NOISE TECHNICAL REPORT
FOR THE
VROOMAN ROAD BRIDGE REPLACEMENT PROJECT

PERRY AND LEROY TOWNSHIPS, LAKE COUNTY, OHIO

(PID 5669)

PREPARED BY:

MICHAEL BAKER JR., INC.
1228 EUCLID AVENUE
SUITE 1050
CLEVELAND, OHIO 44115
(216) 664-6493

FOR:

LAKE COUNTY ENGINEER
550 Blackbrook Road
Painesville, Ohio 44077-1295
Phone: (440) 350-2770

December 2008

NOISE
TECHNICAL
REPORT

VROOMAN ROAD BRIDGE REPLACEMENT PROJECT
PERRY AND LEROY TOWNSHIPS, LAKE COUNTY, OHIO

PID 5669

Prepared by:

Andrew Kuchta

Michael Baker Jr., Inc.
The Halle Building
1228 Euclid Avenue, Suite 11050
Cleveland, Ohio 44115
(216) 664-6493
Fax (216) 664-6532

December 2008

OHIO DEPARTMENT OF TRANSPORTATION
INTER-OFFICE COMMUNICATION
Office of Environmental Services

TO: Dale Schiavoni - Planning and Prog. Admin. #12
Attn: Mark Carpenter - DEC

DATE: Jan. 21, 2009

FROM: Timothy M. Hill - Admin. OES

SUBJECT: Noise Analysis Addendum Comments

PROJECT: **LAK- Vrooman Rd. PID #5669**

The **LAK- Vrooman Rd. PID #5669** Noise Analysis has been reviewed by this office and we find the document acceptable for further processing. No modeled receptor is predicted to have noise levels approaching or exceeding the FHWA Noise Abatement Criteria in the existing or the design year. Therefore, no abatement measures are deemed necessary.

Please summarize the subject addendum and include in the project environmental document.

Any questions, please call Noel Alcala at 614 466-5222 or Elvin Pinckney of this office at 614 466-5154.

TMH:ALS:EWP

cc: Reading File,
File

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SUMMARY 3

3.0 BACKGROUND 4

4.0 NOISE MEASUREMENTS 6

5.0 CRITERIA FOR DETERMINING IMPACTS 7

6.0 METHODS 8

7.0 EXISTING YEAR CONDITION 11

8.0 DESIGN YEAR NO-BUILD CONDITIONS 11

9.0 DESIGN YEAR BUILD ALTERNATIVES 11

10.0 NOISE MITIGATION CONSIDERATION 12

11.0 CONSTRUCTION NOISE 13

12.0 REFERENCES 13

13.0 DEFINITIONS 14

1.0 INTRODUCTION

Michael Baker Jr., Inc. was contracted to perform a noise analysis according to ODOT policy. ODOT policy is listed under the August 1, 2006 ODOT Standard Procedure for Analysis and Abatement of Highway Traffic Noise (No. 417-001(SP), superceding the July 1, 2005 Policy. The responsible office is Environmental Services.

The study was a Step 3 Minor PDP Noise Analysis. The level of analysis includes a Preliminary Analysis of Feasible Alternatives, Cost Reasonableness Screening, and an Estimate of Noise Abatement Costs.

The project is located in Leroy and Perry Townships, Lake County, Ohio along the Grand River Corridor (Figure 1, shown at the end of the report). The Project Area is centered along Vrooman Road and is approximately 1.5 miles long. Vrooman Road provides access to Perry and Leroy Townships, as well as southeastern Painesville from Interstate 90 (I-90). The north end of Vrooman Road is State Route 84 (S.R. 84) (South Ridge Road and Riverview Road), in Perry Township. The Vrooman Road Study Corridor begins at Interstate 90, which crosses Vrooman Road east to west at a full service interchange within Leroy Township. The Grand River, designated a Wild and Scenic River, is the centerpiece of a steep-sided, narrow valley crossed by Vrooman Road north of Interstate 90, adjacent to the Indian Points and Mason's Landing Parks located just south of S.R. 84.

The Project Area is located in an rural area characterized by modest post-war residential structures intermixed with small to moderate mid-nineteenth century residential properties, modern suburban residences, agricultural land, and is bisected by the Grand River and Lake County Metroparks corridors. The Project Area is bound on the east by the Lake County Metro Parks property, on the west by the Grand River, on the north by S.R. 84, and on the south by I-90 . The area immediately north of the Project Area is comprised of mixed residential, light industrial, agricultural (nursery industry), and railroad corridors. The area in the vicinity of Madison Avenue and Riverside Drive is characterized by suburban residential neighborhoods comprised of modern residential structures and modern commercial retail. The east end of S.R. 84 is characterized by residential structures and agricultural land (nursery industry). Within the Project Area, River Road is occupied by modern residential suburban structures.

The Lake County Engineer's Office (LCEO) contracted with Michael Baker Jr., Inc. (Baker) Corporation to evaluate deficiencies along Vrooman Road (County Road 227) between State Route 84 and Interstate 90 in Lake County, Ohio. This project was initiated under ODOT's Major Project Development Process (PDP). However, the project has since been reclassified to follow the Minor PDP.

The improvement to Vrooman Road has been studied and examined in various forms since 1963, including the previous engineering and environmental investigation and studies initiated in the early 1990's. The project proceeded into the environmental clearance phase until, during environmental studies Native American burials were identified within the project limits. The project was then suspended. Following the events of September 11, 2001, Vrooman Road was reexamined as an emergency evacuation route for the Perry

Nuclear Power Plant. As such, the project was revived in 2003. Based on that review, and the burden of upkeep of the structurally deficient and functional obsolete bridge structure and deficient roadway, it became imperative for Lake County to address the deficiencies of Vrooman Road.

As part of the PDP process, two alternatives have been identified for further investigations and development. These two alternatives were developed through PDP process and from the public involvement process. Both alternatives include improvements to Vrooman Road from I-90 north to the area just south of the south rim of the Grand River valley. They are described as follows:

ALTERNATIVE A – Alternative A is a high-level bridge connecting to Madison Avenue. This alternative includes intersection improvements at State Route 84 and Madison Avenue and State Route 84 and Lane Road. Along with the intersection improvements, the stretch of State Route 84 between these two intersections will need to be improved as well.

ALTERNATIVE B – Alternative B is a high-level bridge connecting to Lane Road. This alternative will include improvements to the intersection at State Route 84 and Lane Road. It will also include the reconfiguring of River Road access to State Route 84: either by redirecting its connection with State Route 84 east of its current location, or by turning River Road into a cul-de-sac and developing a side road for access to State Route 84.

2.0 SUMMARY

There were fifty-five (55) modeled receptors analyzed as part of the study, representing approximately one-hundred (100) total dwelling units. None (0) of these receptors currently have existing noise levels approaching or exceeding the criteria levels as referenced in *FWHA's Highway Traffic Noise Analysis and Abatement Policy and Guidance*, the ODOT Noise Policy, and the ODOT Standard Procedure.

For the Design Year No-Build Alternative, none (0) of the modeled receptors were predicted to approach or exceed the criteria levels as referenced in *FWHA's Highway Traffic Noise Analysis and Abatement Policy and Guidance*, the ODOT Noise Policy, and the ODOT Standard Procedure.

If Build Alternative A is constructed, none (0) of the modeled receptors were predicted to have noise levels approaching/exceeding the above referenced criteria levels.

If Build Alternative B is constructed, none (0) of the modeled receptors were predicted to have noise levels approaching/exceeding the above referenced criteria levels.

2.1 GENERAL CHANGES TO SOUND LEVEL ENVIRONMENT

Noise levels in the study area for the Design Year No-Build condition were predicted to have a minimal increase over the existing year (1 dBA ±). Please note that it would take a doubling of traffic volumes (100%) to produce a 3 dBA sound level change, assuming similar fleet mix.

For the Design Year Build Alternative A, the sound levels in the study area were predicted to increase by ~1.5 dBA on average over the No-Build Condition and ~2 dBA on average over the existing condition (5 dBA maximum increase).

For the Design Year Build Alternative B, the sound levels in the study area were predicted to increase by ~2 dBA on average over the No-Build Condition and ~3 dBA on average over the existing condition (6 dBA maximum increase).

2.2 NOISE MITIGATION CONSIDERATION

The Federal Highway Administration (FHWA) and ODOT specifies several types of mitigation to be studied for areas warranting noise abatement consideration such as traffic management measures, changes in horizontal and vertical alignment, sound insulation for public institutions, additional acquisition for abatement features, and noise barriers.

Though there were predicted increases as a result of the proposed project, there were no modeled receptors that met the ODOT noise criteria. Therefore, no further mitigation consideration was required according to ODOT policy.

3.0 BACKGROUND

Sound is the vibration of air molecule waves similar to ripples on water and "noise" is typically defined as unwanted sound. When these vibrations reach our ears, we hear what we call sound. These waves are produced by objects that move back and forth very rapidly, such as vocal chords when we speak. The rate at which these objects move is called their frequency. The loudness of sound is measured in units called decibels (dB). However, since the human ear does not hear sound waves of different frequencies at the same subjective loudness, an adjustment or weighting of the high-pitched and low-pitched sounds is often made to approximate average human perception. When such adjustments to the sound levels are made, they are called "A-weighted levels" and are labeled "dBA". Common outdoor and indoor sound levels as perceived by people are shown in Exhibit 1 on the following page.

The dBA scale for measuring the intensity of sound is based a logarithmic scale relative to a reference sound level pressure. Logarithmic scales are based on powers of ten, not linear like a ruler. Because of this, additions of sound levels are different. For example, if a sound of 60 dBA is added to another sound of 60 dBA the resulting sound is 63 dBA and not 120 dBA. Research has been done to evaluate human sensitivity to noise changes and has shown that a 3 dBA± change in the sound level is perceptible, a 5 dBA± change would be a noticeable change, and a 10 dBA± change would be perceived as twice (or half) as loud. This means that a sound level of 70 dBA sounds twice as loud as a sound level of 60 dBA.

Additionally, the level of highway traffic noise is never constant; therefore, it is necessary to use a statistical descriptor to describe the varying traffic noise levels. The equivalent continuous sound level (L_{eq}) (h) dBA is the statistical descriptor used in this report. The L_{eq} sound level is the steady A-weighted sound energy which would produce the same A-weighted sound energy over a stated period of time (1-hour (h), in this case) as a specified time-varying sound.

EXHIBIT 1- COMMON OUTDOOR AND INDOOR NOISE LEVELS

COMMON OUTDOOR NOISE LEVELS	NOISE LEVEL (dBA)	COMMON INDOOR NOISE LEVELS
	110	
Jet Flyover at 1000ft	100	
Gas Lawn Mower at 3ft		Inside Subway Train (New York)
	90	
Diesel Truck at 50ft		Food Blender at 3 ft
Noisy Urban Daytime	80	Garbage Disposal at 3 ft
		Shouting at 3 ft
Gas Lawn Mower 100ft	70	Vacuum Cleaner at 10ft
Commercial Area		Normal Speech at 3ft
Heavy Traffic at 300ft	60	
		Large Business Office
Quiet Urban Daytime	50	Dishwasher Next Room
	40	Small Theater, Large Conference
Quiet Urban Night Time		Room (Background)
Quiet Suburban Nighttime	30	Library
Quiet Rural Nighttime		Bedroom at Night
	20	Concert Hall (Background)
		Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

4.0 NOISE MEASUREMENTS

4.1 METHODS

Sound level measurements were made at four (4) representative sites in the study area. These representative sites account for all the potential sensitive land use areas in the project corridor including residences, churches, and parks. Commercial zones, unless mixed as part of another sensitive land use, are not typically measured in the field because they are not considered sensitive noise receptors and usually do not have exterior areas of frequent human use for other than short periods of time. (For example, a parking lot in front of a business or office would not be a sensitive location but an outdoor pool at a hotel may be a noise sensitive site).

The field measurements were also used to validate the computer model sound level predictions. If the computed results of the field data were within 3 dBA, then the model is valid for future prediction purposes. When the results are not within 3 dBA, then reasonable explanations must be presented as to why the modeled versus field measurements are noise levels greater than 3 dBA. For this study, all of the measurement sites were validated.

Sound level measurements were made using a Larson Davis 824 Sound Level Analyzer and the calibration of the Analyzer was checked with an LD CA 250 Acoustical Calibrator. After samples of the noise level had been collected, the analyzer computed the Leq noise level for the period during which the samples were collected. The field results and the model validated results are presented in Table 1. The measurement sites are shown in Appendix A at the end of the report.

TABLE 1
MEASURED SOUND LEVELS
AT MONITORING SITES (dBA Leq)

Monitor Site	Area Land Use Type	Location	2008 Measured Levels	2008 Model Validated Levels	Validation Difference	Primary Sound Sources
M1	Residential	5700 Vrooman Road (South Area)	58	59	-1	Vrooman Road (distant I-90)
M2	Park	Vrooman Road (North Area)	51	53	-2	Vrooman Road
M3	Residential	3035 River Road	56	54	+2	River Road (distant nursery farm activity)
M4	Church	S.R. 84 (2643 S. Ridge Road)	57	57	0	S.R. 84

Source: Michael Baker Jr., Inc., December, 2008

5.0 CRITERIA FOR DETERMINING IMPACTS

According to ODOT/FHWA guidelines, a project is defined as having a traffic noise impact and noise abatement measures must be considered if either of the following conditions occur:

1. Predicted noise levels that approach or exceed the Noise Abatement Criteria in Table 2. (Approach levels are considered to be 1 dBA less than the noise abatement criteria shown in the table)
2. A substantial increase occurs when future noise levels exceed existing noise levels by 10 dBA or greater. The substantial increase is considered to be 10 dBA or greater over the existing level. As mentioned previously, the 10 dBA level roughly represents a doubling of the perceived sound levels.

TABLE 2
NOISE ABATEMENT CRITERIA

Activity Category	L_{eq} (h)* dBA	L_{10} (h)* dBA	Description of Land Use Category
A	57 (exterior)	60 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve it's intended purpose.
B	67 (exterior)	70 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 (exterior)	75 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	-	-	Undeveloped lands.
E	52 (interior)	55 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

*Either Leq or L10 may be used, but not both.
Note: These sound levels are only to be used to determine impact. These are the absolute levels where abatement must be considered. Noise abatement should be designed to achieve a substantial noise reduction – not the noise abatement criteria.
Source: FWHA *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, June 1995, Table 5

6.0 METHODS

Regulations specified in *FWHA's Highway Traffic Noise Analysis and Abatement Policy and Guidance*, the ODOT Noise Policy, and the ODOT Standard Procedure state that L_{eq} or L_{10} noise levels (but not both) are to be calculated for development land uses and approved land use developments. These calculations were performed using the TNM 2.5 Noise Prediction Model. The modeling can be set to account for field variables such as tree zones, building rows, traffic speed and traffic volumes for autos, medium trucks, and heavy trucks.

This preliminary noise analysis (ODOT Minor 3) assumed a conservative worst-case scenario without tree zones, building rows, and intervening terrain to maximize initial predicted sound levels. Had there been predicted impacts according to ODOT policy in the preliminary model runs, the model would have been rerun to incorporate these variables to take advantage of these features. However, the model did account for the additional reflective pavement surface (shoulders) proposed in the Design Year Build Alternatives. Nevertheless, since there were no impacts according to ODOT policy, the worst-case results were presented in the report.

Noise prediction analyses were performed for the existing year, Design Year No-Build and Build Alternatives. The predicted Build Alternative sound levels were compared to the Noise Abatement Criteria and to the existing year levels for the Substantial Increase Criteria to determine the traffic noise impacts for the proposed project. When the NAC is approached or exceeded, or if the substantial increase criteria has been met, then noise abatement must be considered for that site. Activity Category B, representative of residences, churches, parks, hotels, etc., was used as the criteria for sensitive receptors identified in the study area. Activity Category C represented commercial/industrial business sites.

The initial fast track analysis was performed as a generalized study to determine the potential need and provide rough cost estimates for noise barriers. It incorporated the modeling of 55 sites (representing more than 100 total dwelling units, a church, several park sites, and some commercial business locations) to supplement potentially affected sites. Some receptors were eliminated because field studies identified the receptors as outbuildings and not residential sites. Receptors were not renumbered to maintain continuity.

Traffic volumes and fleet mix for the study were provided by ODOT OTS for the years 2012 and 2032. The year 2004 volumes were also provided for existing year calculations. Design hour no-build volumes were estimated from available data. The AM design hourly traffic volumes were used in the analysis to represent the greatest daily peak period sound levels. Posted speeds were used for the roadways. Please note that the existing posted speed of Vrooman Road is 25 and 40 mph, depending on the road section. The design year build alternative posted speed for Vrooman Road is proposed to be 35 mph for the entire length.

Table 3 identifies the number of receptors with noise levels approaching, equaling, or exceeding the policy criteria. Table 4 shows the predicted sound levels for the existing, design year no-build and design year build conditions.

TABLE 3
TOTAL MODELED SITES WITH NOISE LEVELS APPROACHING, EQUALING, OR EXCEEDINGTHE FHWA/ODOT CRITERIA

Impact Types	Existing Year	Design Year		
		No-Build	Build A	Build B
Approach, Equal or Exceed NAC	0	0	0	0
Substantial Increase Impacts	Not applicable	Not applicable	0	0
Totals	0	0	0	0

Source: Michael Baker Jr., Inc.

TABLE 4
PREDICTED TRAFFIC SOUND LEVELS (Leq)

Site ID #	Receptor Type	Traffic Noise Source	NAC dBA*	Existing Year	Design Year No-Build	Design Year Build A	Design Year Build B
2	Residential (M1)	Vrooman	66	61	62	63	63
3	Residential	Vrooman	66	60	61	62	62
4	Residential	Vrooman	66	59	60	61	61
5	Residential	Vrooman	66	54	55	59	59
6	Residential	Vrooman	66	54	55	59	59
7	Residential	Vrooman	66	53	54	58	58
8	Residential	Vrooman	66	53	54	58	59
9	Residential	Vrooman	66	61	62	63	63
10	Residential	Vrooman	66	54	55	59	59
11	Residential	Vrooman	66	55	56	59	59
12	Residential	Vrooman	66	55	55	59	59
13	Residential	Vrooman	66	54	55	59	58
14	Residential	Vrooman	66	55	55	60	56
15	Residential	Vrooman	66	54	55	56	49
16	Residential	Vrooman	66	55	56	53	47
17	Residential	Vrooman	66	48	49	53	52
17A	Residential	Vrooman	66	49	50	52	50
18	Masons Landing Metro Park-Dock	Vrooman	66	55	56	46	47
19	Park-(M2)	Vrooman	66	56	57	47	49
20	Park-Play Area	Vrooman	66	51	52	47	49

*Sound Levels are Inclusive of Approach Criteria
(Mx)-Measurement Site Number
Source: Michael Baker Jr., Inc.

TABLE 4 (cont.)
PREDICTED TRAFFIC SOUND LEVELS (Leq)

Site ID #	Receptor Type	Traffic Noise Source	NAC dBA*	Existing Year	Design Year No-Build	Design Year Build A	Design Year Build B
21	Business	S.R. 84	71	55	57	55	58
22	Day Care	S.R. 84	66	57	59	57	60
23	Auto Repair	S.R. 84	71	61	63	R/W	65
24	Residential	Madison	66	59	61	61	59
25	Residential	Madison	66	57	59	59	56
26	Multi-Family	S.R. 84	66	59	61	60	61
27	Multi-Family	S.R. 84	66	60	62	61	64
28	Multi-Family	S.R. 84	66	58	60	58	62
29	Multi-Family	S.R. 84	66	57	59	57	61
30	Church (LDS) (M4)	S.R. 84	66	56	58	56	59
31	Multi-Family	S.R. 84	66	53	55	53	56
32	Vacant home	S.R. 84	66	56	58	56	59
33	Residential	S.R. 84	66	59	61	60	63
34	Residential	S.R. 84	66	59	61	59	62
35	Residential	S.R. 84	66	59	61	61	65
36	Residential	S.R. 84	66	55	57	56	59
37	Residential	S.R. 84	66	59	61	59	62
38	Residential	S.R. 84	66	60	62	61	63
39	Residential	S.R. 84	66	62	63	63	61
40	Outbuilding	S.R. 84	N/A	-	-	-	-
41	Residential	S.R. 84	66	57	59	57	59
42	Residential	S.R. 84	66	59	61	59	62
43	Residential	River Road	66	63	64	64	45
44	Residential	River Road	66	56	56	57	47
45	Residential	River Road	66	56	57	57	45
46	Residential	River Road	66	56	57	57	44
47	Residential	River Road	66	56	57	57	43
48	Residential	River Road	66	56	56	57	43
49	Residential	River Road	66	56	56	57	43
50	Residential	River Road	66	55	56	56	43
51	Residential	River Road	66	56	56	57	43
52	Residential	River Road	66	56	56	57	43
53	Residential	River Road	66	56	56	57	43
54	Residential	River Road	66	56	57	57	45
55	Residential (M3)	River Road	66	58	58	58	48

*Sound Levels are Inclusive of Approach Criteria
(Mx)-Measurement Site Number
Source: Michael Baker Jr., Inc.

7.0 EXISTING YEAR CONDITION

Figure 2, shown at the end of the report, shows the modeled receptor sites. None (0) of the fifty-five (55) receptors, representing approximately one-hundred (100) total dwelling units, currently have existing sound levels approaching or exceeding the criteria.

8.0 DESIGN YEAR NO-BUILD CONDITIONS

For the Design Year No-Build Alternative, the noise levels in the study area are predicted to have a minimal increase over the existing year, generally a 1 dBA increase (rounded). Similar to the existing condition, none (0) of the fifty-five (55) receptors will have predicted sound levels approaching or exceeding the criteria.

9.0 DESIGN YEAR BUILD ALTERNATIVES

9.1 ALTERNATIVE A

Though there were predicted increases as a result of the proposed project, none (0) of the fifty-five (55) representative receptors will have predicted sound levels approaching or exceeding the criteria according to ODOT policy. The sound levels in the study area are predicted to increase by an average of ~1.5 dBA over the No-Build Condition and ~2 dBA on average over the existing condition, with a maximum increase of ~5 dBA. There are also several predicted traffic sound level decreases as a result of the Vrooman Road horizontal and vertical shift in the northern section near S.R. 84.

Please note that the design year build alternative posted speed for Vrooman Road is proposed to be 35 mph for the entire length. If it is changed to 40 mph to reflect the current condition, the sound levels would be ~1 dBA higher at Vrooman Road residences than the levels listed in Table 4. Regardless, the predicted sound levels would still be below the ODOT noise impact criteria.

9.2 ALTERNATIVE B

Though there were predicted increases as a result of the proposed project, none (0) of the fifty-five (55) representative receptors will have predicted sound levels approaching or exceeding the criteria according to ODOT policy. The sound levels in the study area are predicted to increase by an average of ~2 dBA over the No-Build Condition and ~3 dBA on average over the existing condition, with a maximum increase of ~6 dBA. There are also several predicted traffic sound level decreases as a result of the Vrooman Road horizontal and vertical shift in the northern section near S.R. 84.

Please note that the design year build alternative posted speed for Vrooman Road is proposed to be 35 mph for the entire length. If it is changed to 40 mph to reflect the current condition, the sound levels would be ~1 dBA higher at Vrooman Road residences than the levels listed in Table 4. Regardless, the predicted sound levels would still be below the ODOT noise impact criteria.

10.0 NOISE MITIGATION CONSIDERATION

10.1 MITIGATION

FHWA and ODOT specifies several types of mitigation to be studied for areas warranting noise abatement consideration such as traffic management measures, changes in horizontal and vertical alignment, acquisition of property rights for construction of noise barriers/construction of noise barriers, acquisition of property to serve as buffer zones, and sound insulation for public institutions.

Though there were predicted increases as a result of the proposed project, there were no modeled receptors that met the ODOT noise criteria. Therefore, no further mitigation consideration was required according to ODOT policy.

10.2 VACANT/UNDEVELOPED LAND USE PLANNING

ODOT requires that an analysis be performed that also includes a discussion of existing and future noise levels at 100', 300', and 600' from the main roadway for planning purposes of vacant/undeveloped land. Table 5 shows the predicted sound levels for both the existing and design year build alternative conditions along Vrooman Road. These distances represent points located from the edge of the proposed traveled way. Additionally, the sound levels are representative of a clear line of sight from the road to the receptor distance and do not take into account for curvature of the road, terrain, privacy fencing, intervening structures, forestation, and/or other noise generating sources in the area. However, the results account for the additional reflective pavement (shoulders) that were proposed as part of the Design Year Build Alternatives

TABLE 5
MODELED SOUND LEVELS AT VARIOUS DISTANCES FOR PLANNING PURPOSES (dBA Leq)

Analysis Scenario	Receptor Model Distance From Proposed Edge of Traveled Way		
	100 feet	300 feet	600 feet
Existing Condition	56	45	39
Design Year Build Alternatives A & B	60	53	49

Source: Michael Baker Jr., Inc.

11.0 CONSTRUCTION NOISE

Construction noise would generate temporary adverse impacts on abutting and nearby properties, particularly those in residential land uses. The project area is predominantly mixed urban commercial, residential, municipal, industrial land us. Noise would be emitted intermittently by a range of construction equipment at varying levels of intensity based on the type and number of operations at any given time. Depending on the project circumstances, options would be available to minimize adverse noise impacts, including limiting construction activities to daytime hours, providing noise suppressors (mufflers) on equipment, and ensuring that such suppressors are maintained in good working order. The contractor must comply with all local noise ordinances.

12.0 REFERENCES

ODOT *Standard Procedure For Analysis And Abatement Of Highway Traffic Noise, #417-001 (SP),* August 1, 2006.

U.S. Department of Transportation, Federal Highway Administration. February, 2003. *Traffic Noise Model, Version 2.1*. Washington, D.C.

U.S. Department of Transportation, Federal Highway Administration. 1995. *Highway Traffic Noise Analysis and Abatement.* Washington, D.C.

U.S. Department of Transportation, Federal Highway Administration. 1982. *Title 23, Code of Federal Regulations, Part 772: Procedures for Abatement of Highway Noise and Construction Noise.* Washington, D.C.

U.S. Department of Transportation, Federal Highway Administration. *Measurement of Highway-Related Noise, Chapter 4 Existing-Noise Measurements in the Vicinity of Highways Final Report*, Washington, D.C.

Note: The ODOT policy statement is consistent with 23 CFR 772 and the FHWA Highway Traffic Noise Guidance issued June 12, 1995. Supplemental design information can be found in the current ODOT "Location and Design Manual", the current ODOT "Noise Barrier Details", the current ODOT "Bridge Design Manual", the current ODOT Aesthetic Design Guidelines, the current AASHTO Guide Specifications for Structural Design of Sound Barriers" and the ODOT noise barrier plan insert sheets located at http://www.dot.state.oh.us/oes/noise.htm.

13.0 DEFINITIONS

Barrier - A natural or man-made object that interrupts the path of sound from the sound source to the sound receptor.

Benefited Residential Unit - A residence predicted to receive a reduction of at least 3-5 dBA LEQ(H) (5 dBA or more for front row receptors and 3 dBA or more for all other receptors) from the proposed mitigation and inclusive of all such residences, not limited to those receptors in the first row.

Decibel (dB) - A measure used to express the relative level of a sound in comparison with a standard reference level.

dBA - The noise levels in decibels measured with a frequency weighting network, corresponding to the "A-Scale" on a standard sound level meter.

Design year - The future year for which traffic projections are made in establishing the design for a specific project.

Existing noise levels - The surrounding noise of an area. Measured in dBA, it provides a reference base for determining noise impacts when transportation improvements or new highways are being considered. When calculated, it is based upon noise levels experienced during the period of greatest highway traffic noise. Note that this period can occur at other times than normal peak hour.

Front Row Receptors – noise sensitive locations immediately adjacent to the roadway (typically within 100'-150' of the roadway).

Leq - The equivalent, steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same period

Leq (h) - The hourly value of Leq (based upon the peak-hour percentage of the annual average daily traffic).

L10(H) - The A-weighted noise level that is exceeded 10% of the time. Thus the L10 level is an indication of the peak levels of the intruding noise.

Noise Abatement Criteria (NAC) - The absolute value used to determine noise impacts at the various land use activity categories. Refer to Table 1, reference 23 CFR 772.

Noise - Sound that is unwanted or undesirable

Noise Sensitive Area – an area containing multiple noise sensitive receptors in close proximity (Example: a residential neighborhood).

Potentially Impacted Residence – A residential noise receptor predicted to experience noise levels of 60 dBA or more in the noise screening process conducted during the Conceptual Alternatives Study or Preliminary Noise Report.

Protected Residence - A residence or other eligible land use expected to receive a reduction of 5 dBA (Leq)(h) or more, from the proposed mitigation, normally those in the first row or closest to the roadway. Protected residences in a multi-family building include all ground floor residential units facing the roadway.

Receptor - An individual or site location registering measurable sound levels, as described in 23 CFR 772. A receptor may represent one or more noise sensitive locations/residences.

TNM – Traffic Noise Model. The FHWA TNM is the official noise model for use on ODOT projects.

Traffic noise impacts - Impacts which occur when the predicted traffic noise levels approach or exceed the NAC (i.e. within one dBA) or when the predicted noise levels substantially exceed the existing noise levels defined as 10 dBA or more. The ODOT considers design year increases in the average noise level of 30 dBA or more an extraordinary increase. Residences predicted to experience an extraordinary increase due to project construction receive special consideration for noise abatement as per the FHWA Highway Traffic Noise Analysis and Abatement Policy and Guidance (June 1995).

Transportation-related noise - Noise generated by the engine, tires, exhaust, etc. of vehicles using the transportation system.

Type I projects - A proposed Federal, Federal-aid, or State-funded highway project for the 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 or auxiliary lanes longer than 1.5 miles. The addition of non through lanes such as ramps, spurs, etc. can create a significant change in vertical and horizontal alignment, therefore these projects can also be considered Type I projects.

Type II projects - A Federal, Federal aid or State funded project proposed to provide noise abatement at locations that do not meet the Type I project criteria. This program is voluntary for state participation and is more fully described in Section II. Type II Projects.

FIGURE 1- PROJECT AREA MAP (OHIO)

FIGURE 1. MAP OF THE STATE OF OHIO, SHOWING THE PROJECT AREA IN RELATION TO DRAINAGE AREAS AND COUNTY BOUNDARIES (ODNR 2004).

FIGURE 2- PROJECT AREA MAP (LAKE COUNTY)

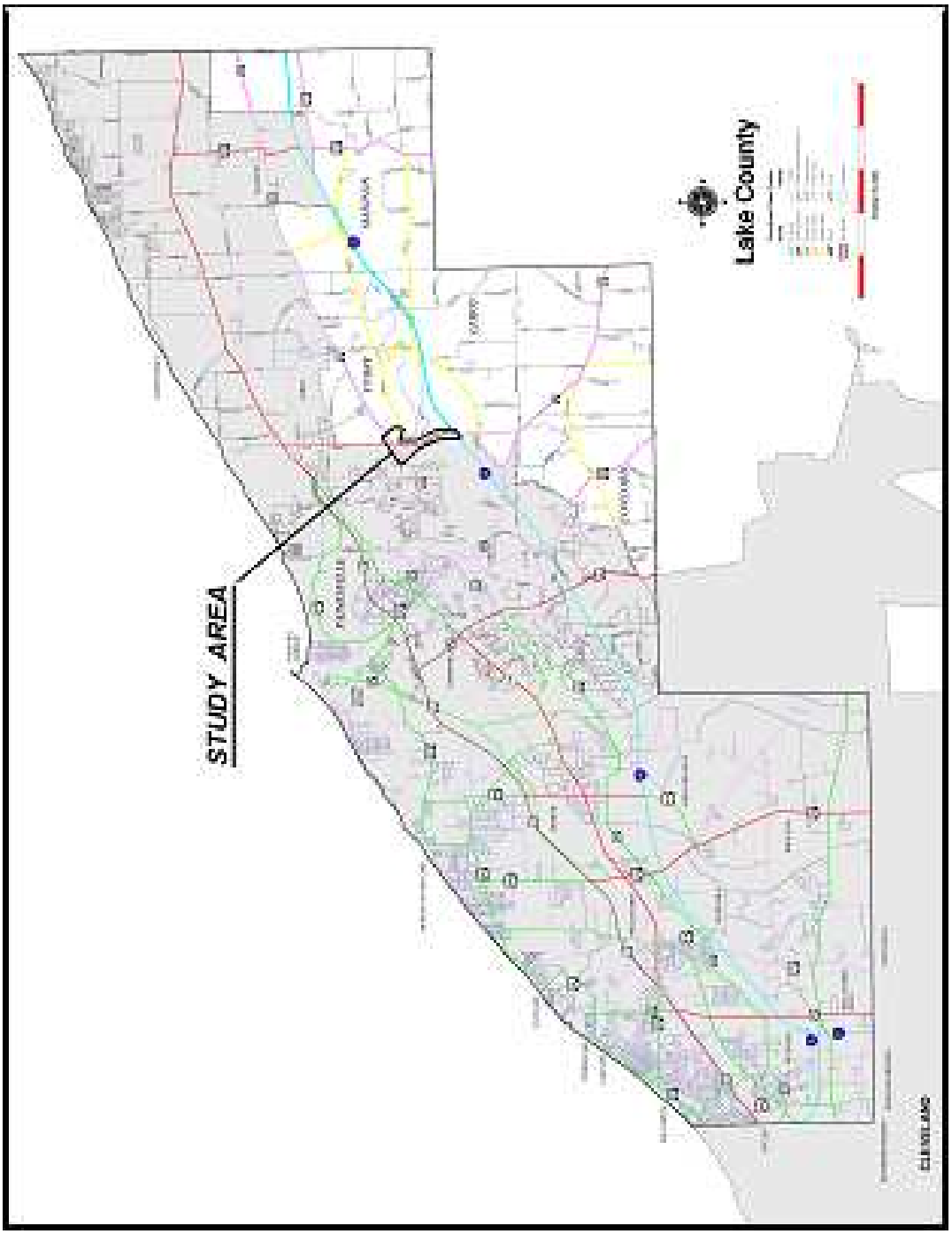


FIGURE 2. MAP OF LAKE COUNTY, OHIO, SHOWING THE PROJECT AREA (ODOT 2004).

FIGURE 3- PROJECT AREA MAP (LOCAL)

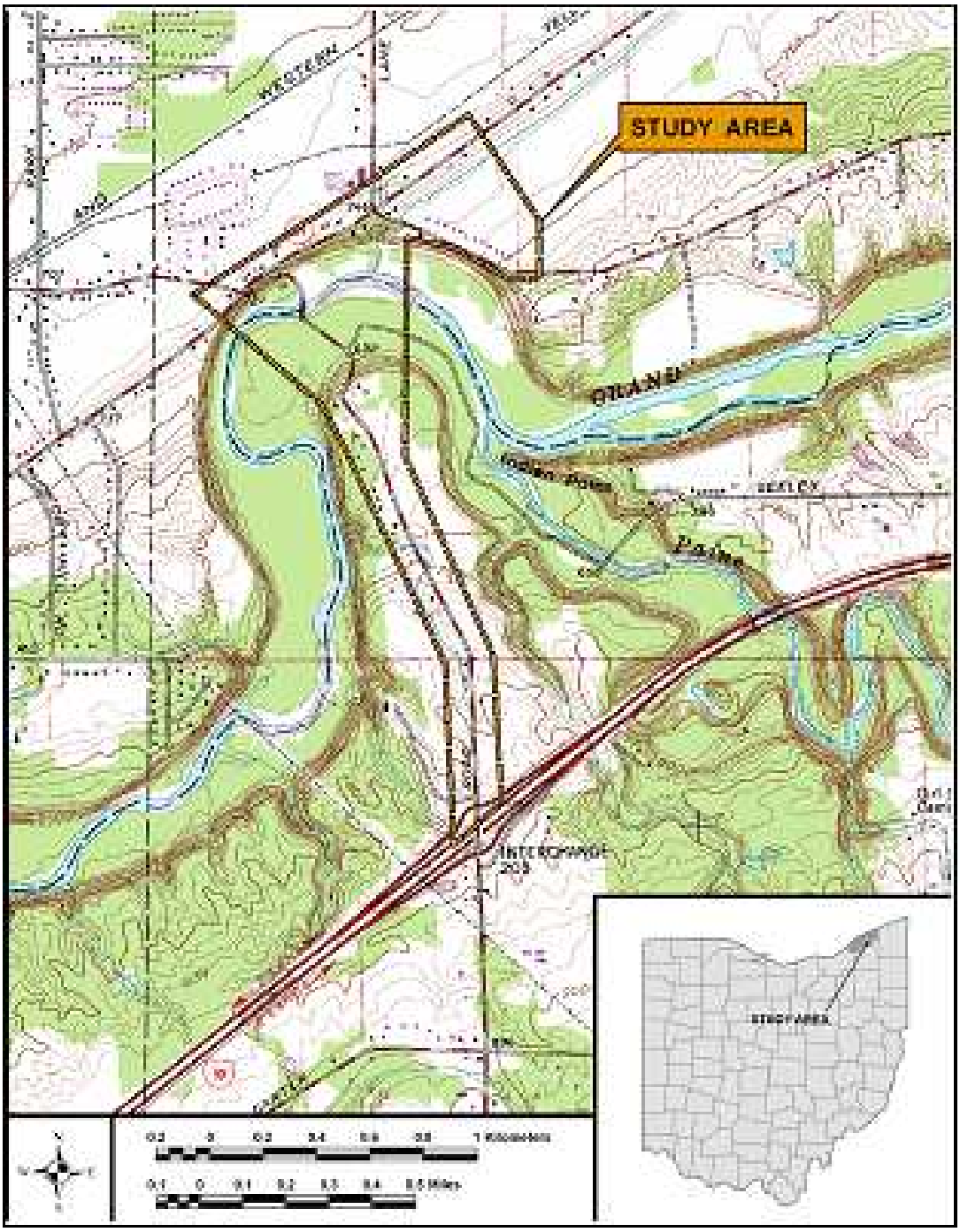
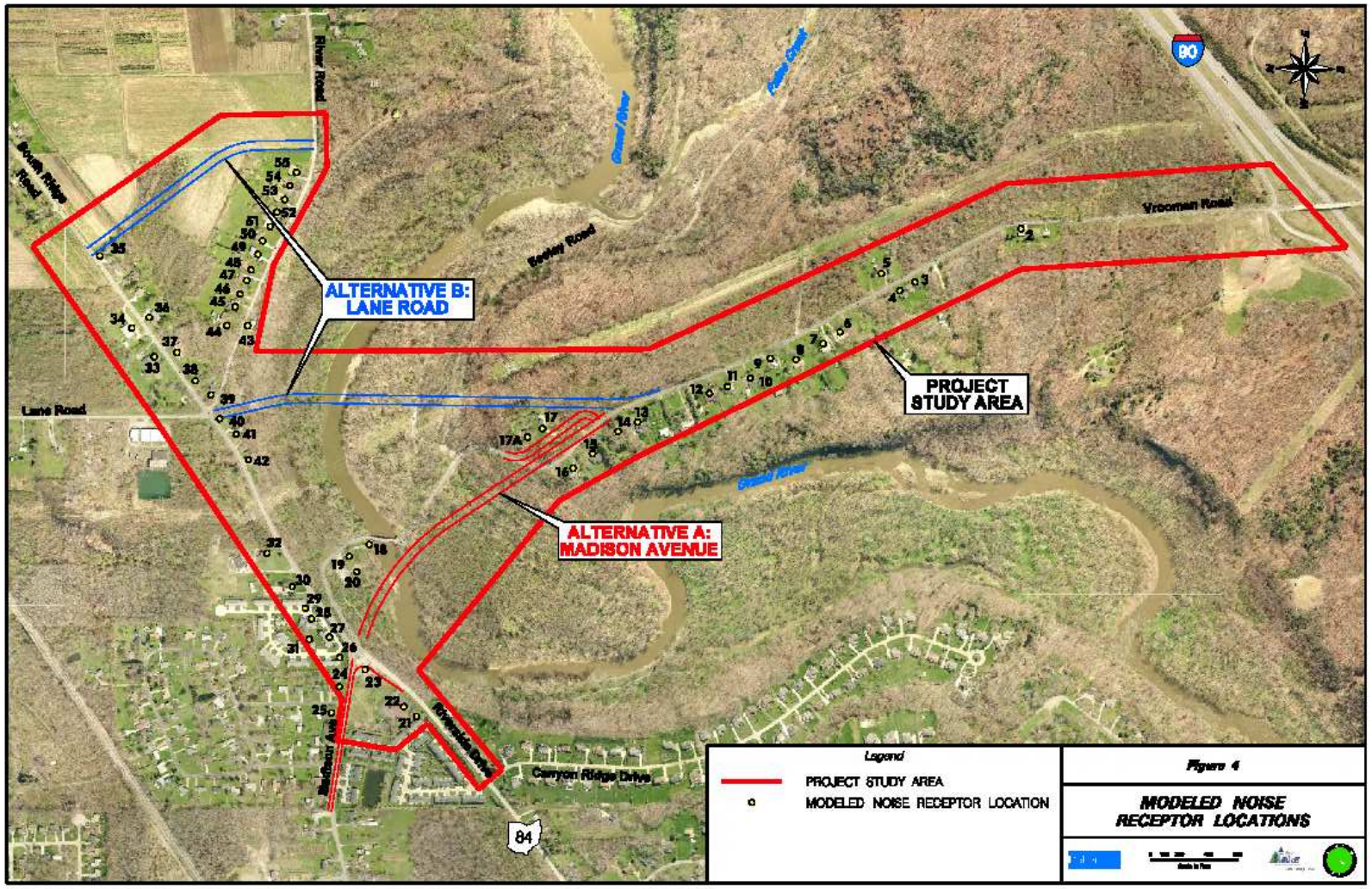


FIGURE 3. LOCATION OF THE STUDY AREA IN LAKE COUNTY, OHIO, FROM THE USGS 1960 (PHOTOREVISED 1985) PAINESVILLE, OHIO QUADRANGLE.

FIGURE 4 - MODELED RECEPTOR LOCATION MAPS


ALTERNATIVE B:
LANE ROAD
ALTERNATIVE A:
MADISON AVENUE
PROJECT
STUDY AREA
Lane Road
South Ridge Road
River Road
Vroomen Road
Canyon Ridge Drive
Madison Ave
Riverside Drive
Grand River
Fall Creek
90
84
Legend
PROJECT STUDY AREA
MODELED NOISE RECEPTOR LOCATION
Figure 4
MODELED NOISE
RECEPTOR LOCATIONS

APPENDIX A
NOISE MEASUREMENT SITE LOCATIONS AND DATA SHEETS

LD 824 LD 250

EQUIPMENT:	METER [redacted]	CALIBRATOR [redacted]	
CALIBRATION:	START 102.0 dB	END 102.0 dB	
RESPONSE:	FAST ✓ SLOW	✓ A-WEIGHTING	✓ BATTERY CHECK
WEATHER DATA:	CLEAR - MID 30'S - <=10 mph WINDS		

TRAFFIC DATA			
ROAD	VROOMAN RD	[redacted]	
AUTOS	55		
MED. TRKS.	2		
HVY. TRKS.	1 BUS		
DURATION	15 MIN	[redacted]	

DATE:	12/3/08
START:	7:00
END:	7:15
SITE #:	1 UR SOUTH
LEQ:	58
SPEED:	40 mph ±

SITE SKETCH

BACKGROUND NOISE VERY FAINT I-90 TRAFFIC
MAJOR SOURCES VROOMAN RD
UNUSUAL EVENTS NONE
OTHER NOTES ~~NONE~~ BUSH STRUCTURES ALSO @ 5700 BROADWAY SOMEWHAT

Michael Baker Jr., Inc., 1996

LD 824 LD 250

EQUIPMENT: METER [redacted] CALIBRATOR [redacted]

CALIBRATION: START 102.0 dB END 102.0 dB

RESPONSE: ___ FAST ✓ SLOW ✓ A-WEIGHTING ✓ BATTERY CHECK

WEATHER DATA: CLEAR - MID 30'S <= 10 mph winds

TRAFFIC DATA			
ROAD	V ROOMAN		
AUTOS	45		
MED. TRKS.	2		
HVY. TRKS.	0		
DURATION	15 min		

DATE:	12/3/08
START:	7:30
END:	7:45
SITE #:	2
LEQ:	51
SPEED:	20-25 mph

SITE SKETCH

BACKGROUND NOISE: PEOPLE TRAIL HIKING, DISTANT SR64

MAJOR SOURCES: V ROOMAN RD

UNUSUAL EVENTS: NONE

OTHER NOTES: SEVERAL PEOPLE (IN CARS) COMING INTO PARK EARLY MORNING TO USE

Michael Baker Jr., Inc., 1996

LD 824 LD 250

EQUIPMENT:	METER [redacted]	CALIBRATOR [redacted]	
CALIBRATION:	START 104.0 dB	END 102.0 dB	
RESPONSE:	FAST ___	SLOW ✓	A-WEIGHTING ✓ BATTERY CHECK ___
WEATHER DATA:	P. CLOUDY ~ UPPER 30'S - <=10 mph wind		

TRAFFIC DATA			
ROAD	RIVER RD		
AUTOS	12		
MED. TRKS.	1		
HVY. TRKS.	1 Bus		
DURATION	15 min		

DATE:	12/03/0[illegible]
START:	8:25
END:	8:40
SITE #:	3
LEQ:	56
SPEED:	~40-45 mph

SITE SKETCH

BACKGROUND NOISE: DISTANT NUBSET FARM MACHINERY
MAJOR SOURCES: RIVER RD
UNUSUAL EVENTS: NONE
OTHER NOTES: NONE

LD 824 LD 250

EQUIPMENT:	METER [redacted]	CALIBRATOR [redacted]	
CALIBRATION:	START 102.0 dB	END 102.0 dB	
RESPONSE:	___ FAST	___ SLOW	___ A-WEIGHTING ___ BATTERY CHECK
WEATHER DATA:	P. CLOUDS – UPPER 30'S – <10 mph winds		

TRAFFIC DATA			
ROAD	SR 84		
AUTOS	108		
MED. TRKS.	3		
HVY. TRKS.	2		
DURATION	15 min		

DATE:	12/03/08
START:	8:00
END:	8:15
SITE #:	4
LEQ:	57
SPEED:	35-40 mph

SITE SKETCH

BACKGROUND NOISE	NONE
MAJOR SOURCES	SR 84
UNUSUAL EVENTS	NONE
OTHER NOTES	NONE

Michael Baker Jr., Inc., 1996

APPENDIX B
EQUIPMENT CERTIFICATIONS

West Caldwell Calibration Laboratories Inc.

Certificate of Calibration

for

MICROPHONE

Manufactured by:	LARSON DAVIS
Model No:	2560
Serial No:	3408
Calibration Recall No:	17571

Submitted By:

Customer:	GONZALO SANCHEZ
Company:	SANCHEZ INDUSTRIAL DESIGN INC
Address:	4319 TWIN VALLEY RD STE.3
	MIDDLETON WI 53562

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Procedure No. 2560 LARS

Upon receipt for Calibration, the instrument was found to be:

Within (X) see attached Report of Calibration.

the tolerance of the indicated specification.

West Caldwell Calibration Laboratories' calibration control system meets the requirements. ISO 10012-1 MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25, ISO 9001:2000 and ISO 17025.

Note: With this Certificate, Report of Calibration is included.

Approved by:

Calibration Date: 12-Jun-08

Certificate No: 17571 -8

Felix Christopher
Quality Manager

CA Doc. 4001 Rev. 2010/09/07 Certificate Page 1 of 1

West Caldwell Calibration Laboratories, Inc.
uncompromised calibration
1575 Ridge Route 41, Victor, NY 14564, U.S.A.
Phone: (585) 924-0800 Fax: (585) 585-4327

West Caldwell Calibration Laboratories Inc.

Certificate of Calibration

for

PRECISION ACOUSTIC CALIBRATOR

Manufactured by:	LARSON DAVIS
Model No:	CA250
Serial No:	2831
Calibration Recall No:	18166

Submitted By:

Customer:	GONZALO SANCHEZ
Company:	SANCHEZ INDUSTRIAL DESIGN INC
Address:	4319 TWIN VALLEY RD STE.3
	MIDDLETON WI 53562

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Procedure No. CA250 LARS

Upon receipt for Calibration, the instrument was found to be:

Within (X) see attached Report of Calibration.

the tolerance of the indicated specification.

West Caldwell Calibration Laboratories' calibration control system meets the requirements. ISO 10012-1 MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25, ISO 9001:2000 and ISO 17025.

Note: With this Certificate, Report of Calibration is included.

Approved by:

Calibration Date: 03-Dec-08

Certificate No: 18166 -3

Felix Christopher
Quality Manager

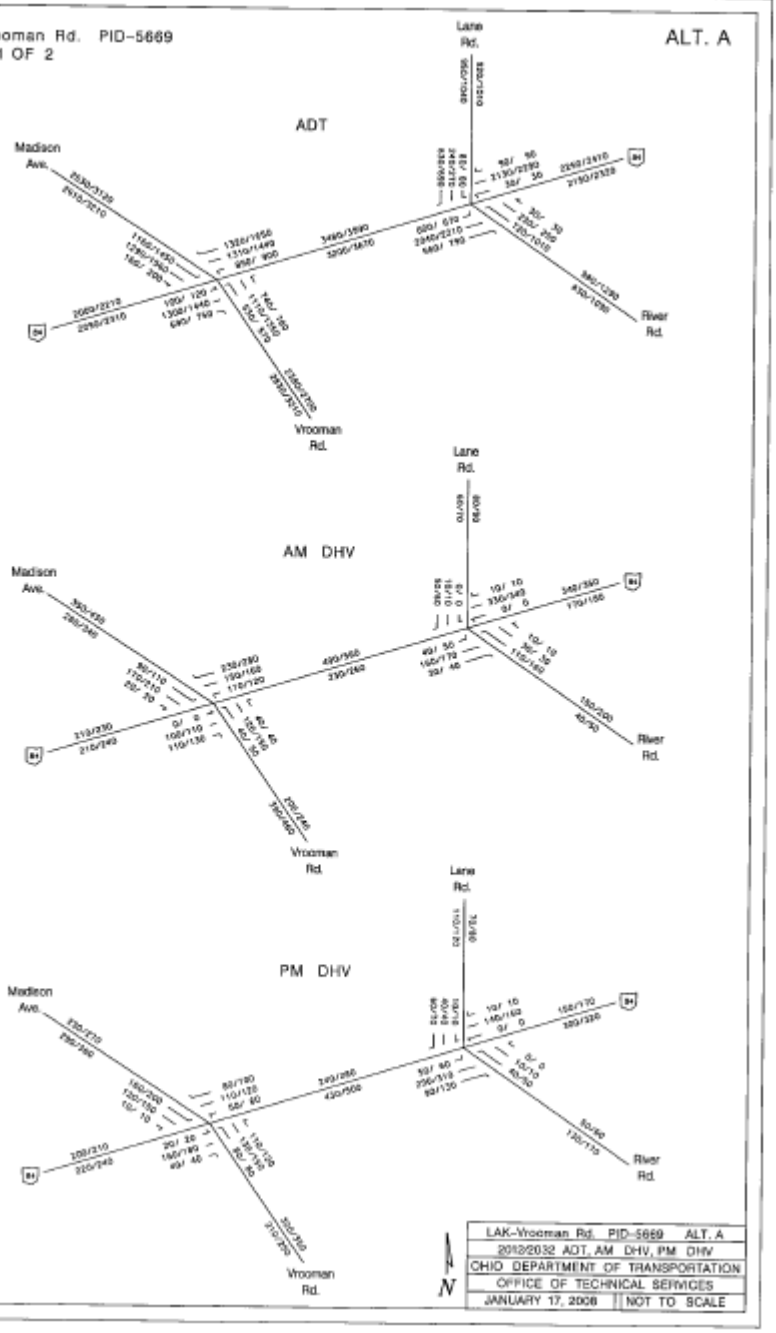
CA Doc. 4001 Rev. 2010/09/07 Certificate Page 1 of 1

West Caldwell Calibration Laboratories, Inc.
uncompromised calibration
1575 Ridge Route 41, Victor, NY 14564, U.S.A.
Phone: (585) 924-0800 Fax: (585) 585-4327

APPENDIX C
ODOT CERTIFIED TRAFFIC INFORMATION

LAK-Vrooman Rd. PID-5669
PLATE 1 OF 2

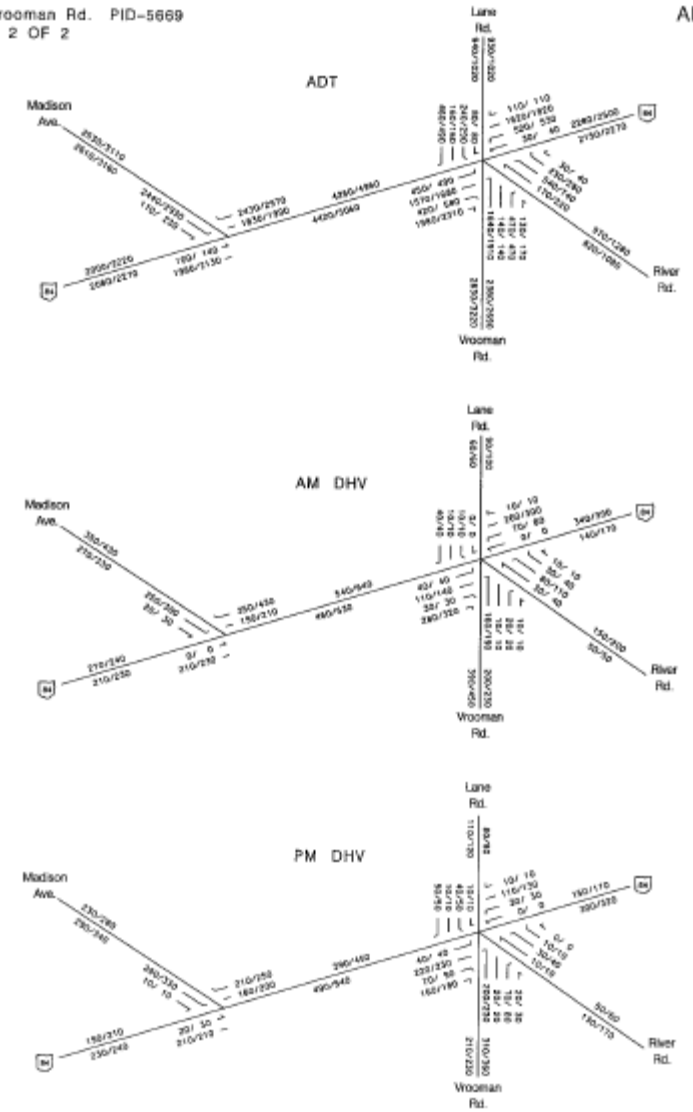
ALT. A



LAK-Vrooman Rd. PID-5669 ALT. A	
2012/2032 ADT, AM DHV, PM DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF TECHNICAL SERVICES	
JANUARY 17, 2008	NOT TO SCALE

LAK-Vrooman Rd. PID-5669
PLATE 2 OF 2

ALT. B



LAK-Vrooman Rd. PID-5669 ALT. B	
2012/2032 ADT, AM DHV, PM DHV	
OHIO DEPARTMENT OF TRANSPORTATION	
OFFICE OF TECHNICAL SERVICES	
JANUARY 17, 2008	NOT TO SCALE

N

TRAFFIC DATA
LAK-VROOMAN ROAD
ALTERNATIVE A - MADISON / SR 84

1A	PROJECT PID	5669	1A
1B	ROAD	LAK-Vrooman	1B
2A	EX. ADT	10774	2A
2B	24 HR B&C		2B
2C	EX YEAR	2004	2C
3	OPENING YEAR	2012	3
4	DESIGN YEAR	2032	4
5A	EX. YEAR - OPENING YEAR	8	5A
5B	EX. YEAR - DESIGN YEAR	28	5B
6	SELECT A GROWTH RATE	0.015	6
	STABLE: 0.0025		
	LOW: 0.0050-0.0100		
	MODERATE: 0.0100-0.0200		
	HIGH: 0.0200-0.0300		
7	OPENING YEAR FACTOR: [([6]*[5A])+1}=	1.12	7
8	DESIGN YEAR FACTOR: [([6]*[5B])+1}=	1.42	8
9	OPENING YEAR ADT ([2A]*[7])=	12100	9
10	DESIGN YEAR ADT ([2A]*[8])=	15300	10
11A	K, SELECTFROM FOLLOWING TABLE OF DESIGN YEAR ADT:	0.09	11A
	<1000 = 0.12		
	1001-5000 = 0.11		
	5001-15000 = 0.10		
	15001< = 0.09		
11B	DHV ([10]*[11A])	1377	11B
12	D FACTOR (FOR DDHV):	0.6	12
	within an MPO area = 0.60		
	outside an MPO area = 0.55		
	any one way bridge = 1.00		
13	T24 FACTOR ([2B]/[2A]) OR 0.03 IF 2B IS BLANK	0.03	13
14	TD FACTOR ([13]*0.60)	0.02	14
15	COMMENTS		15
	DESIGN DESIGNATION	**5669**	**1A**
	ROAD	**LAK-Vrooman**	**1B**
	OPENING YEAR ADT =	**12100**	**9**
	DESIGN YEAR ADT =	**15300**	**10**
	K =	**0.09**	**11A**
	D =	**0.6**	**12**
	T24 =	**0.03**	**13**
	TD =	**0.02**	**14**

12/27/2007

TRAFFIC DATA
LAK-VROOMAN ROAD
ALTERNATIVE B - LANE / SR 84

1A	PROJECT REF.	5669	1A
1B	ROAD	LAK-Vrooman	1B
2A	EX. ADT	9020	2A
2B	24 HR B&C		2B
2C	EX YEAR	2004	2C
3	OPENING YEAR	2012	3
4	DESIGN YEAR	2032	4
5A	EX. YEAR - OPENING YEAR	8	5A
5B	EX. YEAR - DESIGN YEAR	28	5B
6	SELECT A GROWTH RATE	0.015	6
	STABLE: 0.0025		
	LOW: 0.0050-0.0100		
	MODERATE: 0.0100-0.0200		
	HIGH: 0.0200-0.0300		
7	OPENING YEAR FACTOR: [([6]*[5A])+1}=	1.12	7
8	DESIGN YEAR FACTOR: [([6]*[5B])+1}=	1.42	8
9	OPENING YEAR ADT ([2A]*[7])=	10200	9
10	DESIGN YEAR ADT ([2A]*[8])=	12900	10
11A	K, SELECTFROM FOLLOWING TABLE OF DESIGN YEAR ADT:	0.10	11A
	<1000 = 0.12		
	1001-5000 = 0.11		
	5001-15000 = 0.10		
	15001< = 0.09		
11B	DHV ([10]*[11A])	1290	11B
12	D FACTOR (FOR DDHV):	0.6	12
	within an MPO area = 0.60		
	outside an MPO area = 0.55		
	any one way bridge = 1.00		
13	T24 FACTOR ([2B]/[2A]) OR 0.03 IF 2B IS BLANK	0.03	13
14	TD FACTOR ([13]*0.60)	0.02	14
15	COMMENTS		15
	DESIGN DESIGNATION	**5669**	**1A**
	ROAD	**LAK-Vrooman**	**1B**
	OPENING YEAR ADT =	**10200**	**9**
	DESIGN YEAR ADT =	**12900**	**10**
	K =	**0.1**	**11A**
	D =	**0.6**	**12**
	T24 =	**0.03**	**13**
	TD =	**0.02**	**14**

12/27/2007