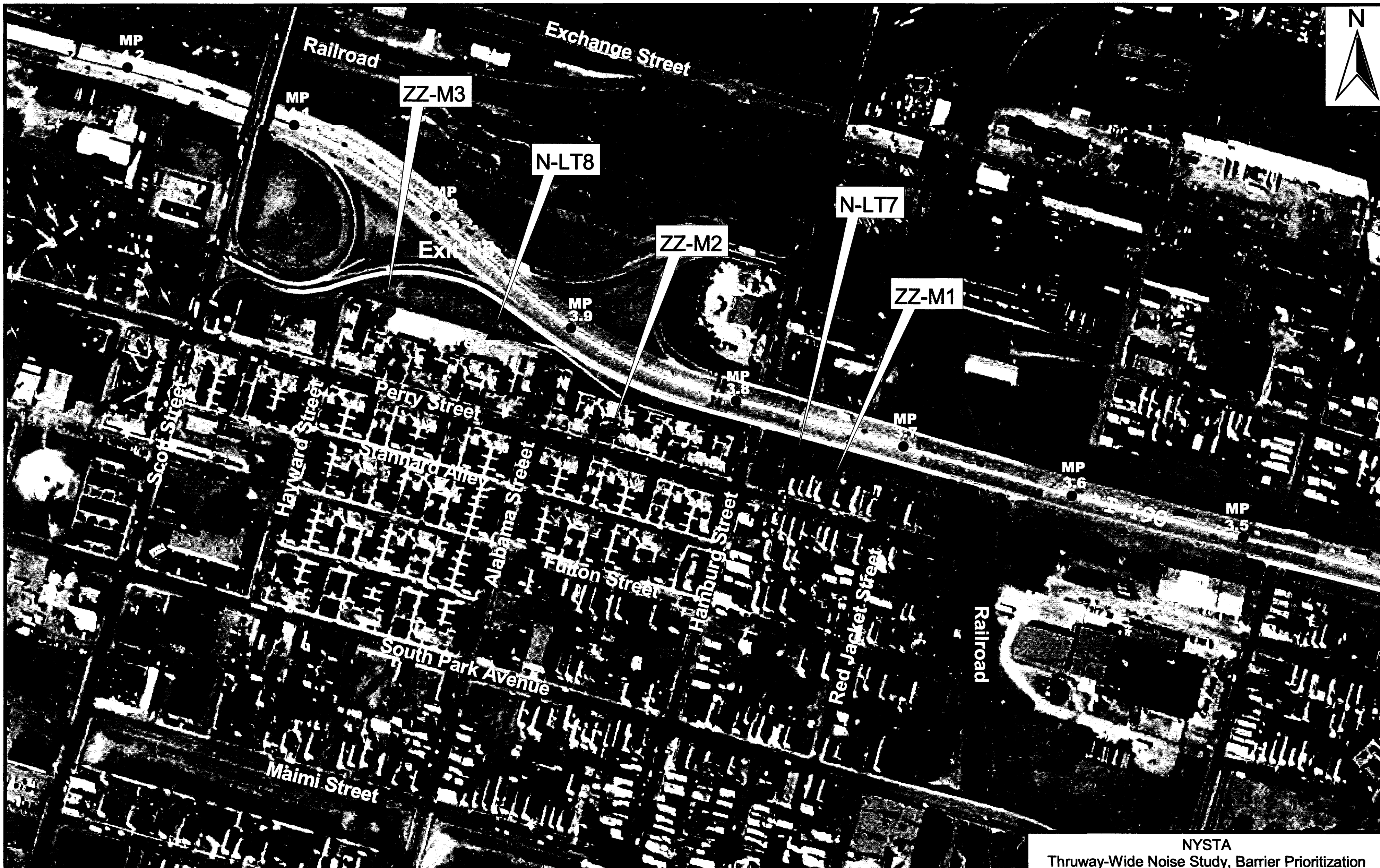
Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT N5/SB/2

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 51



Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

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Thruway-Wide Noise Study, Barrier Prioritization

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT N5/SB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 52

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Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 — Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT N7/NB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 53

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Thruway-Wide Noise Study, Barrier Prioritization

Date of Aerial: 3/28/95

Legend

- Short Term Measurement Sites
- Long Term Measurement Sites
- Proposed Barrier Locations
- MP 560.8 Thruway Mile Post

Noise Measurement Sites
and Barrier Location Plan

Assessment Area
ML/EXIT N8/NB/1

SCALE:	DATE:	FIGURE:
1" = 400'	07/2003	B - 54