109325

SOMERVILLE BYPASS
(US Route 64)
(State Route 15)
(State Highway No. 460)

SR 15 West to SR 15 West (Loop)
Fayette County, Tennessee

AIR QUALITY AND NOISE ANALYSIS

Prepared for
Tennessee Department of Transportation

PIN NO.: 101607
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1.0 AIR QUALITY ANALYSIS

1.1 EXECUTIVE SUMMARY

The proposed project is identified as the Somerville Bypass in Fayette County (Figure 1, located at the end of this report). It is proposed to be a 4-lane limited access highway, with grade-separated and at-grade intersections. The planned road will create a circumferential loop around the Town of Somerville (Figure 2, also located at the end of this report), crossing the following primary roads in the area:

- US Route 64
- State Route 15
- State Route 76

The project is in an area that has been designated as being in attainment for all the relevant mobile source pollutants. Because of the low design year volumes and worst-case mainline and intersection conditions are predicted to be equal to or better than Level of Service (LOS) C, the potential air quality concentrations are likely to be well below the NAAQS for CO and $PM_{2.5}$. Additionally, for air toxics, the predicted traffic volumes are well below the threshold that would make it a project of concern. As a result, no mitigation is necessary other than the TDOT standard construction mitigation measures.

1.2 FEDERAL REGULATORY SETTING

Consistent with the National Environmental Policy Act (NEPA) and as detailed in 23 CFR Part 771, projects must be evaluated for potential human environment air quality impacts. Additionally, the Federal Clean Air Act (CAA) has established specific procedures and limitations for evaluating transportation projects in designated air quality nonattainment areas. These procedures, generally referred to as the “conformity regulations,” are outlined in 42 USC Part 7401 (et. seq.) and are further detailed in 40 CFR Part 93. Although separate from the NEPA process, the conformity regulations also require a review of the potential transportation air quality impacts on the human environment.

Two notable differences exist between NEPA and CAA project level requirements. NEPA applies to federal projects regardless of location, whereas the CAA applies to projects within specifically identified areas. Also, NEPA regulations provide limited detail on direction and criteria for project level analyses, whereas the CAA and its implementing regulations provide substantial detail. However, a common element to NEPA and CAA project level analysis is that the relevant criteria pollutants are applied to both for considering potential impacts.

The Clean Air Act directed the Environmental Protection Agency (EPA) to establish standards for clean air. The EPA promulgated the National Ambient Air Quality Standards (NAAQS) for the following atmospheric pollutants: Carbon Monoxide (CO), 1-hour Ozone (O_3), 8-hour Ozone (O_3), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), Particulate Matter (PM_{10} and $PM_{2.5}$), and Lead (Pb). Only O_3, CO, and PM are currently of concern to mobile sources (motor vehicles). Table 1 shows the EPA National Ambient Air Quality Standards.

TABLE 1
NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

Pollutant	Primary[a]	Averaging Times	Secondary
Carbon Monoxide	35 ppm (40 $\mu g/m^3$)	1-hour (1)	None
	9 ppm (10 $\mu g/m^3$)	8-hour (1)	None
Lead	1.5 $\mu g/m^3$	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 $\mu g/m^3$)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM_{10})	Revoked (2)	Annual (2) (Arithmetic Mean)	Same as Primary
	150 $\mu g/m^3$	24-hour (1)	Same as Primary
Particulate Matter ($PM_{2.5}$)	15 $\mu g/m^3$	Annual (3) (Arithmetic Mean)	Same as Primary
	35 $\mu g/m^3$	24-hour (4)	Same as Primary
Ozone	0.08 ppm	8-hour (5)	Same as Primary
	0.12 ppm	1-hour (6) (Applies only in limited areas)	Same as Primary
Sulfur Oxides	0.03 ppm	Annual (Arithmetic Mean)	----------
	0.14 ppm	24-hour (1)	----------
	----------	3-hour (1)	0.50 ppm (1300 $\mu g/m^3$)

Source: USEPA, 9-06.
(1) Not to be exceeded more than once per year.
(2) Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, the agency revoked the annual PM10 standard in 2006.
(3) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
(4) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3. Note: Former standard was 65 µg/m3. New standard announced 9-21-2006. Designations will be in 12-09 and will take effect in 2010.
(5) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(6) (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is < 1, as determined by appendix H. (b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the fourteen 8-hour ozone nonattainment Early Action Compact (EAC) Areas.

The EPA Final Conformity Rule requires state Departments of Transportation and Metropolitan Planning Organizations (MPOs) to develop Long Range Transportation Plans and Transportation Improvement Programs (TIPs) that conform to the emissions budget and the implemented schedule of Transportation Control Measures (TCMs) established in the State Implementation Plan (SIP) for air quality. TIPs and Long Range Transportation Plans (LRTPs) are essentially lists of transportation projects that are to be undertaken in the short term and the long term.

The purpose of conformity is to reduce the severity and number of violations of the NAAQS, to achieve the NAAQS as fast as possible for areas designated as nonattainment, to ensure compliance with an air quality maintenance plan, and to support the intent of the 1990 CAAA to integrate transportation, land use and air quality planning. The CAAA establishes three designations for areas based on ambient air quality conditions observed for NAAQS pollutants:

- Nonattainment areas: Areas that exceed NAAQS for transportation-related criteria pollutants;
- Maintenance areas: Areas that at one time were designated nonattainment, but have since met NAAQS for transportation-related criteria pollutants. Areas are designated "maintenance" for 20 years from the date the EPA approves the state's request for redesignation; and
- Attainment areas: All other areas.

Transportation conformity is a way to ensure that federal funding and approval are given only to those transportation projects that are consistent with federal air quality goals. According to the CAA, transportation plans, programs and projects cannot:

- Create new NAAQS violations;
- Increase the frequency or severity of exiting NAAQS violations; or
- Delay attainment of the NAAQS.

Federal funding dedicated to transportation projects/programs can be withheld if a region is found to be in violation of conformity. The responsibility falls upon the MPOs and the US Department of Transportation (USDOT). These agencies must ensure that the transportation plan/program within the MPO conform to the SIP. The policy board of each MPO must formally make a conformity determination on its transportation plan and transportation improvement program prior to submitting them to the USDOT for approval.

Verification of project conformity for currently approved TIPs for both MPO and non-MPO projects, including listings of qualifying projects in each MPO area are on file at the TDOT Planning Division. The status of a project is addressed in the MPO-approved TIPs as exempt or analyzed, meaning that the project was included in the conformity analysis for the current TIP.

The EPA Conformity Rule also established requirements for project-specific analysis of carbon monoxide impacts in transportation projects. Localized areas of concern, such as intersections, are referred to as "hot spots." As stated in the EPA conformity guidelines, the need for a hot spot analysis is determined as follows:

- If the project worsens an intersection level of service from Level of Service (LOS) C or D, and
- If the intersection is LOS D or worse and the project substantially increases the intersection delay.

1.2.1 Recent Guidance Relating To Particulate Matter And Air Toxics

PARTICULATE MATTER

On March 10, 2006, the EPA released its Final rule on "$PM_{2.5}$ and PM_{10} Hot Spot Analysis in Project-Level Transportation Conformity Determinations for the new $PM_{2.5}$ and Existing PM_{10} National Ambient Air Quality Standards" (71 FR 12468). From this date forward, future qualitative $PM_{2.5}$ and PM_{10} hot-spot analyses are to be based on this Rule and associated guidance, which supersedes the Federal Highway Administration's (FHWA) September 12, 2001, "Guidance for Qualitative Project-Level: Hot-spot Analysis in PM_{10} Nonattainment and Maintenance Areas." Any PM_{10} hot-spot analysis that was started prior to the release of this guidance may be completed with the previous 2001 guidance. All projects in $PM_{2.5}$ and PM_{10} nonattainment and maintenance areas determined to be "projects of air quality concern" must undergo a qualitative analysis.

On March 29, 2006, EPA and FHWA signed joint guidance on how to perform qualitative hot-spot analyses in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance areas. It is anticipated that EPA will, in the future, release analytical tools for conducting quantitative $PM_{2.5}$ and PM_{10} hot spot analyses. Future correspondence will be issued at that time. Pending the release of official EPA hot spot quantitative tools, the above-noted Rule and Guidance will be implemented for a qualitative analyses.

AIR TOXICS

Qualitative analyses for Mobile Source Air Toxics (MSAT's) is described in the FHWA memorandum titled "Interim Guidance on Air Toxic Analysis in NEPA Documents", February, 2006. Evaluating the environmental and health impacts from MSATs on a proposed highway project involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the MSAT health impacts of this project. However, even though reliable methods do not exist to accurately estimate the health impacts of MSATs at the project level, it is possible to qualitatively assess the levels of future MSAT emissions for projects with higher potential of MSAT impacts.

1.3 TDOT AIR QUALITY STUDY PROCESS

The analysis was performed according to the guidelines in the TDOT NEPA Procedures Manual, dated August, 2004. This project was evaluated for short- and long-term regional and project level impacts that the proposed improvements may have on the air quality study area.

1.3.1 Regional Level Analysis

Data on the air quality attainment designation of the study area, monitored air quality levels for NAAQS pollutants, and anticipated future traffic volumes expected with the Build Alternative was collected and a review of the STIP and TIP for air quality conformity was completed. The purpose was to determine the need for additional air quality analysis. Typically, the air quality conformity analysis determines whether the proposed project's projected emissions levels, when combined with background emissions levels (existing or expected emissions levels if the project is not implemented), will exceed the NAAQS. If the area or a project area is not in conformity, FHWA may require that an air quality analysis be conducted.

Conformity applies to the following transportation-related criteria pollutants: 1-hour and 8-hour ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), and particulate matter (PM_{10} and $PM_{2.5}$). Conformity also applies to the pre-cursor pollutants for ozone, which are volatile organic compounds (VOCs) and nitrogen oxides (NOx). This analysis is conducted using emissions models (current version of MOBILE) to estimate the pollutant burden of the project. The model requires traffic data (vehicle miles traveled, vehicle hours of travel, traffic speed) to estimate pollutant levels. Detailed information about conformity analysis and modeling is available through the FHWA (http://www.fhwa.dot.gov/environment). This type of analysis would be prepared by the Planning Division or a by a consultant.

1.3.2 Project Level (Microscale) Analysis

The project level air quality analysis required during the NEPA process can vary in content and in level of detail from one project to another based on the project scope, size, geographic location, background conditions and anticipated impacts. The microscale analysis focuses on CO and PM impacts to determine if the pollutant concentrations (project contribution plus background levels) are above or below the NAAQS. Analysis guidance for CO is presented below. Recently developed analysis guidance for PM was previously discussed in Section 2.1.1.

Dispersion modeling is the most commonly used method for assessing localized CO air quality impacts. It estimates pollutant concentration levels based on project-specific design data, traffic data, and meteorological data. The concentrations are combined with background concentration levels (based on available air quality monitoring data or estimates) to determine total pollutant concentrations, which are then compared to the one-hour and eight-hour NAAQS for the pollutant. For those projects where a microscale analysis is performed, each reasonable alternative and the No Build alternative should be analyzed for the opening year and the design year. A brief summary of the methodologies and assumptions used should be included in the environmental document. Total CO concentrations (project contribution plus estimated background) at identified reasonable receptors for each alternative should be reported.

If the total CO concentration is less than either the one-hour or the eight-hour NAAQS, the project is considered to have minimal environmental impact and does not require consideration of mitigation for long-term air quality impacts.

Where the selected alternative results in violations of EPA's one-hour or eight-hour CO standards, an effort should be made to develop reasonable mitigation measures through early coordination between FHWA, EPA, TDEC and appropriate local transportation agencies. Mitigation measures can include, but are not limited to, changes in design scope and concept, changes in intersection design to improve traffic flow and level of service, development and implementation of transportation demand measures (e.g., park-and-ride lots, improved transit service, and high occupancy vehicle lanes) at the regional and study area levels.

The draft environmental document should summarize the findings of the air quality analysis or discuss that an analysis was not needed for the project and explain why. The final NEPA document should discuss the proposed mitigation measures if air quality impacts are identified and include evidence of the coordination with federal, state and local agencies, as appropriate. All projects require the implementation of mitigation measures to address short-term air quality impacts, i.e., construction impacts. Such impacts can be mitigated through the implementation of Best Management Practices, which are included in the project through the incorporation of TDOT Standard Specifications for Road and Bridge Construction.

1.4 CURRENT PROJECT AREA CRITERIA POLLUTANT STATUS

According to the EPA Air Data website (http://www.epa.gov/air/data/index.html), there are no monitors other than site specific facility monitors in Fayette County. These facility monitors are located in the southern part of Fayette County, generally along the SR 57 corridor and are not near the project area in Somerville.

1.4.1 1-hour and 8-hour Ozone (O_3)

The 1-hour standard is no longer applicable as of June 15, 2005. According to the EPA nonattainment areas website (http://www.epa.gov/oar/oaqps/greenbk/), the only TN areas still subject to the 1-hour standard are various counties in and around Chattanooga, Bristol, and Nashville (all are Subpart 1 EAC). Prior to June 15, 2005, Fayette County was designated as being in attainment of the 1-hour standard. For the 8-hour standard, Fayette County has been designated as an attainment area.

1.4.2 Carbon Monoxide (CO)

Fayette County has been designated as being in attainment of the CO standard. Nonetheless, NEPA regulations still require that the proposed project will not cause an impact (exceedance) of the National Ambient Air Quality Standards (NAAQS).

1.4.3 Particulate Matter (PM_{10} And $PM_{2.5}$)

The annual standard for PM_{10} has been revoked. Fayette County has been designated as being in attainment of the PM_{10} and $PM_{2.5}$ standards.

1.4.4 Air Toxics

Air Toxics are not currently listed as a criteria pollutant. They are not monitored nor are there designated nonattainment areas. If necessary, it is possible to qualitatively assess the levels of future MSAT emissions. This will be discussed in the analysis/results section of this report.

1.5 ANALYSIS / RESULTS

1.5.1 Regional Conformity Impact

The proposed project is in an area designated as being in attainment for all mobile source criteria pollutants. As a result, there are no federal actions or requirements to address regional conformity.

1.5.2 Project Level Impact

1-HOUR AND 8-HOUR OZONE (O_3)

Project level ozone analysis is not applicable since ozone is a regional pollutant. Nonetheless, the proposed project is in an area designated as being in attainment of the standard.

CARBON MONOXIDE (CO)

The worst-case intersection is located in the western area of the project at the intersection of US64/SR15 and the bypass; specifically, at the northbound off-ramp from the bypass to US64/SR15. An LOS analysis was not provided by TDOT. Nonetheless, to provide something of a screening analysis, Baker analyzed the highest mainline free-flow volume located in the southwest quadrant of the proposed bypass. Baker also took the traffic volumes and ran a hypothetical worst-case scenario for a signalized intersection if one were to be placed at this location. The results are as follows:

For the mainline analysis, the greatest one-direction DHV traffic is 256 vehicles per hour (vph). This was derived from the southwest quadrant AADT of 5,120. The DHV% is 10 (from TDOT). Therefore the DHV is 512. With a 50/50 directional split, the one-directional volume is 256 vph. Using the HCS Version 5.21 basic freeway segments worksheet, the LOS C/D threshold is 2,599 vhp in one-direction. Therefore, the predicted design year mainline volume is well below the threshold.

Though our hypothetical (and unofficial) screening suggests that a signal is likely not warranted at the intersection of US64/SR15 and northbound off-ramp from the bypass (west side), we assumed a theoretical optimized signal for the air quality analysis. For this hypothetical worst-case signalized intersection, the LOS was predicted to operate at a Level-of Service A. Even accounting for some margin of error, the LOS is still likely to be better than LOS D. Therefore, there is no predicted NAAQS impact as a result of project level CO concentrations.

PM_{10} AND $PM_{2.5}$

The proposed project is located in an attainment area for PM_{10}, and $PM_{2.5}$. According to the $PM_{2.5}$ and PM_{10} hot-spot analysis requirements established in the March 10, 2006, final transportation conformity rule (71 FR 12468), no further project level air quality analysis is required.

AIR TOXICS

To fall into the Mobile Source Air Toxics (MSAT) category for potential MSAT effects, the project must create new or add significant capacity to urban highways such as interstates, urban arterials, or urban collector-distributor routes with traffic volumes where the AADT is projected to be in the range of 140,000-150,000, or greater, by the design year. The predicted design year volumes for the bypass are well below the threshold, with less than 6,000 AADT.

Also, emissions will likely be lower in the design year than the present levels as a result of EPA's national control programs that are projected to reduce MSAT emissions by 57 to 87 percent between 2000 and 2020. Though local conditions may differ, the magnitude of the EPA-projected reductions is so great (even accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

1.6 POTENTIAL MITIGATION MEASURES

1.6.1 REGIONAL

The project is in an area that has been designated as being in attainment for all the relative mobile source pollutants. No mitigation is necessary.

1.6.2 PROJECT LEVEL

Based on the predicted results, no mitigation is necessary. Because of the low design year volumes and conditions equal to or better than LOS C, the potential air quality concentrations are likely to be well below the NAAQS for CO and $PM_{2.5}$, Additionally, the air toxics discussions do not indicate a worse condition over the existing conditions.

1.6.3 CONSTRUCTION ACTIVITIES

All projects require the implementation of mitigation measures to address short-term air quality impacts, i.e., construction impacts. Such impacts can be mitigated through the implementation of Best Management Practices, which are included in the project through the incorporation of TDOT Standard Specifications for Road and Bridge Construction.

2.0 NOISE IMPACT ANALYSIS

2.1 EXECUTIVE SUMMARY

2.1.1 Summary

There are approximately 100 dwelling units in the project area that are in close proximity to the proposed bypass. Additionally, there are several businesses, churches and the proposed Fayette County Jail. Furthermore, much of the land use in close proximity to the bypass is open space, with forested areas throughout. There are zero (0) receptors that have existing exterior noise levels approaching or exceeding the Federal Highway Administration (FHWA) 23 CFR Part 772 Noise Abatement Criteria Levels (NAC).

Generally, for the Design year 2030 No-Build Alternative, the peak L_{eq} noise levels from highway traffic at the receptors are predicted to minimally increase (0-2 dBA) over the existing year even though the total daily traffic volume has increased. Generally, those receptors that are located away from the heavier traveled ways in the region, such as US 64 and SR 76, have a 0 dBA increase from traffic noise. Only those receptors located near to the major arterials had a predicted increase of 1-2 dBA as a result of increased traffic noise. Nevertheless, similar to the existing condition, the predicted number of highway traffic noise impact is also expected to be zero (0) for the Design Year No-Build Alternative.

For the Design Year Build Alternative, the predicted highway traffic noise impact is also expected to be zero (0). There are no receptors that meet the NAC criteria and the greatest increase over existing condition is predicted to be 6 dBA. The primary reasons why there are no impacts according to TDOT policy include the relatively low design year bypass volumes ("low" as they relate to noise) and the distances from the proposed bypass.

2.1.2 Noise Mitigation Consideration

FHWA and TDOT specifies several types of mitigation to be studied for areas warranting noise abatement consideration such as traffic management measures, changes in horizontal and vertical roadway alignment, sound insulation for public institutions, additional land acquisition for noise abatement features, and noise barriers. Since there are no impacts according to TDOT policy, no further analysis is warranted.

This preliminary noise analysis was performed without detailed plans and profiles. During any subsequent engineering or environmental analysis phase, modifications and detailed plans may change the results of the preliminary analysis. TDOT will revisit the noise analysis if there is a likelihood that impacts could occur based on the plans.

The preliminary analysis assumed a condition that is worse than is likely to occur. Since profiles and cut and fill areas are not yet developed, the elevation relationship of the receptors to the roadway was assumed to be the same, except for where bridge overpasses could be estimated. Additionally, the preliminary analysis included no tree zones, terrain shielding, building row shielding, and bridge parapets in the noise prediction model, essentially creating an unabated direct noise line of sight between the traffic noise and the receptors. As mentioned, even with this worst-case approach, there were no impacts according to TDOT policy. Had there been a preliminary impact, then those features, where applicable, would have been added to the model and rerun for an updated result.

2.2 INTRODUCTION

The noise analysis was performed according to the guidelines in the TDOT NEPA Procedures Manual, dated August, 2004. TDOT, in cooperation with the Federal Highway Administration (FHWA) is proposing a full circumferential bypass around the Town of Somerville. A general location is provided in Figure 1, located at the end of this report. It is proposed to be a four-lane arterial with at-grade and grade separated interchanges, as shown in Figure 2, also at the end of this report.

2.3 STUDY METHODS

2.3.1 Fundamentals Of Sound And Noise

Sound is the vibration of air molecules in waves similar to ripples on water. When these vibrations (sound waves) reach our ears, we hear "sound". These sound waves are produced by objects, which move back and forth very rapidly, such as vocal chords when we speak. The rate at which these objects move back and forth is called their frequency. The frequency of the moving objects determines the frequency or pitch of the sound. Human ears can only hear sound waves with a frequency or pitch between approximately 20 and 15,000 cycles per second.

The intensity or 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 are made to the sound levels, they are called "A-weighted levels" and are labeled as "dBA". Exhibit 1 illustrates some of the more common A-weighted noise levels one might typically experience.

The dBA scale for measuring the intensity of sound is based on a logarithmic scale. Logarithmic scales are based on powers of ten, and are not linear. Because of this, sound level changes are hard to define. For example, if a sound of 60 dBA is added to another sound of 60 dBA the result is 63 dBA and not 120 dBA. It has been found by testing large numbers of people that a 10 dBA increase in the sound level is equivalent to a doubling of the sound level as heard by the human ear. This means that a sound level of 60 dBA sounds twice as loud as a sound level of 50 dBA. Exhibit 2 illustrates people sensitivity to sound level change.

Noise is often defined as unwanted sound. Since highway traffic sound is normally unwanted, highway traffic sound is usually referred to as highway traffic noise. 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 (Leq) is the statistical descriptor used in this report. The Leq sound level is the steady A-weighted sound energy , which would produce the same A-weighted sound energy over a stated period of tie as a specified time-varying sound.

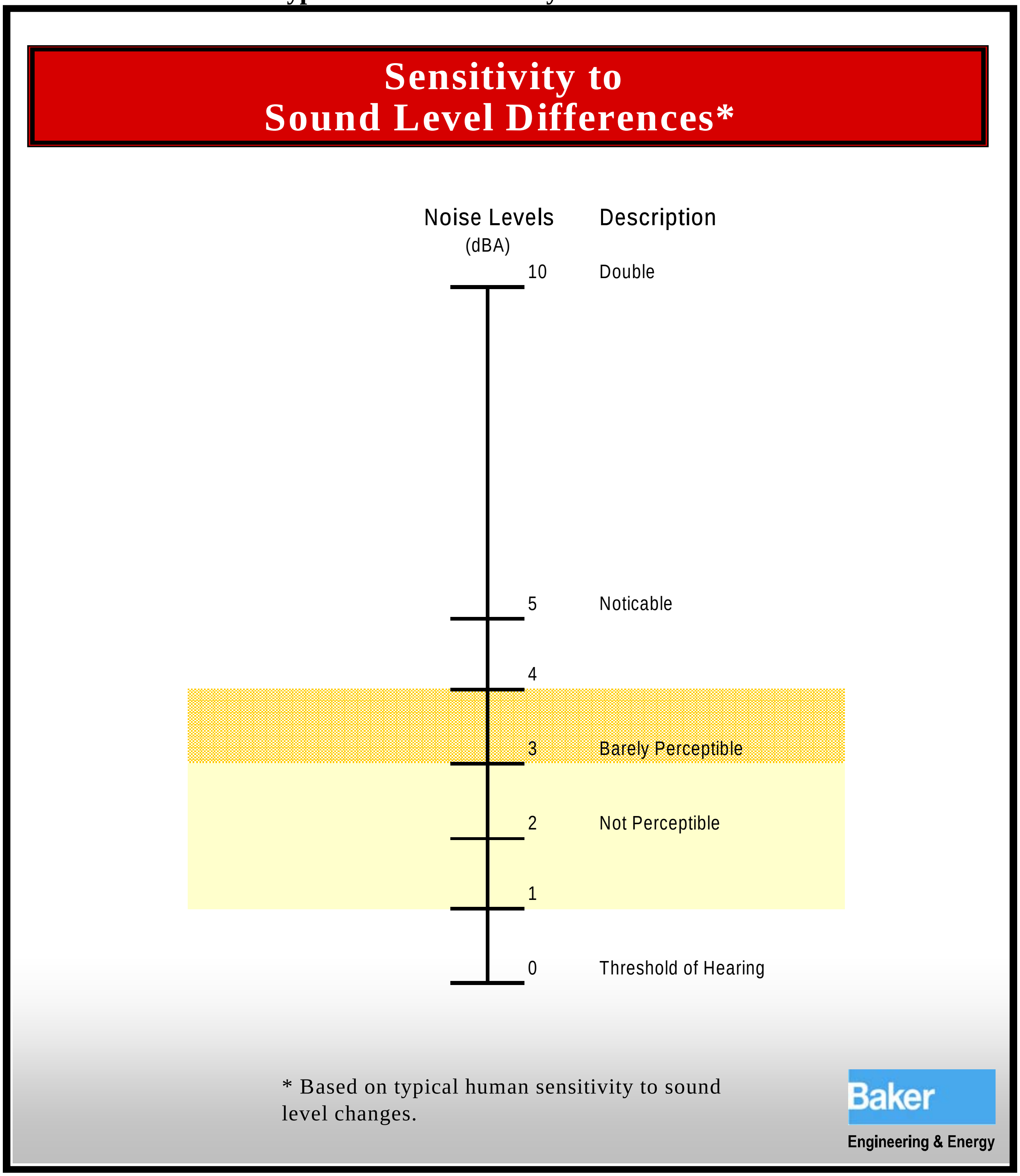
Studies have shown that some of the most pervasive sources of noise in our environment today are those associated with transportation (FHWA, Highway Traffic Noise Analysis and Abatement Policy and Guidance, 1995). Traffic noise tends to be a dominant noise source in our urban and rural areas and construction noise is a common source of complaint. FHWA has established noise standards for its programs, policies and actions, which are contained in 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise.

Exhibit 1. Common Outdoor and Indoor Sound Levels

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

Source: FHWA, Highway Noise Fundamentals, 9/80.

Exhibit 2. Typical Person Sensitivity To Sound Level Differences



2.3.2 Noise Applicable Regulations And Study Methods

The National Environmental Policy Act (NEPA) provides broad authority and responsibility for evaluating and mitigating adverse environmental effects, including highway traffic noise. NEPA directs the federal government to use all practical means and measures to promote the general welfare and foster a healthy environment. Another federal law, which specifically involves abatement of highway traffic noise, is the Federal-Aid Highway Act of 1970. This legislation mandated FHWA to develop noise standards for mitigating highway traffic noise. The law further provides that FHWA not approve the plans and specifications for a federally aided highway project unless the project includes adequate noise abatement measures to comply with the standards.

FHWA regulations contained in 23 CFR 772 require the following during the planning and design of a highway project:

- Identification of traffic noise impacts;
- Examination of potential mitigation measures;
- The incorporation of reasonable and feasible noise mitigation measures into the highway project; and
- Coordination with local officials to provide helpful information on compatible land use planning and control.

A typical TDOT highway traffic noise analysis includes seven basic steps:

1) Identify existing and potential noise sensitive areas within the study area. [Sections 3-7]
2) Validate/confirm existing noise conditions through the use of computer modeling. [Section 4]
3) Determine future noise levels and the impact of future noise levels on sensitive land use activities for the given design year. [Section 7]
4) Compare existing and projected conditions to determine the projected impact on the surrounding area. [Section 7]
5) Identify and evaluate reasonable and feasible noise abatement measures for reducing noise where impacts are determined to occur. [Section 8]
6) Address potential concerns for noise occurring during construction and mitigate when possible. [Section 9]
7) Document public involvement activities as well as public concerns, comments and responses to public comments on project noise impacts and TDOT's noise abatement strategies. [Section 10]

Field reconnaissance and map review was undertaken to identify and classify noise-sensitive receptor locations. Representative locations were selected for analysis at outdoor (exterior) areas where frequent human use occurs. TDOT policy also requires that these locations should also include development that has been designed, planned and programmed, (i.e., platted and filed with the County Recorder) before the date of the environmental document approval). Phone calls to the Fayette County Planning and Development Office and the Town of Somerville indicated that they were not aware of any new residential development that might be affected by the proposed bypass.

2.3.3 Noise Impact Criteria

Title 23 of the Code of Federal Regulations Part 772 (23 CFR 772) defines traffic noise impacts as those "impacts which occur when predicted traffic noise levels approach or exceed the Noise Abatement Criteria or when the predicted traffic noise levels substantially exceed the existing noise levels."

According to TDOT policy, all alternatives to be addressed in the NEPA document, including the No Build alternative, should be analyzed for noise impacts in the noise study. The impact analysis simply involves the comparison of future noise levels to the noise abatement criteria (Table 2) and existing noise levels. As defined in 23 CFR 772, highway noise impacts occur when there is a substantial increase in design year noise levels above the existing noise levels when the predicted design year noise levels are between 57 and 67 dBA Leq or when the predicted noise levels approach (1 dBA or less than the criteria) equal, or exceed FHWA's noise abatement criteria. The criteria for a noise level increase are:

- 0 – 5 dBA Minor Increase
- 6 – 9 dBA Moderate Increase
- 10 or more dBA Substantial Increase

TABLE 2
FEDERAL HIGHWAY ADMINISTRATION NOISE ABATEMENT CRITERIA (NAC)
HOURLY A-WEIGHTED SOUND LEVEL – DECIBEL (dBA)

Activity Category	Leq (h)[1]	Description of Activity Category
A	57 (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)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

[1] Leq (h) is the one-hour time averaged equivalent sound level.
Note: Approach criteria is 1 dBA less than the stated Leq (h) criteria.
Source: Title 23 CFR, Part 772.

2.3.4 Sound Level Predictions

Sound level predictions are determined by a traffic noise prediction method, which generally meets the following two conditions:

- The methodology is consistent with the current FHWA highway traffic noise prediction model; and
- The prediction method uses current FHWA reference energy mean emission levels or such levels as measured by current FHWA measurement procedures.

Modeled estimates of the exterior noise levels in the vicinity of the proposed project were based on the FHWA Highway Traffic Noise Prediction Model TNM2.5. These estimates were made for the existing year and the for the 2030 Design Year No-Build and Build Alternative conditions. In making these estimates, the traffic volume, fleet mix, operating speed, and new grade-separated interchange elevations were considered.

There are several receptors located within the preliminary right-of-way line that may be acquired as part of the build alternative. There are also receptors that may have to be acquired because of access restrictions. These receptors were not studied since they may be acquired.

2.3.5 Traffic

Paragraph b, Section 772.17 of 23 CFR 772 says that, "in predicting noise levels and assessing noise impacts, traffic characteristics which will yield the worst hourly traffic noise impact on a regular basis for the design year shall be used." Since the level of highway traffic noise is normally related directly to the traffic volume, the traffic characteristics which will yield the worst hourly traffic noise impact on a regular basis for the design year will be the average hourly volume for the highest hour of each day of the design year. The traffic volumes were obtained from TDOT.

For the design year build alternative, the following input variables were used:

- The bypass through lane volumes were input with 65 mph speeds for all vehicle types.
- The Design Hourly volumes used were 10% on US 64, 11% on SR 76, and 10% on the Beltway (from TDOT).
- Various truck percentages were provided by TDOT, ranging from 5-10%, depending on the specific road. The bypass was predicted to have a 6% total truck percentage.
- Various fleet mixes were provided by TDOT. For the bypass, the mix was 94% autos, 2% medium trucks, and 4% heavy trucks.
- A directional split of 50/50 was assumed for the preliminary analysis.

2.4 FIELD NOISE MEASUREMENTS

The determination of existing sound levels is made utilizing field measurement of actual sound levels. The measurements are taken at a representative number of noise sensitive land uses that are likely to be affected by the project and are representative of outdoor areas of frequent human use. The measurements are taken consistent with the guidelines contained in FHWA's Measurement of Highway-Related Noise (1996).

Ambient noise level measurements were made at seventeen (17) representative sites selected sites in the vicinity of the proposed project using a Metrosonics dB-3080 Type I Sound Level Analyzer during hours of maximum traffic volumes, where traffic could be counted. The calibration of the Sound Level Analyzer was checked with a QC-10M Calibrator before and after each measurement was taken. The results are shown below (Table 3). Figure 3, located at the end of this report, shows the measurement locations on a map.

TABLE 3
SOUND LEVEL MEASUREMENTS

Measurement Site Number	Receptor Identification and Location	Measured	Model Validated	Dominant Noise Source(s)
1	Residences; US 64 E, west of interchange	60	63	US 64
2	Residences; Country Club Cove, southeast of site #1	47	N/A	Wildlife, neighborhood activities, distant US 64
3	Commercial; US 64 E, west of site #1	68	69	US 64
4	Commercial; US 64 W, east of interchange	69	66	US 64
5	Residences; SR 76 S, south of interchange	62	59	SR 76
6	Residences; SR 76 N, south of interchange	65	65	SR 76
7	Mixed commercial/residential; US 64 W, near to downtown Somerville	69	66	US 64
8	Mixed use commercial/residential; SR 76 S, south of downtown Somerville	63	61	SR 76
9	Residences; SR 76 N, north of downtown Somerville	62	61	SR 76
10	Residences; Old Jackson South Spur, near proposed bypass	49	N/A	Wildlife, neighborhood activities
11	Residences; Old Jackson South, near proposed bypass	51	N/A	Wildlife, neighborhood activities
12	Residences; Jefferson Drive, north of SR 76 N interchange with bypass	44	N/A	Wildlife, neighborhood activities, distant SR 76
13	Residences/Elks Lodge; Moose Lodge Road	47	N/A	Wildlife, neighborhood activities
14	Residences; Doll Way, near Fayette Academy	43	N/A	Wildlife, neighborhood activities, distant US 64
15	Residences; Somerville Street, east-northeast of proposed jail	44	N/A	Wildlife, neighborhood activities, distant SR 76
16	Residences; Jernigan Road	59	58	Jernigan Road, Wildlife, neighborhood activities
17	Residences; Deerfield Cove, northwest of proposed justice center	44	N/A	Wildlife, neighborhood activities

N/A - Not Applicable: there was no traffic or only a few vehicular passby's.
Source: Michael Baker

2.5 EXISTING CONDITION MODELED RESULTS

In the existing year scenario, there are zero (0) receptors that have existing exterior noise levels approaching or exceeding the 23 CFR Part 772 Noise Abatement Criteria Levels (NAC).

The highest modeled sound levels occur at those locations near the principle arterials US 64 and SR 76. Please note that all receptors were placed at exterior ground level sites near the residences. The results are shown in Table 4. Figure 4 shows the locations on a map.

Please note that the field sound level measurements were made to help calibrate/validate the TNM computer model where possible. Generally, however, the proposed bypass alignment traverses through areas where nearby traffic can not be seen, does not exist, and/or local subdivision street traffic and neighborhood activities are the dominant sources. In such area, the measured sound levels were used as the existing baseline unless the modeled results showed higher sound levels.

2.6 DESIGN YEAR NO-BUILD ALTERANTIVE MODELED RESULTS

Generally, for the Design year 2030 No-Build Alternative, the peak Leq noise levels from highway traffic at the receptors are predicted to minimally increase (0-2 dBA) over the existing year. Generally, those receptors that are located away from the heavier traveled ways in the region have a 0 dBA increase from traffic noise. Only those receptors located near to the major arterials such as US 64 and SR 76 had a predicted increase of 1-2 dBA as a result of predicted traffic growth.

Nevertheless, similar to the existing condition, the predicted number of highway traffic noise impact is also expected to be zero (0) for the Design Year No-Build Alternative. The results are shown in Table 4. Figure 4 shows the locations on a map.

2.7 DESIGN YEAR BUILD ALTERNATIVE MODELED RESULTS

For the Design Year Build Alternative, the predicted highway traffic noise impact is also expected to be zero (0). There are no receptors that meet the NAC criteria and the greatest increase over existing condition is predicted to be 6 dBA. The results are shown in Table 4. Figure 4 shows the locations.

The primary reasons why there are no impacts according to TDOT policy include the relatively low design year bypass volumes ("low" as they relate to noise) and the distances from the bypass.

Generally, the highest "absolute" sound levels were predicted along the two main routes to and through the Town of Somerville (US 64 and SR 76), with sound levels in the high 50's and low 60's dBA. The rural and suburban areas generally had sound levels in the mid 40's to low 50s dBA.

The highest relative sound level changes (predicted 6 dBA maximum increase over existing) generally occur where the proposed bypass intersects with local cross streets and there are existing homes nearby. By and large, this included areas near to Old Jackson, Old Jackson South, Jefferson, Fendall, and Old Jackson South Spur.

There were also predicted sound level decreases as a result of the proposed action. Receptors located immediately along US 64 and SR 76 that would be within the bypass beltway (but still not too near to the bypass) would experience a decrease in traffic volumes and traffic noise as a result of the

diversion to the proposed bypass. Outside of the immediate downtown Somerville town area, the predicted sound level decreases are approximately 1-2 decibels less than the no-build condition.

In the immediate downtown area where US 64 and SR 76 intersect, the sound levels are exaggerated by the stop-and-go acceleration and brake noise, primarily from heavy vehicles. The decrease in the downtown area is predicted to be 3 dBA less than the no-build condition according to the noise model. The noise model has flow control inputs that can account for vehicular acceleration. However, the model does not account for air braking and idling truck noise. Nonetheless, professional judgment indicates that if the number of trucks is reduced, then the sound level change may be perceived to be more than just the 3 dBA that is predicted by the model. Note: though it normally takes a doubling (or halving) of the traffic volumes to change the sound levels by 3 dBA, the proposed bypass also is predicted to change the fleet mix going through downtown Somerville by reducing the number of heavy trucks.

2.8 MITIGATION

The preliminary noise study results indicate that there are no sound level impacts according to TDOT policy (Table 4). As a result, a mitigation analysis is not warranted.

2.9 CONSTRUCTION NOISE CONSIDERATION AND MITIGATION ALTERNATIVES

Sensitive receptors can also experience short-term noise impacts as a result of project construction. Construction impacts can be controlled by the implementation of Best Management Practices during construction. Measures to be incorporated in the project to mitigate construction noise impacts should be identified in the environmental document and specified in the contract plans for the project.

The following noise abatement measures "are suggested" to be incorporated in the contract plans and specifications in order to prevent adverse construction noise impact in the vicinity of the proposed project:

(A) The contractor shall comply with all state and local sound control and noise level rules, regulations and ordinances which apply to any work performed pursuant to the contract.
(B) Each internal combustion engine used for any purpose on work related to the project shall be equipped with a muffler of a type recommended by the manufacturer. No internal combustion engine shall be operated on the project without such muffler.

TABLE 4
MODELED NOISE LEVELS

Receiver Number	No. of DU's	Receiver Type/Location	NAC	Existing Year	Design Year Alternatives	
					No-Build	Build
1	1	Residential - US 64 W	66	60	62	61
2	1	Residential - US 64 W	66	61	62	61
3	1	Residential - US 64 W	66	60	62	61
4	N/A	Outbuilding -Off of SR 76 S	-	-	-	-
5	1	Residential - SR 76 S	66	52	54	55
6	1	Residential - SR 76 S	66	57	58	57
7	8	Residential - SR 76 S	66	63	64	64
8	1	Residential - SR 76 S	66	64	65	65
9	1	Residential - Kay Lane	66	50	51	53
10	4	Residential - SR 76 S	66	61	62	62
11	1	Residential - Kay Lane	66	51	52	53
12	-	Commercial - US 64 E	71	58	59	58
13	-	Commercial - US 64 E	71	58	60	58
14	-	Commercial - US 64 E	71	57	58	57
15	2	Residential - US 64 E	66	48	49	49
16	N/A	Outbuilding - US 64 E	-	-	-	-
17	2	Residential - Country Club Cove	66	47	47	47
18	1	Residential - US 64 E	66	60	61	62
19	1	Residential - Old Jackson So.	66	49	49	49
20	1	Residential - Old Jackson So.	66	49	49	55
21	N/A	Outbuilding - Old Jackson So.	-	-	-	-
22	1	Residential - Old Jackson Rd	66	47	48	51
23	2	Residential - Old Jackson Rd	66	48	49	51
24	1	Residential - SR 76 N	66	60	61	61
25	2	Residential - Jefferson Drive	66	48	49	52
26	2	Residential - Jefferson Drive	66	44	44	49
27	2	Residential - Jefferson Drive	66	44	44	49
28	2	Residential - Jefferson Drive	66	48	49	51
29	2	Residential - Jefferson Drive	66	44	44	48
30	2	Residential - Jefferson Drive	66	44	44	46
31	2	Residential - SR 76 N	66	58	59	59
32	2	Residential - SR 76 N	66	59	60	58
33	1	Residential - SR 76 N	66	58	59	57
34	1	Residential - Vester Drive	66	51	52	52
35	2	Residential - Vester Drive	66	51	52	51
36	-	Church - SR 76 N	66	55	55	54
37	1	Residential - SR 76 N	66	56	56	55
38	1	Residential - Armory Road	66	51	52	50
39	1	Residential - Armory Road	66	48	48	47
40	1	Residential - Armory Road	66	46	46	47

N/A - 23 CFR 772 noise criteria do not apply to service stations, industrial areas, storage areas and other areas having limited human use or where lowered noise levels would produce little benefit.
DU-Dwelling Units
Source: Michael Baker, Inc.

TABLE 4 (cont.)
MODELED NOISE LEVELS

Receiver Number	No. of DU's	Receiver Type/Location	NAC	Existing Year	Design Year Alternatives	
					No-Build	Build
41	1	Residential - Fendall Drive	66	44	44	50
42	3	Residential - Armory Road	66	53	54	56
43	-	Elks Lodge - Tuckers Way	66	47	47	48
44	2	Residential - Feathers Chapel	66	51	53	54
45	2	Residential - Henry Road	66	47	47	47
46	1	Residential - Feathers Chapel	66	47	47	47
47	1	Residential - Feathers Chapel	66	47	47	47
48	1	Residential - US 64 W	66	62	64	63
49	-	Commercial - US 64 W	71	68	70	68
50	1	Residential - US 64 W	66	63	65	63
51	-	Commercial - US 64 W	71	57	59	58
52	-	Commercial - US 64 W	71	52	53	53
53	1	Residential - Doll Way	66	51	53	52
54	1	Residential - Doll Way	66	47	48	49
55	1	Residential - Doll Way	66	46	47	48
56	1	Residential - Doll Way	66	46	48	48
57	1	Residential - Deerfield Avenue	66	44	44	44
58	1	Residential - Deerfield Avenue	66	44	44	44
59	1	Residential - Deerfield Avenue	66	44	44	44
60	2	Residential - Deerfield Avenue	66	44	44	44
61	3	Residential - Deerfield Avenue	66	44	44	44
62	3	Residential - Woodbridge Road	66	44	44	44
63	1	Residential - Woodbridge Road	66	44	44	44
64	3	Residential - Woodbridge Road	66	44	44	44
65	-	Fayette County Justice Center - Outdoor Activity Area	66	44	44	46
66	2	Residential - Jernigan Road	66	49	51	51
67	1	Residential - Jernigan Road	66	48	50	51
68	1	Residential - Jernigan Road	66	56	58	57
69	1	Residential - Old Jackson South Spur	66	49	49	49
70	1	Residential - Old Jackson South Spur	66	49	49	53
71	1	Residential - Old Jackson Rd	66	51	51	51
72	2	Residential - Moose Lodge Road	66	47	47	49
73	1	Residential - Feathers Church Road	66	47	47	50
74	1	Residential - US 64 W	66	49	51	50
75	-	Commercial - US 64 W	71	60	61	60
76	-	Church - SR 76 S	66	60	61	59
77	-	Commercial - US 64 W	71	63	64	62
78	-	Municipal - US 64 & SR 76	-	69	70	67

DU-Dwelling Units
Source: Michael Baker, Inc.

2.10 PUBLIC INVOLVEMENT PROCESS

According to 23 CFR 772.15, Information for Local Officials, in an effort to prevent future traffic noise impacts on currently undeveloped lands, highway agencies shall inform local officials within whose jurisdiction the highway project is located of the following:

- The best estimation of future noise levels (for various distances from the highway improvement) for both developed and undeveloped lands or properties in the immediate vicinity of the project,
- Information that may be useful to local communities to protect future land development from becoming incompatible with anticipated highway noise levels

The following table (Table 5), indicates the future predicted noise levels and their critical distances for the proposed project. This information is being included to make local officials and planners aware of anticipated highway noise levels so that future development may be compatible with these levels.

The distances in the table are measured perpendicular to the center of the proposed near lane at an at-grade situation. The predicted Leq sound levels displayed are conservative and should be considered to be the maximum (highest) noise levels expected at any location along the entire roadway at the same distance from the roadway. Note: the highest traffic volumes were predicted to occur on the southwest link of the circumferential bypass between US 64 West and SR 76 South. All other bypass sections had lower predicted volumes.

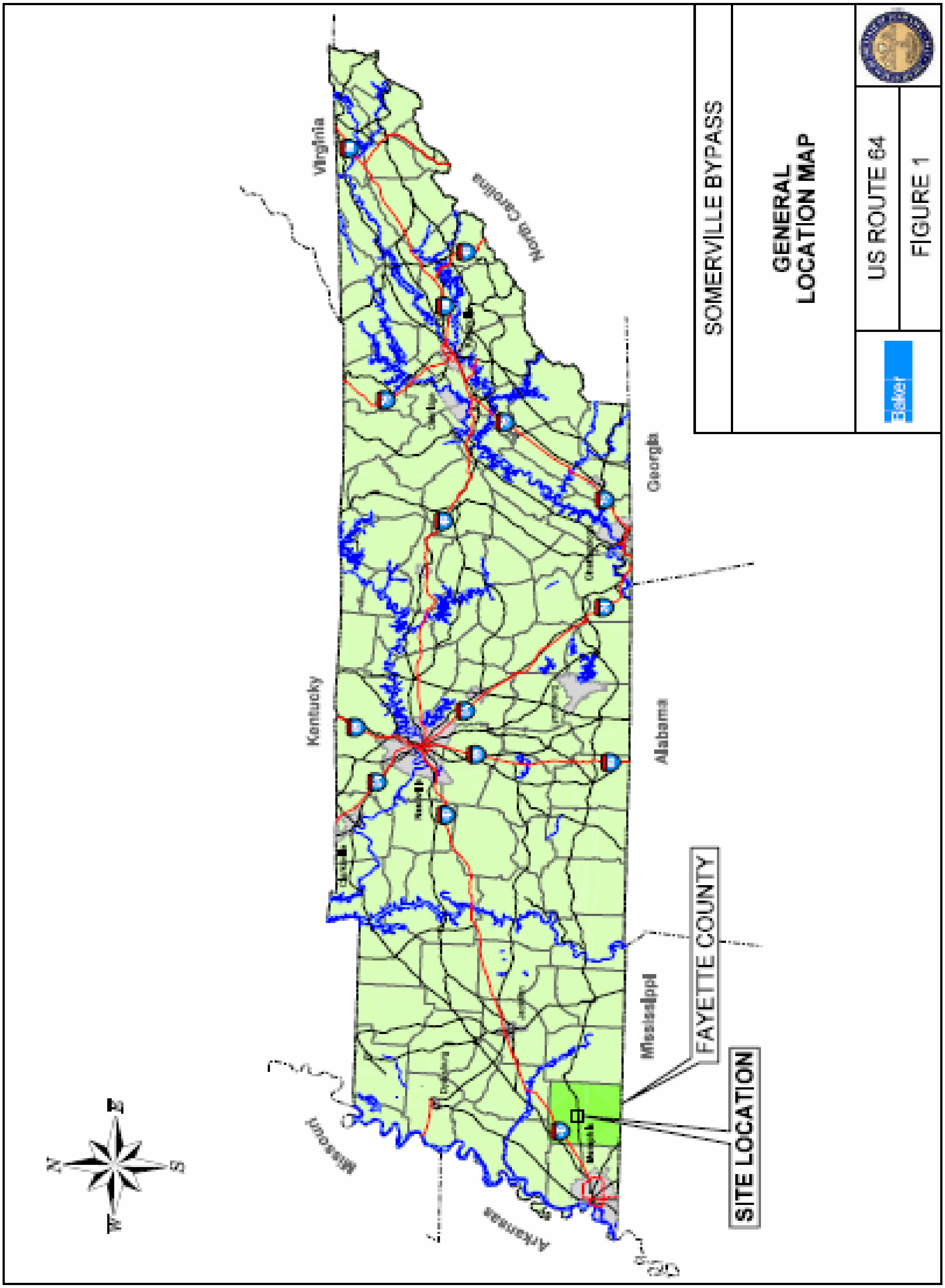
Additionally, TDOT noise analysis reports must document public involvement activities as well as public concerns, comments and responses to public comments on project noise impacts and TDOT's noise abatement strategies. Currently, there are no extenuating circumstances in regards to the proposed action at this time other than past comment(s) made about "loud" sound levels in the downtown area from the traffic congestion and subsequent acceleration/braking noise from the queuing. (Note that the analysis shows a 3 dBA reduction at receptor #78). During the public involvement process, if such circumstances arise, then they will be addressed as reasonably as possible according to applicable TDOT policy and procedure.

TABLE 5
DESIGN YEAR (2030) PREDICTED dBA Leq CONTOURS
(PROJECT CONTRIBUTED)

Distance (in feet)*	Leq Sound Levels
100	64
200	57
300	53
400	50
500	49

*Perpendicular distance to the center of the proposed near traffic lane for an at-grade situation.
Source: Michael Baker

FIGURE 1. GENERAL LOCATION MAP



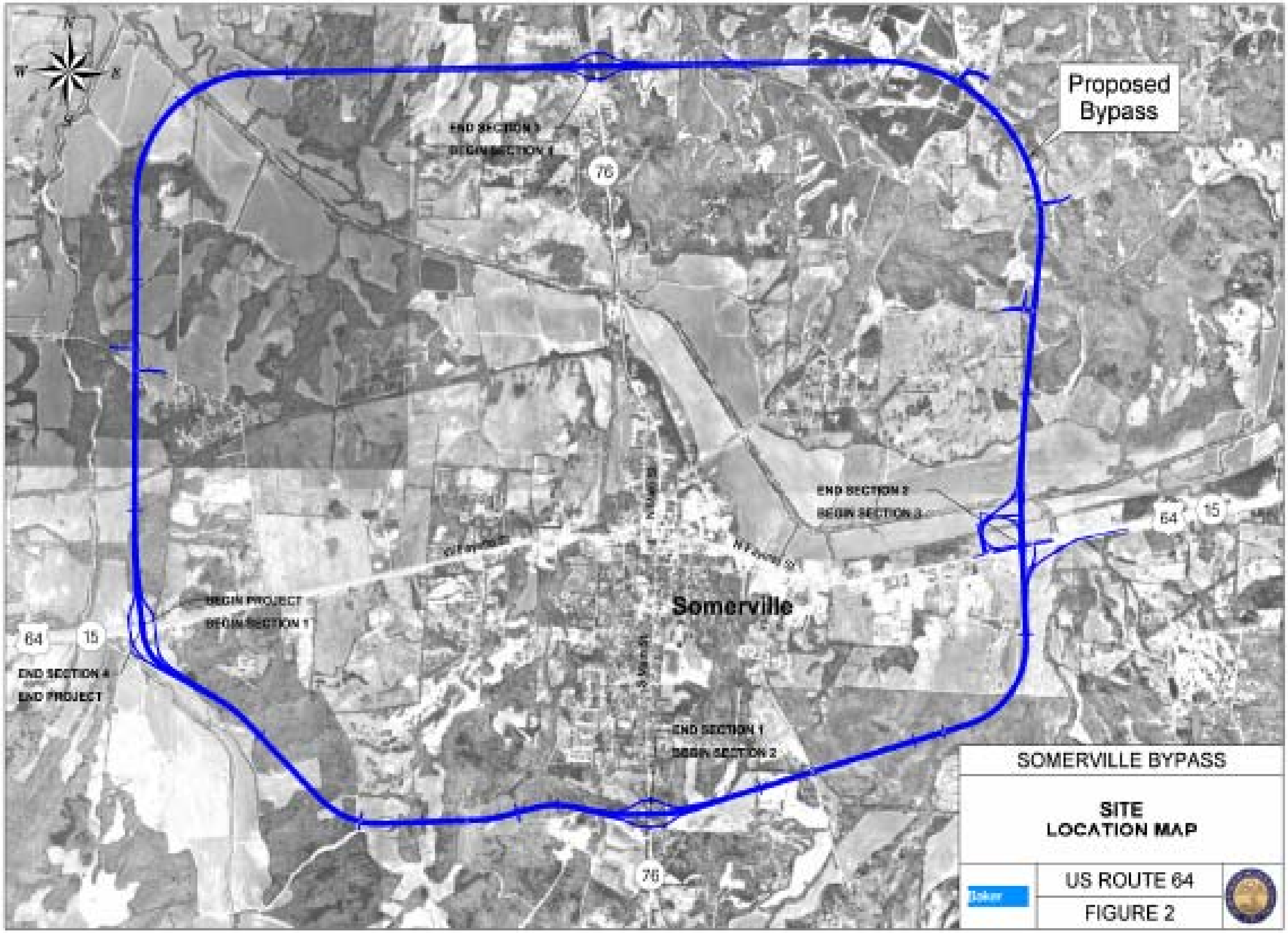


FIGURE 2. SITE LOCATION MAP

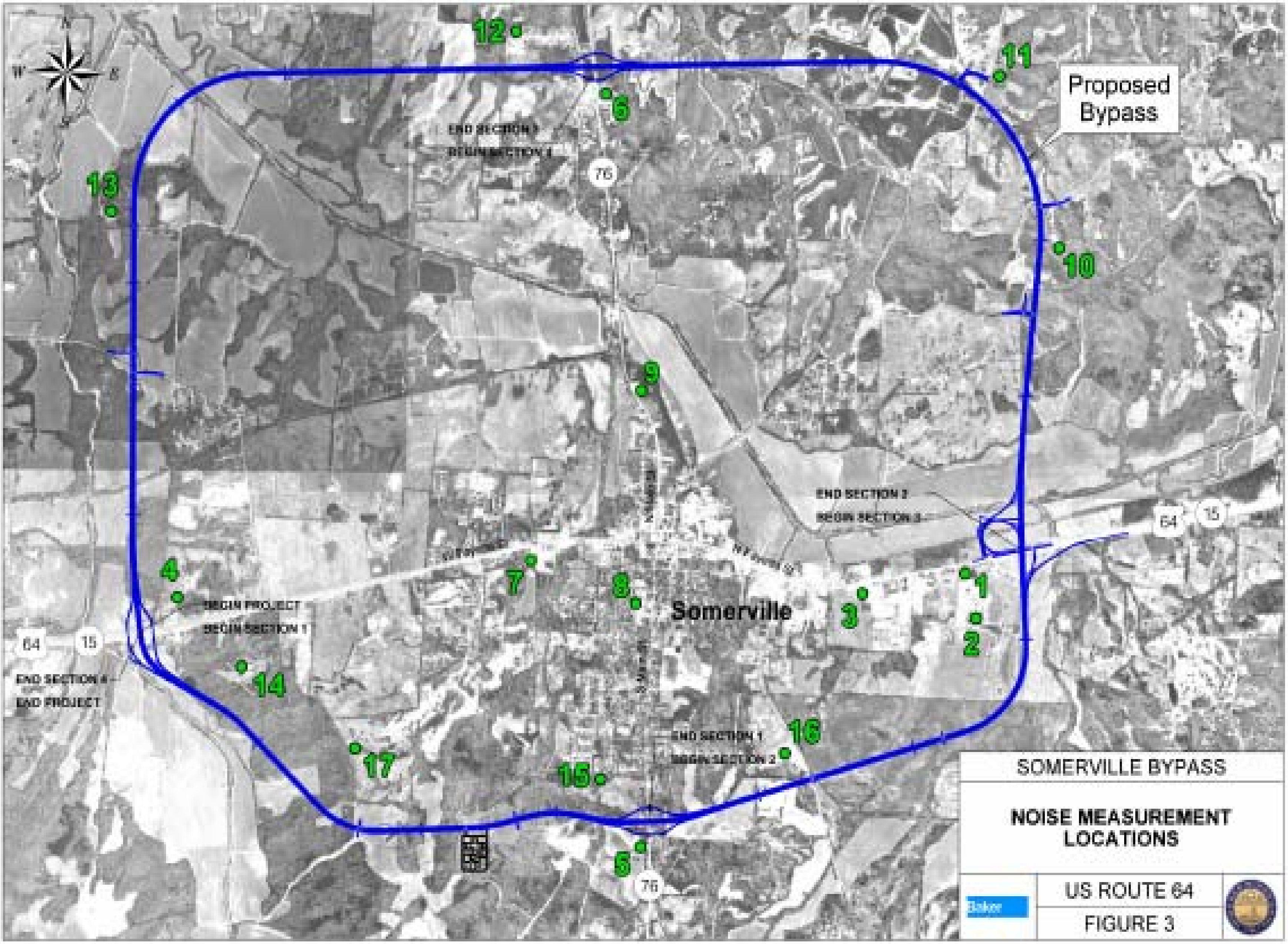


FIGURE 3. NOISE MEASUREMENT LOCATIONS

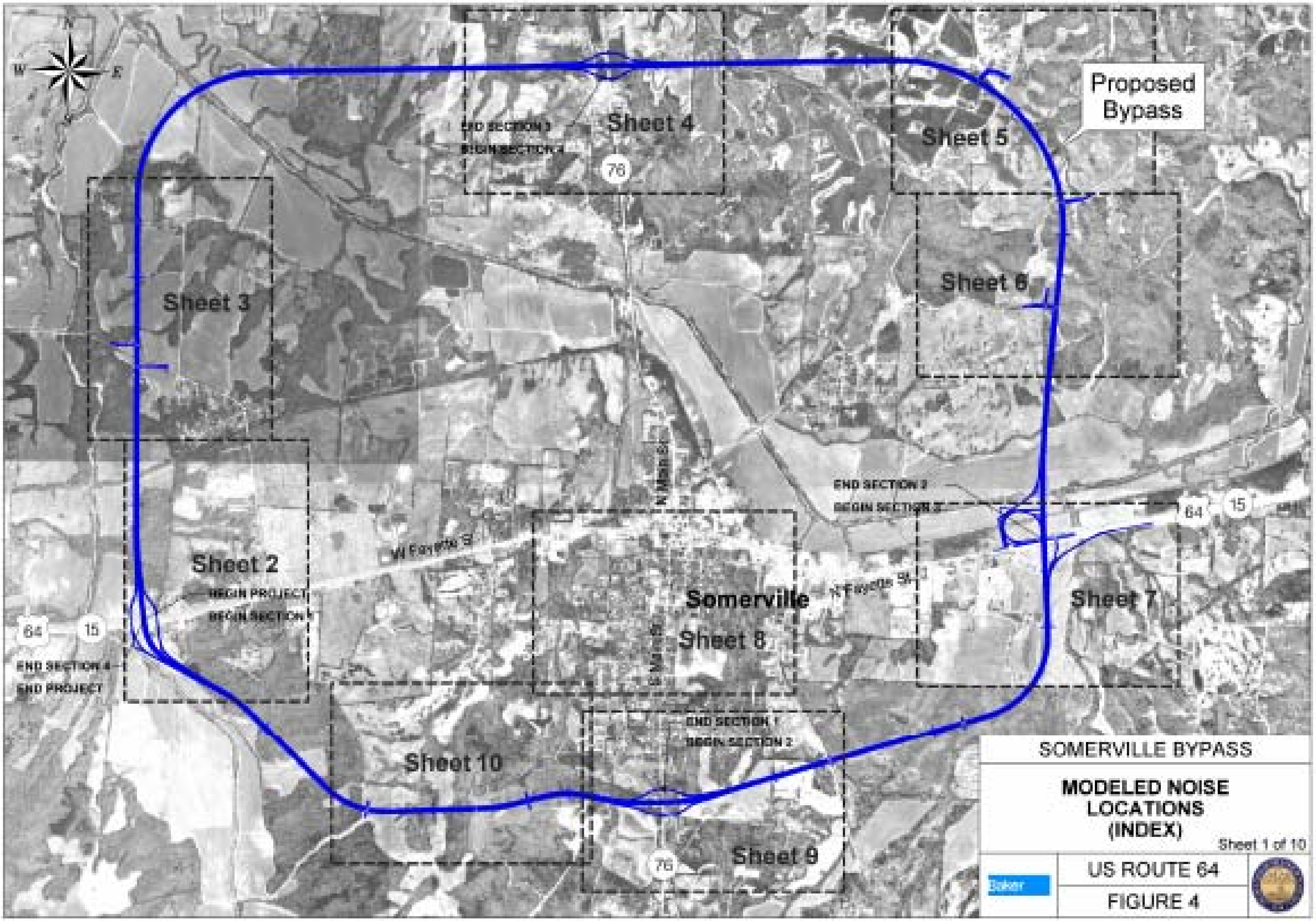
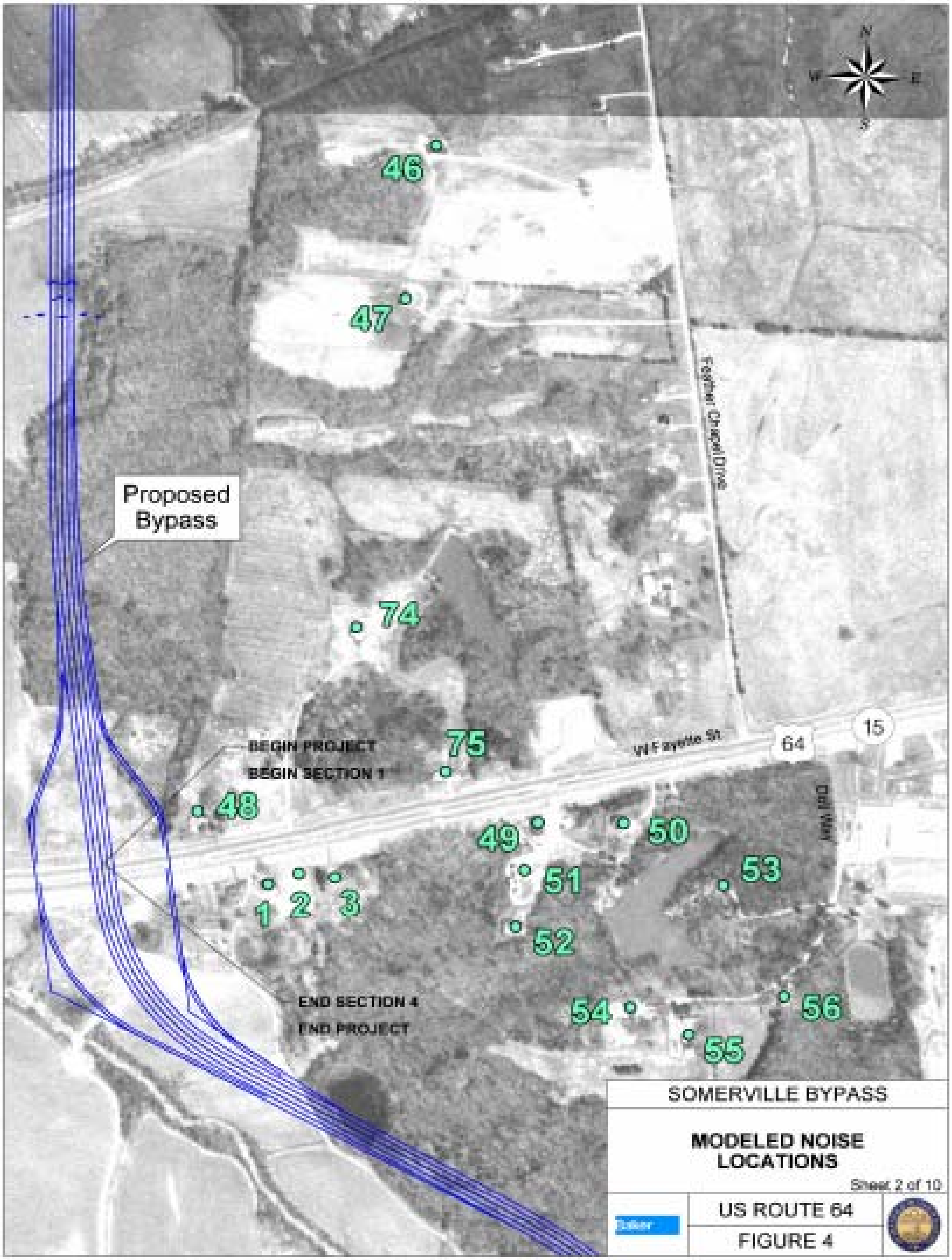
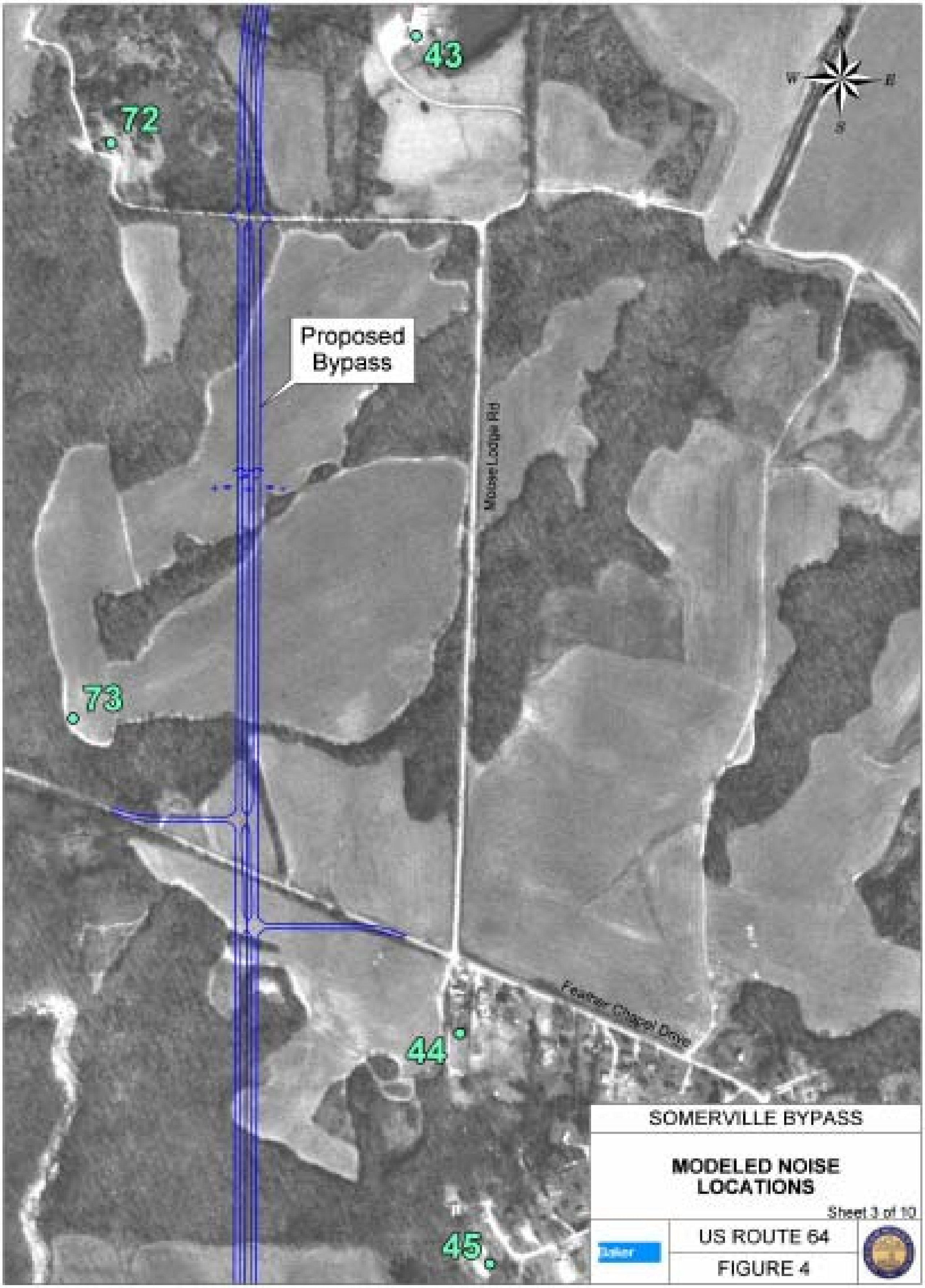
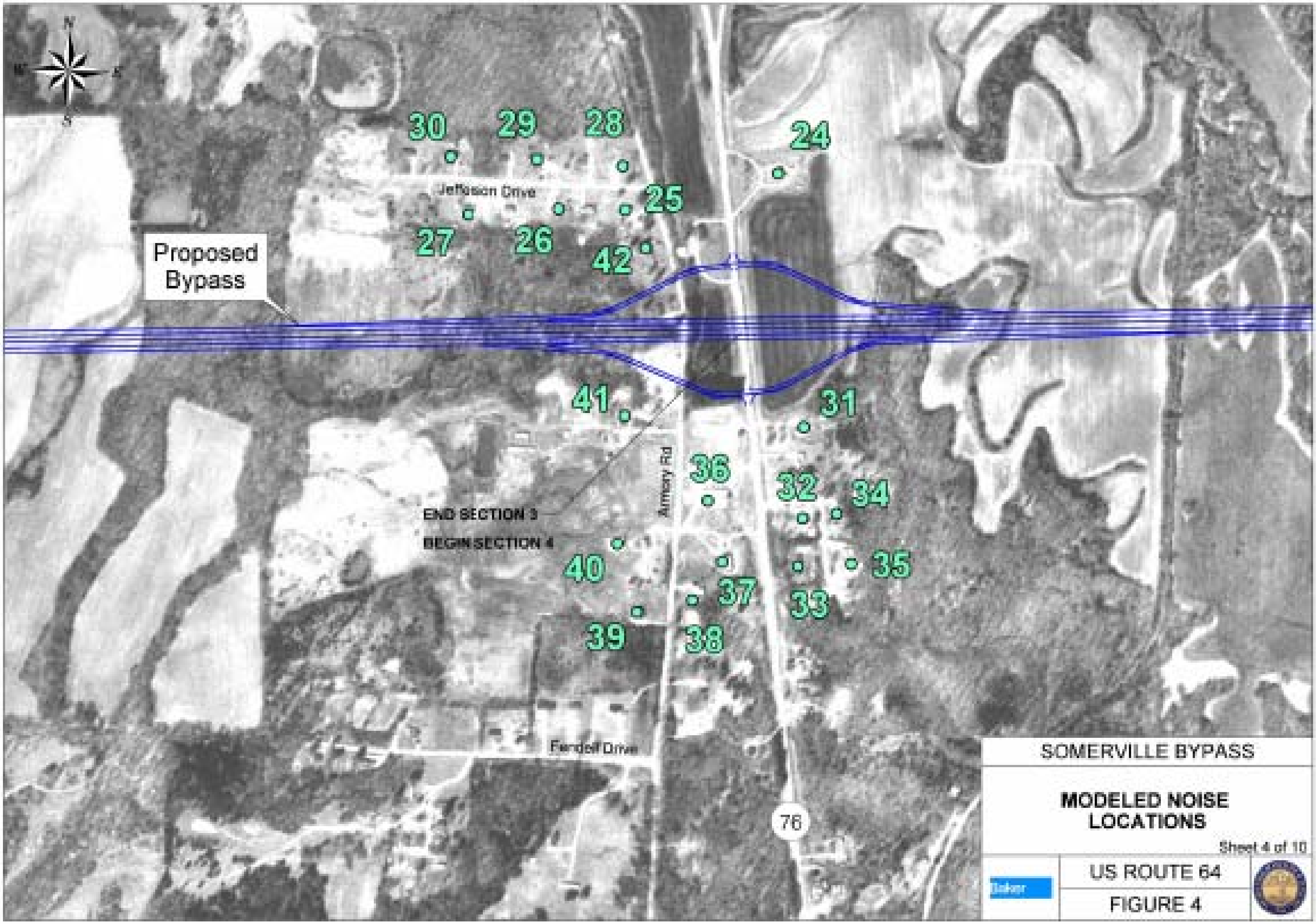
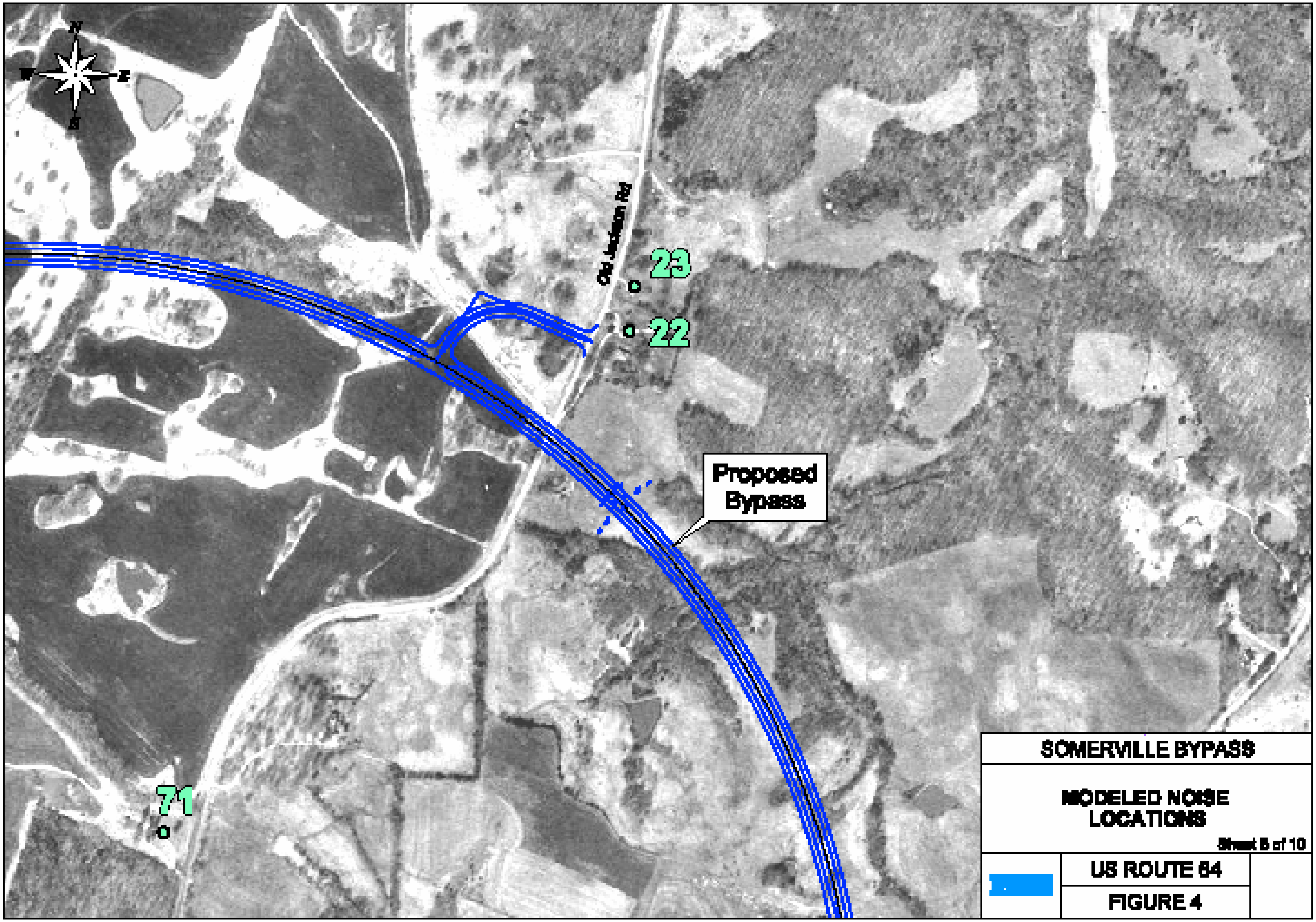


FIGURE 4. MODELED NOISE LOCATIONS [SHEETS 1-10]

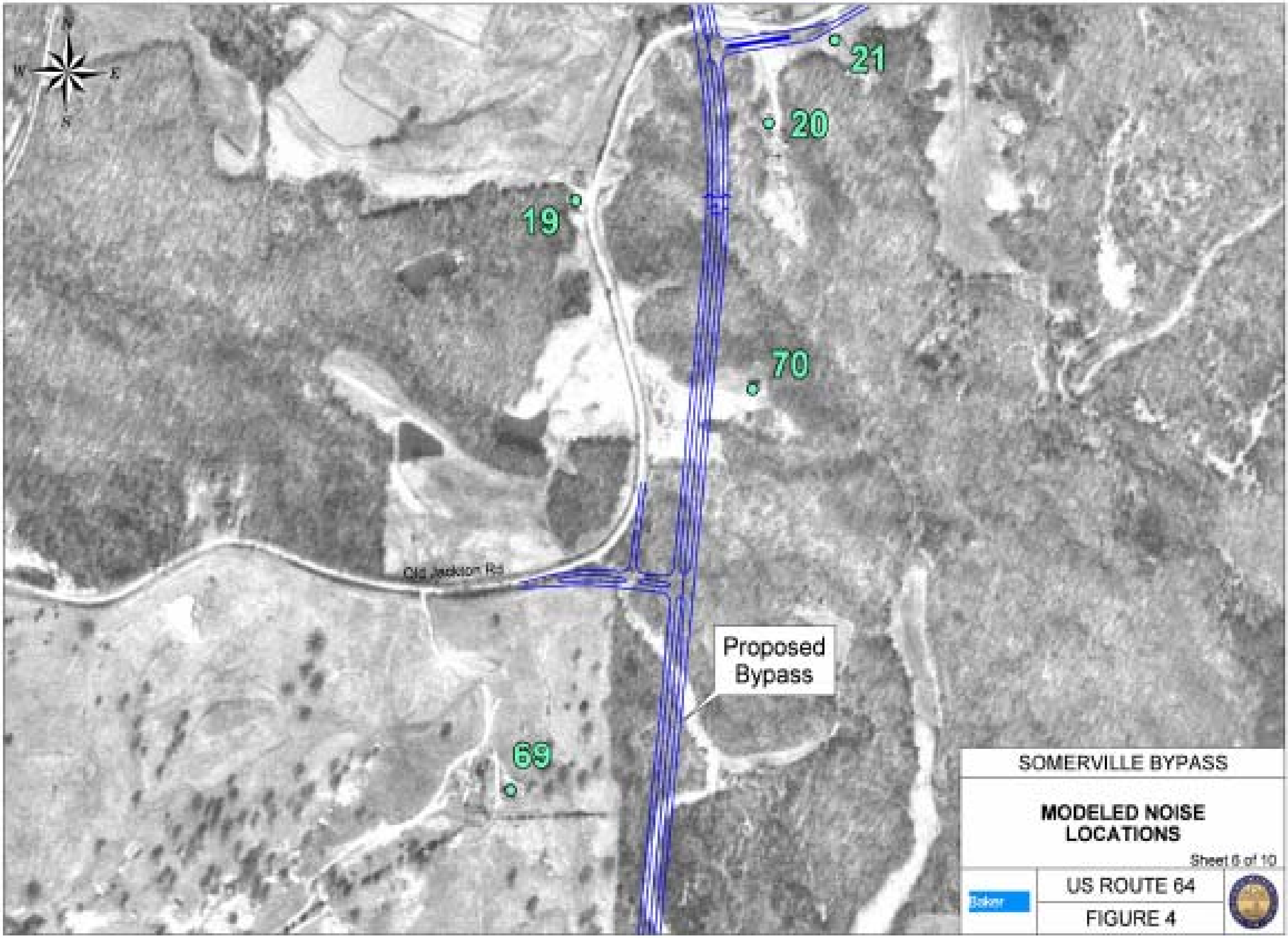

N
W
E
S
46
47
Proposed Bypass
Fayette Chapel Drive
74
75
W Fayette St
64
15
Dial Way
BEGIN PROJECT
BEGIN SECTION 1
48
49
50
51
53
1
2
3
52
END SECTION 4
END PROJECT
54
56
55
SOMERVILLE BYPASS
MODELED NOISE LOCATIONS
Sheet 2 of 10
US ROUTE 64
FIGURE 4


43
72
W
E
S
Proposed
Bypass
Moose Lodge Rd
73
Feather Chapel Drive
44
45
SOMERVILLE BYPASS
MODELED NOISE
LOCATIONS
Sheet 3 of 10
US ROUTE 64
FIGURE 4


30
29
28
24
Jefferson Drive
25
27
26
42
Proposed Bypass
41
31
Armory Rd
36
32
34
END SECTION 3
BEGIN SECTION 4
40
35
37
33
39
38
76
SOMERVILLE BYPASS
MODELED NOISE LOCATIONS
Sheet 4 of 10
US ROUTE 64
FIGURE 4



N
W
E
S
Old Jackson Rd
23
22
71
Proposed Bypass
SOMERVILLE BYPASS
MODELED NOISE LOCATIONS
Sheet 6 of 10
US ROUTE 64
FIGURE 4


N
W
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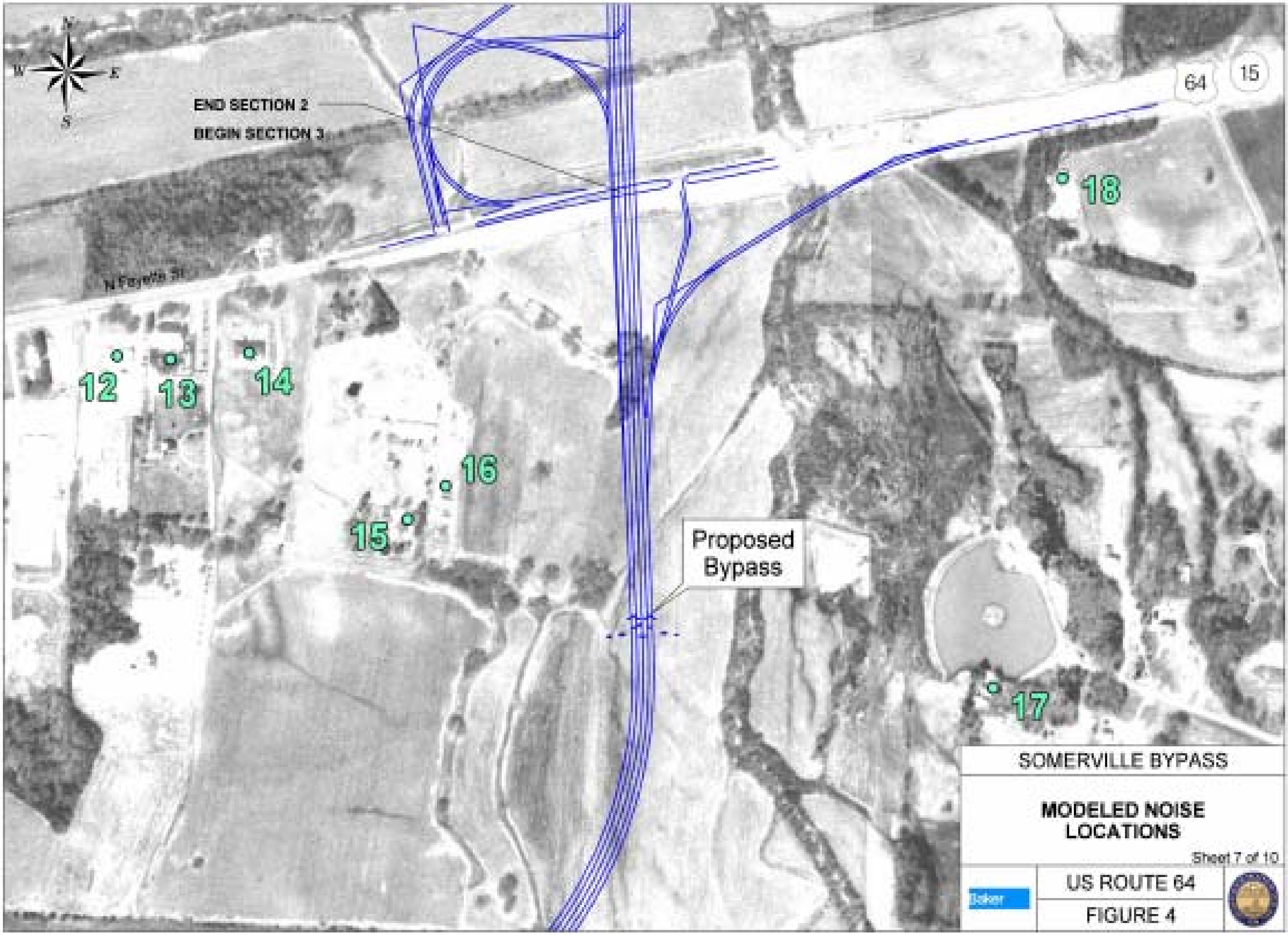
21
20
19
70
Old Jackson Rd
Proposed Bypass
69
SOMERVILLE BYPASS
MODELED NOISE LOCATIONS
Sheet 6 of 10
Baker
US ROUTE 64
FIGURE 4


N
S
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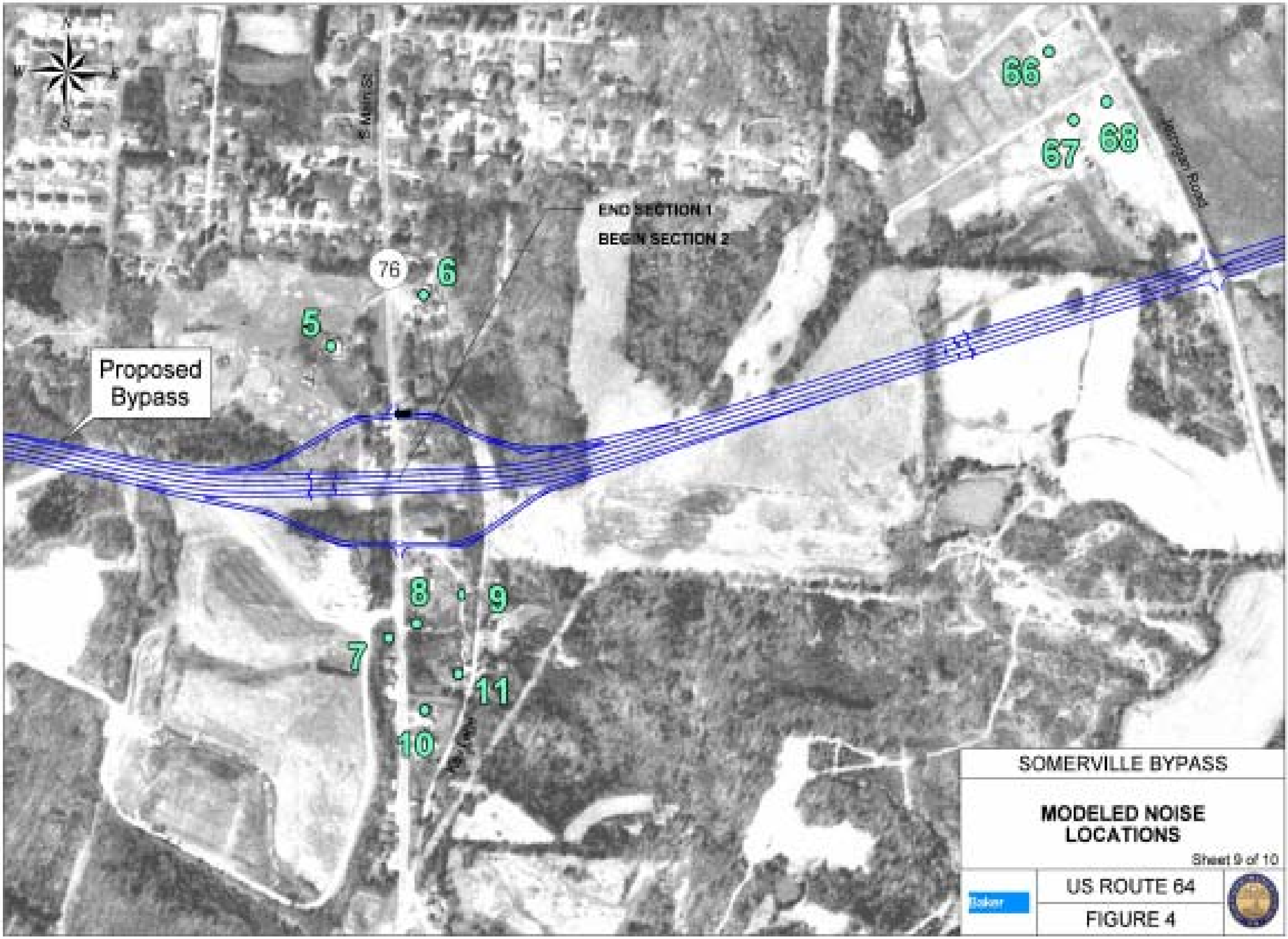
END SECTION 2
BEGIN SECTION 3
N Fayette St
64
15
12
13
14
15
16
17
18
Proposed Bypass
SOMERVILLE BYPASS
MODELED NOISE LOCATIONS
Sheet 7 of 10
US ROUTE 64
FIGURE 4

78
77
76
W Fayette St
64
15
N Fayette St
Somerville
E Marginal St
S Lord St
S Main St
76
SOMERVILLE BYPASS
MODELED NOISE LOCATIONS
Sheet 8 of 10
US ROUTE 64
FIGURE 4


N
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S Main St
76
END SECTION 1
BEGIN SECTION 2
Proposed Bypass
5
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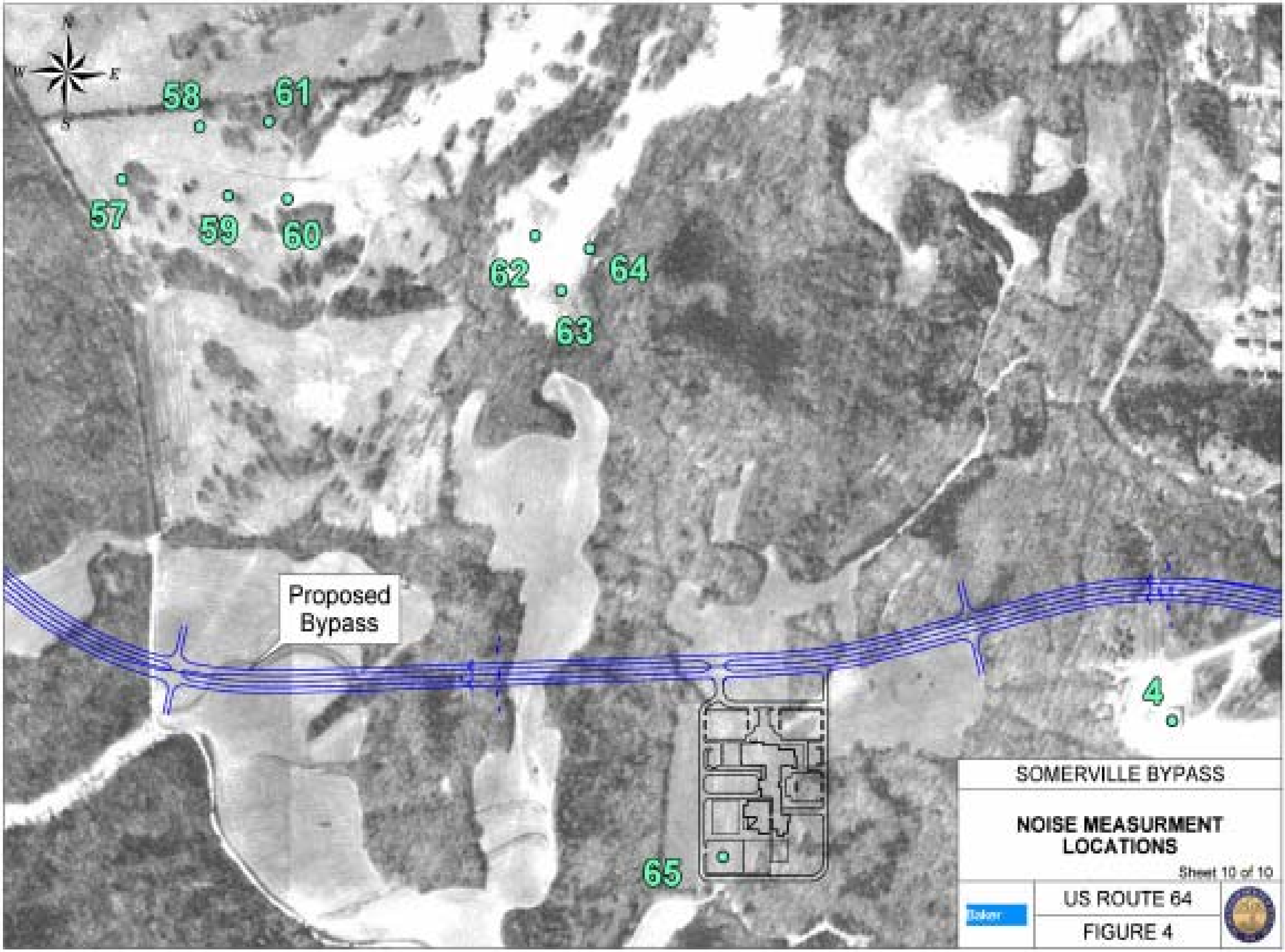
67
68
SOMERVILLE BYPASS
MODELED NOISE LOCATIONS
Sheet 9 of 10
US ROUTE 64
FIGURE 4
Baker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58
61
57
59
60
62
64
63
Proposed
Bypass
4
65
SOMERVILLE BYPASS
NOISE MEASURMENT
LOCATIONS
Sheet 10 of 10
Baker
US ROUTE 64
FIGURE 4